



FLORA OF AUSTRALIA

Volume 4
Phytolaccaceae to
Chenopodiaceae



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FLORA OF AUSTRALIA

The five families in this volume of the *Flora of Australia* are Aizoaceae, Cactaceae, Chenopodiaceae, Nyctaginaceae and Phytolaccaceae. The Chenopodiaceae is a large family with 302 species in Australia, found especially in arid and saline areas. They include important native pasture plants such as saltbush, bluebush and samphire, and weeds such as goosefoot.

The family Cactaceae contains only introduced species in Australia, among them prickly pear, which invaded large areas of Queensland in the 1920s and still persists in some areas. The other families include both native and introduced species. Aizoaceae includes many succulent plants such as pigface and ice-plant.

A number of species of Chenopodiaceae and Nyctaginaceae are described for the first time.

Cover. *Halosarcia peltata* Paul G. Wilson (Chenopodiaceae), a samphire endemic in Western Australia. Painting by Margaret Menadue, reproduced by courtesy of the artist.

Contents of volumes in the Flora of Australia, the families arranged according to the system of A.J. Cronquist (1981).

Volume 1	Cannabaceae Moraceae	Volume 7	Volume 10	Haloragales Haloragaceae Gunneraceae
Introduction	Urticaceae	Malvales Elaeocarpaceae Tiliaceae	Ebenales Sapotaceae Ebenaceae Symplocaceae	Myrtales Sonneratiaceae Lythraceae Thymelaeaceae Punicaceae Onagraceae Melastomataceae Combretaceae Trapaceae
Volume 2	Fagales Balanopaceae Betulaceae Fagaceae	Sterculiaceae Bombacaceae Malvaceae	Primulales Myrsinaceae Primulaceae	Volume 19,20,21 Myrtaceae
Magnoliales Winteraceae Himantandraceae Eupomatiaceae Austrobaileyaceae Magnoliaceae Annonaceae Myristicaceae	Casuarinales Casuarinaceae	Volume 8 Lecythidales Lecythidaceae	Rosales Connaraceae Eucryphiaceae Cunoniaceae Davidsoniaceae Pittosporaceae Byblidaceae Grossulariaceae Crassulaceae Cephalotaceae Saxifragaceae Rosaceae Chrysobalanaceae Surianaceae	Volume 22 Rhizophorales Rhizophoraceae Cornales Alangiaceae
Laurales Monimiaceae Idiospermaceae Lauraceae Hernandiaceae	Caryophyllales Phytolaccaceae Nyctaginaceae Aizoaceae Cactaceae Chenopodiaceae	Nepenthales Nepenthaceae Droseraceae Violales Flacourtiaceae Bixaceae Cistaceae Violaceae Tamaricaceae Frankeniaceae Passifloraceae Cucurbitaceae Datisceae	Volumes 11,12 Fabales Mimosaceae Caesalpinaceae	Volume 22 Rhizophorales Rhizophoraceae Cornales Alangiaceae Santalales Olacaceae Opiliaceae Santalaceae Loranthaceae Viscaceae Balanophoraceae
Piperales Piperaceae	Volume 5	Salicales Salicaceae	Volumes 13,14,15 Fabaceae	Volume 22 Rhizophorales Rhizophoraceae Cornales Alangiaceae Santalales Olacaceae Opiliaceae Santalaceae Loranthaceae Viscaceae Balanophoraceae
Aristolochiales Aristolochiaceae	Amaranthaceae Portulacaceae Basellaceae Molluginaceae Caryophyllaceae	Capparales Capparaceae Brassicaceae Moringaceae Resedaceae	Volumes 16,17 Proteales Elaeagnaceae Proteaceae	Volume 22 Rhizophorales Rhizophoraceae Cornales Alangiaceae Santalales Olacaceae Opiliaceae Santalaceae Loranthaceae Viscaceae Balanophoraceae
Nymphaeales Nelumbonaceae Nymphaeaceae Cabombaceae Ceratophyllaceae	Polygonales Polygonaceae	Batales Gyrostemonaceae Bataceae	Volume 18 Podostemales Podostemaceae	Volume 22 Rhizophorales Rhizophoraceae Cornales Alangiaceae Santalales Olacaceae Opiliaceae Santalaceae Loranthaceae Viscaceae Balanophoraceae
Ranunculales Ranunculaceae Berberidaceae Menispermaceae	Plumbaginales Plumbaginaceae	Volume 9 Ericales Epacridaceae Ericaceae		Volume 22 Rhizophorales Rhizophoraceae Cornales Alangiaceae Santalales Olacaceae Opiliaceae Santalaceae Loranthaceae Viscaceae Balanophoraceae
Papaverales Papaveraceae Fumariaceae	Dilleniales Dilleniaceae			Volume 22 Rhizophorales Rhizophoraceae Cornales Alangiaceae Santalales Olacaceae Opiliaceae Santalaceae Loranthaceae Viscaceae Balanophoraceae
Volume 3	Theales Ochnaceae Theaceae			Volume 22 Rhizophorales Rhizophoraceae Cornales Alangiaceae Santalales Olacaceae Opiliaceae Santalaceae Loranthaceae Viscaceae Balanophoraceae
Hamamelidales Hamamelidaceae	Actinidiaceae Elatinaceae Clusiaceae			Volume 22 Rhizophorales Rhizophoraceae Cornales Alangiaceae Santalales Olacaceae Opiliaceae Santalaceae Loranthaceae Viscaceae Balanophoraceae
Urticales Ulmaceae				Volume 22 Rhizophorales Rhizophoraceae Cornales Alangiaceae Santalales Olacaceae Opiliaceae Santalaceae Loranthaceae Viscaceae Balanophoraceae

Volume 23	Volume 28	Bignoniaceae Lentibulariaceae	Cymodoceaceae Zosteraceae	Bromeliales Bromeliaceae
Euphorbiales Euphorbiaceae	Gentianales Loganiaceae Gentianaceae Apocynaceae Asclepiadaceae	Volume 34	Triuridales Triuridaceae	Zingiberales Musaceae Zingiberaceae Costaceae Cannaceae Marantaceae
Volume 24	Volume 29	Campanulales Sphenocleaceae Campanulaceae Stylidiaceae Donatiaceae	Arecales Arecaceae	Liliales Philydraceae Pontederiaceae Haemodoraceae Liliaceae
Rhamnales Rhamnaceae Leeaceae Vitaceae	Solanales Solanaceae	Volume 35	Pandanales Pandanaaceae	
Linales Erythroxylaceae Linaceae	Volume 30	Brunoniaceae Goodeniaceae	Arales Araceae Lemnaceae	
Polygalales Malpighiaceae Tremandraceae Polygalaceae Xanthophyllaceae	Convolvulaceae Cuscutaceae Menyanthaceae Polemoniaceae Hydrophyllaceae	Volume 36	Volume 40	Volume 46
	Lamiales Boraginaceae Verbenaceae	Rubiales Rubiaceae	Commelinales Xyridaceae Commelinaceae	Iridaceae Agavaceae Xanthorrhoeaceae Hanguanaceae Taccaceae Stemonaceae Smilacaceae Dioscoreaceae
Volume 25	Volume 31	Dipsacales Caprifoliaceae Valerianaceae Dipsacaceae	Eriocaulales Eriocaulaceae	
Sapindales Melianthaceae Akaniaceae Sapindaceae Aceraceae Bursereaceae Anacardiaceae Simaroubaceae	Lamiaceae	Volume 37,38	Restionales Flagellariaceae Restionaceae Centrolepidaceae	Volume 47
	Volume 32	Asterales Asteraceae	Juncuales Juncaceae	Orchidales Burmanniaceae Corsiaceae Orchidaceae
Volume 26	Callitrichales Callitrichaceae	Volume 39	Volume 41,42	
Meliaceae Rutaceae Zygophyllaceae	Plantaginales Plantaginaceae	Alismatales Limnocharitaceae Alismataceae	Cyperales Cyperaceae	Volume 48
	Scrophulariales Oleaceae Scrophulariaceae	Hydrocharitales Hydrocharitaceae	Volume 43,44	Gymnospermae
Volume 27	Volume 33	Najadales Aponogetonaceae Juncaginaceae Potamogetonaceae Ruppiceae Najadaceae Zannichelliaceae Posidoniaceae	Poaceae	Pteridophyta
Geraniales Oxalidaceae Geraniaceae Tropaeolaceae	Myoporaceae Orobanchaceae Gesneriaceae Acanthaceae Pedaliaceae		Volume 45	Volume 49 et seq.
Apiales Araliaceae Apiaceae			Hydatellales Hydatellaceae	Non-vascular plants and floras of administered territories
			Typhales Sparganiaceae Typhaceae	

FLORA OF AUSTRALIA



BUREAU OF FLORA AND FAUNA, CANBERRA

FLORA OF AUSTRALIA

Volume 4

Phytolaccaceae to Chenopodiaceae

Australian Government Publishing Service Canberra 1984

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ISBN 0 644 03442 4
ISBN 0 642 07013 X (series—case bound)
ISBN 0 644 03443 2
ISBN 0 642 07016 4 (series—soft bound)

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CONTENTS

Contributors to Volume 4	vi
Illustrators	vii
Introduction	ix
Phytolaccaceae <i>H.J. Hewson</i>	1
Nyctaginaceae <i>H.J. Hewson & R.D.Meikle</i>	5
Aizoaceae <i>A. Prescott & J. Venning</i>	19
Cactaceae <i>I.R.H. Telford</i>	62
Chenopodiaceae <i>Paul G. Wilson</i>	81
Appendix: new taxa, combinations, etc.	318
Supplementary Glossary	331
Abbreviations and Contractions	332
Publication date of the previous volumes	334
Index	335

Endpapers

Front: Contents of volumes in the *Flora of Australia*, the families arranged according to the system of A. J. Cronquist (1981).

Back: *Flora of Australia*: Index to families of flowering plants.

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INTRODUCTION

Volume 4 of the *Flora of Australia* contains five families of the order Caryophyllales in the Cronquist phylogenetic system. By far the largest of these is Chenopodiaceae which, with 32 genera and 302 species, is a major component of the Australian flora. The family is especially well represented in arid and saline habitats, some species being economically important as pasture plants. Four of the genera in Australia are represented only by naturalised species. These and several introduced species in other genera are significant weeds in some areas. The account of Chenopodiaceae in this volume is the culmination of a revision of the family in Australia by Paul G. Wilson. Some of this work has been published elsewhere, but the family is here brought together for the first time in Australia since Ulbrich's account of 1934. Detailed study is still needed, however, to solve some problems in the family.

The family Aizoaceae is also represented mainly by species of dry habitats. A high proportion of the Australian content is introduced, in particular species from South Africa.

The Cactaceae contains only naturalised species in Australia. Some are economically significant as aggressive weeds. The present account is the first comprehensive taxonomic study of the family in this country.

Although a small family, Nyctaginaceae has posed problems of classification in Australia. The present account resolves some of these with the description of new taxa, but further research is still needed.

Phytolaccaceae is represented by three genera (two of them introduced) and five species, mostly found in eastern Australia.

New species, new combinations and lectotypifications are published for Aizoaceae, Chenopodiaceae and Nyctaginaceae.

Scope and Presentation

The geographical area covered by the *Flora* includes the six Australian States, the Northern Territory, the Australian Capital Territory, immediate offshore islands and Macquarie Island. Other Australian and State-administered territories such as Christmas Island and Lord Howe Island are excluded, but the occurrence in those territories of species included in the *Flora* is added to the notes on distribution. A complete *Flora* of those territories is in preparation.

Descriptions and discussion in the *Flora* are concise and are supplemented by important references, synonymy, and information on type collections, chromosome numbers, distribution, habitat, and illustrations published elsewhere. Descriptions are based on Australian material except for some taxa not confined to Australia for which the collections in Australian herbaria are inadequate. Synonymy is restricted to names based on Australian types or widely used in Australian literature. Misapplied names are given in square brackets together with an example of the misapplication. Alien taxa which are established in one or more localities, other than under cultivation, are considered naturalised and are included and marked with an asterisk(*).

Families are arranged in the system of A. J. Cronquist, *An Integrated System of Classification of Flowering Plants* (Columbia University Press, New York, 1981). Within families, the genera and species are arranged to show natural relationships as interpreted by the contributor. Although relationships cannot be shown adequately in a linear sequence, such an arrangement in a *Flora* usually assists comparison of related taxa.

INTRODUCTION

Infraspecific taxa are keyed out under relevant species. Up to five collections are cited for each species and infraspecific taxon.

Maps showing distribution in Australia are arranged in the same sequence as the descriptions and are grouped 15 on a page. Each group of maps occurs on the first right-hand page after the text reference to its last map. Thus, for any taxon, the reader will always find the map on a later page. The term 'Malesia' is often used in the notes on geographical distribution for species which occur widely in the region covered by *Flora Malesiana*, i.e. Malaysia, Singapore, Indonesia, Philippines, Papua New Guinea and adjacent islands.

New taxa, new names and other taxonomic and nomenclatural changes are included in an appendix where they are formally published in accordance with the *International Code of Botanical Nomenclature* (Bohn, Scheltema & Holkema, Utrecht, 1978).

A number of terms that appear in Volume 4 and were not included in the Glossary of Volume 1 are defined here in a Supplementary Glossary. Abbreviations, contractions and references to the format for author and bibliographic citations are listed after the Glossary.

Acknowledgments

There are fifteen contributors (including photographers) to Volume 4. Their achievement in completing some difficult families is gratefully acknowledged. The directors and staff of Australian and overseas institutions have assisted preparation of the Volume with loans of specimens to writers and illustrators as well as with additional information and reviews of manuscripts.

The contributors of Aizoaceae acknowledge the assistance of Dr J. P. Jessop, State Herbarium of South Australia, in the preparation of this family.

Several collectors made a special effort to assist the preparation of Cactaceae by gathering material of this poorly-collected family. Particular thanks are expressed to Dr J. R. Hosking, Agricultural Research Centre, Department of Agriculture, Tamworth, N.S.W.; Dr R. E. McFayden and Mr G. Donnelly, Alan Fletcher Research Station, Sherwood, Department of Primary Industries, Queensland and Dr N. D. Murray, Department of Genetics and Human Variation, La Trobe University, Victoria.

A number of figures have been reproduced, by permission, from other sources. The originals of figures from *Nuytsia* were made available by courtesy of the Director, Department of Agriculture, Western Australia. Permission to reproduce figures from the *Flora of Central Australia*, A. H. & A. W. Reed (1981), was granted by the Australian Systematic Botany Society and A. H. & A. W. Reed Pty. Ltd. The source of individual figures is given in the relevant captions. This co-operation is gratefully acknowledged.

The assistance of the staff of the Bureau of Flora and Fauna in producing Volume 4 is acknowledged with pleasure. Special thanks go to David Berman, Arthur Chapman, Helen Hewson, Wendy Riley, Geetha Sriprakash, Cindy Warhurst and Cindy Wolter.

The continued co-operation of the Australian Government Publishing Service, Canberra, and Griffin Press, Adelaide, is gratefully acknowledged.

PHYTOLACCACEAE

H. J. Hewson

Herbs, shrubs or trees, mostly glabrous; hairs simple when present. Leaves alternate, simple, entire, exstipulate in Australia. Inflorescence a terminal, axillary or lateral raceme, bracteate. Flowers unisexual or bisexual, actinomorphic or zygomorphic. Perianth of 4 or 5 free, uniseriate, petaloid, imbricate tepals, equal or unequal, persistent. Stamens 3 to many, hypogynous, free; anthers 2-locular; stamens reduced to staminodes or absent in ♀ flowers. Ovary superior (rarely inferior outside Australia); carpels 1 to many, free or connate; styles as many as carpels, free; ovules 1 per carpel, basal. Fruit a nut, achene, drupe or berry. Seeds erect, with endosperm enclosed by large embryo.

A family of 20 genera and 100 species of tropical regions, predominantly American; 3 genera in Australia.

G. Bentham, *Phytolaccaceae*, *Fl. Austral.* 5: 142–150 (1870) *p.p.*; H. Walter, *Phytolaccaceae*, *Pflanzenr.* 39: 1–154 (1909); A. Heimerl, *Phytolaccaceae*, *Nat. Pflanzenfam.* 2nd edn, 16c: 135–164 (1934); C. A. Backer, *Phytolaccaceae*, *Fl. Males.* ser. 1, 4: 227–232 (1951).

KEY TO GENERA

- | | |
|-------------------------------|---------------|
| 1 Tepals 5; carpels 5 or more | 1. PHYTOLACCA |
| 1: Tepals 4; carpel 1 | |
| 2 Stamens 4 | 3. RIVINA |
| 2: Stamens numerous | 2. MONOCOCCUS |

1. PHYTOLACCA

Phytolacca L., *Sp. Pl.* 1: 441 (1753); *Gen. Pl.* 5th edn, 200 (1754); from the Greek *phyton* (plant) and new Latin *lacca* (gum or lacquer), in reference to the crimson colour of the sap in the fruit.

Type: *P. americana* L.

Erect herbs, shrubs or trees, monoecious in Australia; stems angular. Inflorescence an erect raceme, sometimes spike-like. Flowers mostly bisexual, bracteate. Perianth 5-merous. Stamens 6–33, 1- or 2-seriate, irregularly inserted on or below disc. Ovary of 5–16 carpels. Fruit a berry, (outside Australia sometimes more than one per flower).

A genus of 25 species, mostly in tropical America, some cultivated weeds extending into temperate regions of the world; 3 species naturalised in Australia.

- | | |
|---|------------------------|
| 1 Carpels 8; stamens 8 | 1. <i>P. octandra</i> |
| 1: Carpels usually more than 8; stamens or staminodes more than 8 | |
| 2 Herb; flowers bisexual; stamens 10; carpels 10 | 2. <i>P. americana</i> |
| 2: Tree; flowers unisexual; stamens 20–30 or staminodes c. 10; carpels usually 10 | 3. <i>P. dioica</i> |

1. *Phytolacca octandra L., *Sp. Pl.* 2nd edn, 1: 631 (1762)T: from Mexico; *n.v.*

Illustrations: H. E. Kleinschmidt & R. W. Johnson, *Weeds of Queensland* fig. 351 (1977); C. Lamp & F. Collett, *Weeds in Australia* fig. 184 (1979); N. C. W. Beadle, *Stud. Fl. N.E. New South Wales* 2: fig. 85A (1972).

Herb to 2 m tall, semi-succulent above, woody below; stems slightly tuberculate. Leaves petiolate, elliptic or lanceolate, acute or acuminate; lamina to 21 cm long and 9 cm wide; base acute; petiole to 5 cm long. Racemes dense, 7–16 cm long; flowers bisexual; pedicels to 3 mm long. Tepals ovate, 2.5–4 mm long, white to red, persistent. Stamens mostly 8, inserted on outer edge of disc. Carpels mostly 8; styles recurved, c. 0.5 mm long, persistent. Berry depressed-globose, furrowed between the seeds, c. 0.7 mm diam., black. Seeds ovoid, compressed, c. 2 mm long, shining black. *Inkweed*. Fig. 1A.

A weed of disturbed soils in moister regions of all States except Tas. Map 1.

W.A.: Wanneroo, *G. J. Keighery* 2627 (PERTH). Qld: Serpentine Ck, *L. Durrington* 509 (BRI). N.S.W.: near Albion Park, *M. Evans* 2586 (AD, BRI, CANB, NSW); near Wolumla, *R. Schodde* 3487 (AD, CANB, NSW). Vic.: Braeside, *H. I. Aston* 2235 (CANB).

2. *Phytolacca americana L., *Sp. Pl.* 1: 441 (1753)T: from North America; *n.v.*

Phytolacca decandra L., *Sp. Pl.* 2nd edn, 1: 631 (1762). T: from North America; *n.v.*

Illustration: H. Walter, *Pflanzenr.* 39: fig. 17 (1909).

Herb or shrub to 1.5 m tall, glabrous or sparsely papillate. Leaves petiolate, ovate, elliptic or lanceolate, acute, sometimes apiculate; lamina to 16 cm long and 7 cm wide, the lower leaves sometimes much larger; petiole to 2 cm long. Racemes to 20 cm long. Flowers bisexual; pedicels to 1 cm long, spreading to horizontal, rarely branched. Tepals broadly ovate, 2–4 mm long, white or cream, persistent. Stamens 10, inserted below disc or rarely epitepalous at base of tepals. Carpels 10; styles recurved, c. 0.5 mm long, persistent. Berry depressed-globose, furrowed between seeds, c. 0.8 mm diam., black. Seeds ovoid-compressed, c. 2 mm long, shining black. *Pokeweed*, *Pidgeon Berry*.

A weed of disturbed soils in south-eastern Qld and north-eastern N.S.W. Map 2.

Qld: Boreen Point, *P. R. Sharpe* 2403 (BRI); Mudgeraba, June 1914, *C. T. White* (BRI). N.S.W.: Bulga Ck, *E. F. Constable* 6354 (NSW); near Murwillumbah, *E. F. Constable* 6582A (NSW); near Nimbin, Jan. 1971, *H. Salasoo* (NSW).

3. *Phytolacca dioica L., *Sp. Pl.* 2nd edn, 1: 632 (1762)T: cultivated Madrid Gardens, *Alstroemer s.n.*; *n.v.*

Illustration: H. Walter, *Pflanzenr.* 39: fig. 16 (1909).

Tree to 7 m tall, papillate, glabrescent. Leaves petiolate, ovate to broadly ovate, acute, apiculate; lamina to 12 cm long and 7.5 cm wide; petiole to 7 cm long. Raceme to 20 cm long. Flowers unisexual; pedicels to 5 mm long. Male flowers with ovate or elliptic tepals up to 3.5 mm long, white; stamens 20–30, inserted irregularly; ovary rudimentary. Female flowers with ovate or elliptic tepals up to 4 mm long, white; staminodes c. 10; carpels 7–11; style recurved, c. 1 mm long. Berry depressed-globose, furrowed between seeds, c. 1 cm diam. Seeds ovoid-compressed, c. 3 mm long, shining black. *Bella Sombra*. Fig. 1B–C.

This species is frequently cultivated and persists around old farmyards. It has been recorded for Qld, N.S.W. and Vic., but may not be fully naturalised. Map 3.

Qld: near Boonah, June 1976, *D. Hanger* (BRI); Cunnamulla (cult.), Oct. 1977, *R. J. Henderson* (BRI, CANB); Boonah, *N. Michael* 2234 (BRI); Minden, *L. J. Webb* 5234 (CANB).

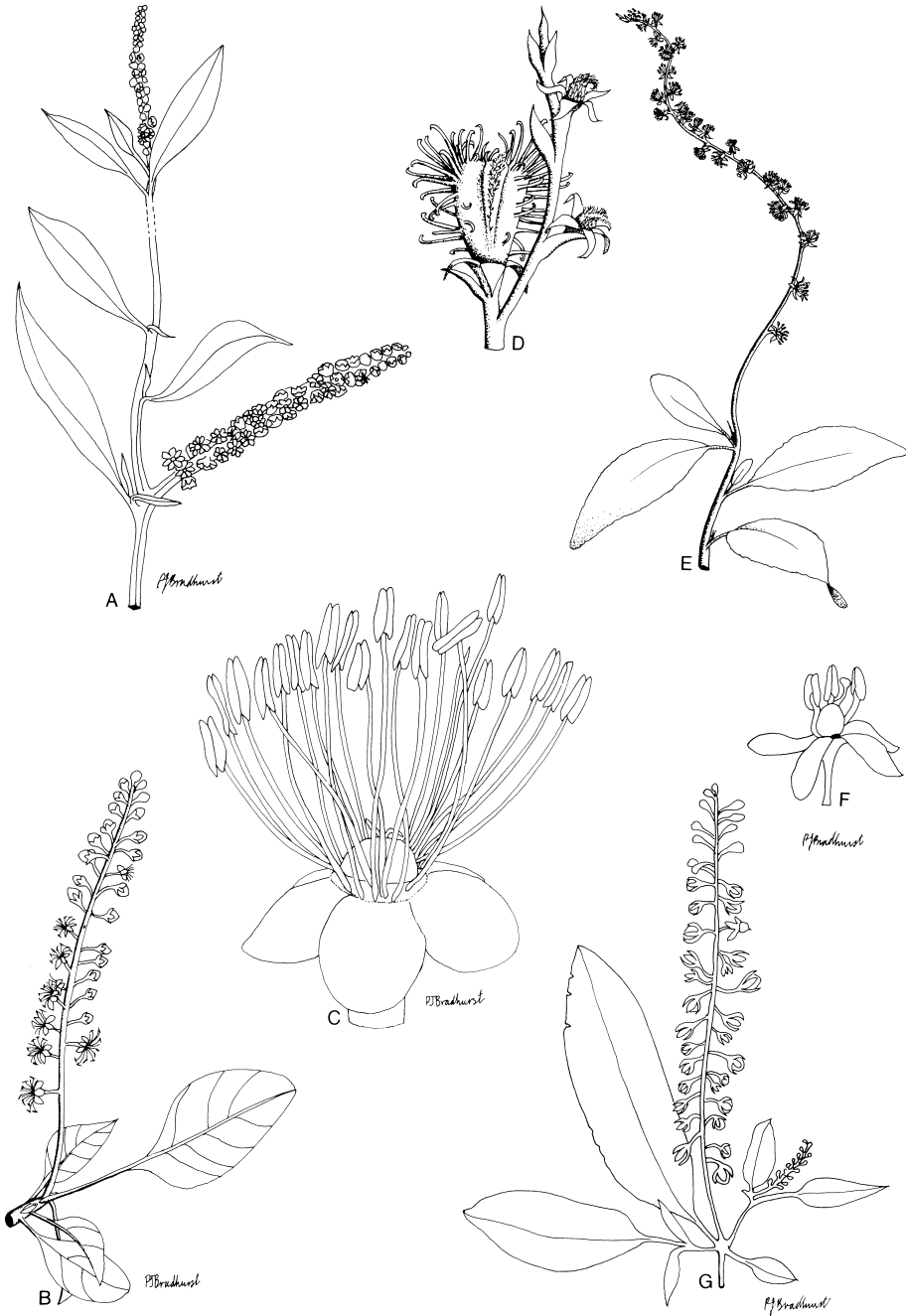


Figure 1. A–C, *Phytolacca*. A, *P. octandra*, inflorescence $\times 0.3$ (W. Jones 3307, CANB). B–C, *P. dioica*. B, male inflorescence; $\times 0.25$; C, male flower $\times 2.5$ (B–C, R. Henderson H2575, CANB). D–E, *Monococcus echinophorus*. D, fruit and female flowers; $\times 2.5$; E, inflorescence $\times 0.5$ (D–E, I. Telford 9043 & G. Butler, CBG). F–G, *Rivina humilis*. F, flower with 1 stamen removed $\times 3$; G, inflorescence $\times 0.5$ (F–G, W. Jones 1423, CANB). D–E drawn by H. Hewson.

2. MONOCOCCUS

Monococcus F. Muell., *Fragm.* 1: 46 (1858); from the Greek *mono* (one) and *coccus* (seed), in reference to the single carpel.

Type: *M. echinophorus* F. Muell.

Shrubs, monoecious or dioecious. Inflorescence terminal or lateral in the upper axils; flowers unisexual or bisexual. Perianth 4-merous. Stamens 10–20. Ovary unicarpellate. Fruit a dry indehiscent achene.

Monotypic native genus from Qld and N.S.W.; also in New Caledonia and New Hebrides.

***Monococcus echinophorus* F. Muell., *Fragm.* 1: 47 (1858)**

T: Brisbane, Qld, *W. Hill & F. Mueller s.n.*; *n.v.*

Illustrations: H. Walter, *Pflanzenr.* 39: fig. 35 (1909); A. Heimerl, *Nat. Pflanzenfam.* 2nd edn, 16c: fig. 66 (1934); N. C. W. Beadle, *Stud. Fl. N.E. New South Wales* 2: fig. 85C (1972).

Shrub to 2.5 m tall, straggling to erect, sometimes climbing, sparsely pubescent. Stems with lenticels. Leaves petiolate, ovate to lanceolate, obtusely acuminate; lamina to 12 cm long and 5 cm wide; margins irregularly crenulate; petiole to 1.5 cm long. Racemes to 30 cm long; pedicels to 5 mm long, each with a lanceolate bract and 2 bracteoles; male flowers usually on separate racemes or plants, sometimes both male and female flowers in the same raceme. Female flowers with or without staminodes; ovary a single oblique carpel covered with coarse straight hairs developing into hooked bristles; style 1.5 mm long, covered on the adaxial surface with weak hairs, persistent. Achene burr-like, c. 0.5 mm long. Fig. 1D–E.

Grows in rainforest or moist situations near the coast in Qld and northern N.S.W. Map 4.

Qld: Burleigh Heads, *C. T. White 6580* (BRI). N.S.W.: Lismore, *W. Baeuerlen 363* (NSW); Clarence R., *E. Betche s.n.* (NSW); Brunswick Heads, *E. F. Constable 4848* (BRI, NSW); Cherry Tree Forest Reserve, *A. G. Floyd 893* (CANB).

3. RIVINA

Rivina L., *Sp. Pl.* 1: 121 (1753); *Gen. Pl.* 5th edn, 57 (1754) as *Rivinia*; named in honour of Augustus Q. Rivinus (1652–1723), a German botanist and physician at Leipzig.

Type: *R. humilis* L.

Monoecious herbs. Inflorescence a lax raceme, terminal or in upper axils; flowers bisexual. Perianth 4-merous. Stamens 4. Ovary unicarpellate, glabrous. Fruit a berry.

A genus of either three species or with one very variable species. The genus is native to tropical America, now naturalised in South America, the island of Madagascar, Sri Lanka, S.E. Asia, Malaysia and Australia. One species in Australia found in Qld, N.S.W., Norfolk Is. and Cocos (Keeling) Islands.

****Rivina humilis* L., *Sp. Pl.* 1: 121 (1753)**

T: from the West Indies; *n.v.*

R. glabra L., *Sp. Pl.* 1: 122 (1753); *R. humilis* var. *glabra* (L.) H. Walter, *Pflanzenr.* 39: 105 (1909).

T: from the West Indies; *n.v.*

R. laevis L., *Mant. Pl.* 1: 41 (1767). T: from the West Indies; *n.v.*

Illustrations: H. Walter, *Pflanzenr.* 39: fig. 30 (1909); C. A. Backer, *Fl. Males.* ser. 1, 4: 228, fig. 1 (1951); N. C. W. Beadle, *Stud. Fl. N.E. New South Wales* 2: fig. 85B (1972).

Erect herb, often woody at base and shrublike, to 2 m tall, usually below 1 m, shortly pubescent or sparsely puberulent. Leaves ovate-oblong to ovate-lanceolate, acuminate or acute; lamina to 12 cm long and 4 cm wide, glabrous above; base obtuse, rounded or subcordate; petiole to 5 cm long. Racemes many-flowered, erect to slightly spreading, 4–12 cm long; pedicels 2–3 mm long each with a bract to 4 mm long and a pair of minute bracteoles. Tepals 2–3 mm long, white or pink, reflexed and green in fruit. Ovary globose; style 0.5 mm long; stigma capitate. Berry globose or pyriform, 3–4 mm diam., red or orange. Seed ovoid, c. 2 mm long, hairy. *Coral Berry*. Fig. 1F–G.

Occurs in or near rainforest or rainforest margins in Qld and northern N.S.W. Map 5.

Qld: near Bundaberg, *M. D. Crisp* 2656 (BRI, CBG); Crystal Cascades, *R. D. Hoogland* 8543 (BRI, CANB, NSW); Bulburin State Forest, *W. J. F. McDonald* 3279 (BRI); Intake Ck, *R. Melville* 3663 (BRI, NSW). N.S.W.: Laurieton, Apr. 1978, *A. Willows* (NSW).

Reported as tainting milk. Sometimes confused with the native *Deeringia amaranthoides* (Lam.) Merr. (Amaranthaceae), a straggling shrub or low vine from similar habitats, with red berries, but usually with 5-merous flowers and 2 or more seeds per fruit.

NYCTAGINACEAE

R. D. Meikle & H. J. Hewson

Trees, shrubs, herbs or spiny climbers, glabrous or hairy; hairs simple, sometimes glandular. Leaves alternate, opposite or whorled, simple, exstipulate. Inflorescence basically cymose but variously modified, often umbellate, glomerulose, verticillate or thyrsoid, axillary or terminal, bracteate. Flowers bisexual or unisexual, actinomorphic. Perianth petaloid with 5–10 tepals connate into a tube, the upper part sometimes caducous, lower part persistent. Stamens 1–40, hypogynous, free or basally connate, unequal; anthers 2-locular. Ovary superior, 1-carpellate; style 1; stigma 1. Fruit usually an anthocarp consisting of an achene enclosed in the persistent basal portion of the perianth. Seed 1, with straight or curved embryo, with or without endosperm.

A family of c. 30 genera with 300 species, predominantly tropical but extending into temperate regions around the world. Five genera and 14 species in Australia.

G. Bentham, Nyctagineae, *Fl. Austral.* 5: 276–281 (1870); A. Heimerl, Nyctagineae, *Nat. Pflanzenfam.* 2nd edn, 16c: 86–134 (1934); J. F. Stemmerik, Nyctagineae, *Fl. Males.* ser. 1, 6: 450–468 (1964); A. L. Bogle, The genera of Nyctagineae in the Southern United States, *J. Arnold Arbor.* 55: 1–37 (1974).

KEY TO GENERA

- | | | |
|----|---|------------------------|
| 1 | Inflorescence with involucre or with brightly coloured bracts | |
| 2 | Flowers surrounded by a 5-lobed involucre; plants herbaceous, sometimes shrublike | 1. MIRABILIS |
| 2: | Flowers with brightly coloured bracts, 3–6 cm long, adnate to pedicel | † BOUGAINVILLEA |
| 1 | Inflorescence without either involucre or brightly coloured bracts | |
| 3 | Woody trees | 4. PISONIA |
| 3: | Herbs or subshrubs | |

4 Fruit prominently 3- or 5-ribbed, glabrous or glandular hairy

2. **BOERHAVIA**

4: Fruit obscurely 10-ribbed, studded with conspicuous wart-like viscid glands

3. **COMMICARPUS**

† *Bougainvillea spectabilis* Willd. is grown as an ornamental in tropical, subtropical and frost-free temperate regions. It persists but does not seem to have become naturalised.

1. **MIRABILIS**

Mirabilis L., *Sp. Pl.* 1: 177 (1753); *Gen. Pl.* 5th edn, 82 (1754); from the Latin *mirabilis* (wonderful) referring to the spectacular flowers.

Type: *M. jalapa* L.

Herbs, sometimes shrublike, erect, branched, glabrous or glandular-hairy. Leaves opposite, equal at nodes. Inflorescence a 1- to many-flowered terminal corymbose cyme. Flowers surrounded by a 5-lobed involucre, bisexual. Perianth trumpet-shaped, brightly coloured, constricted above basal green region. Stamens 3–6, exserted. Style exserted; stigma shortly lobed or fimbriate; ovary sessile. Fruit ribbed or tuberculate, not viscid.

A genus of 60 species, mostly from America; 1 cultivated and naturalised in Australia.

**Mirabilis jalapa* L., *Sp. Pl.* 1: 177 (1753)

T: from India; *n.v.*

Illustration: N. C. W. Beadle, *Stud. Fl. N.E. New South Wales* 2: fig. 104B (1972).

Plant to 1 m, rarely 2 m, tall; roots tuberous. Leaves petiolate, ovate or oblong to triangular, acute, to 9 cm long; base cordate; petiole to 4 cm long. Flowers 3–7 per cyme, opening in late afternoon, scented; involucral bracts 5, c. 1 cm long; pedicel less than 0.5 mm long. Perianth to 6.5 cm long; limb 2.5–3.5 cm diam., white, pink, red, yellow or variegated. Stamens 5 or 6, exserted for 8–15 mm. Style equal to stamens; stigma lobed or fimbriate. Fruit subglobular, 7–8 mm long, ribbed or tuberculate, black. *Four o'clock*, *Marvel of Peru*.

Native of tropical America; frequently a garden escape in moist regions in Qld, N.S.W. and Vic. Also naturalised on Lord Howe Island. Map 6.

Qld: Mareeba, *L. K. Bates* 222 (BRI); Tolga Scrub, *B. Hyland* 2755 (BRI); Brisbane, *C. T. White* 8651 (BRI). N.S.W.: Woolloomooloo, *R. Coveny* 7587 (NSW); Pymble, *S. Jacobs* 247 (NSW).

2. **BOERHAVIA**

Boerhavia L., *Sp. Pl.* 1: 3 (1753); *Gen. Pl.* 5th edn, 4 (1754); named after Herman Boerhaave (1668–1738), a famous Dutch physician and botanist.

Type: *B. erecta* L.; see E. R. Farr, *Index Nom. Gen.* 1: 214 (1979).

Annual or perennial herbs, erect, diffuse or decumbent, sometimes with woody base; roots commonly thick, fleshy or woody; stems usually branched, terete, glabrous or hairy; hairs glandular, often glandular-viscid; raphides commonly present in all structures. Leaves opposite, those at each node often of unequal size, sinuate or entire, often undulate, often fleshy, usually grading to bracts above. Inflorescences usually grading along branches from simple to compound; basic inflorescence unit a solitary flower, a glomerule, or an umbel; bracteoles minute, membranous. Flowers small, bisexual. Perianth tubular, the upper part caducous, 5-lobed, campanulate or trumpet-shaped, white, pink, mauve or crimson-purple. Stamens 1–4, rarely –6; anthers suborbicular, included or shortly exserted. Style slender, often elongate; stigma capitate. Fruit indehiscent, conspicuously 3–5-sulcate, with blunt, acute or winged ribs, often densely glandular-viscid; ribs usually mucous when wet. Seed 1, erect. *Tarvine*.



Figure 2. A–G, *Boerhavia*. A–B, *B. repleta*. A, habit $\times 0.5$; B, fruit $\times 5$ (A–B, R. Perry 618, CANB). C–D, *B. burbidgeana*. C, habit $\times 0.5$; D, fruit $\times 5$ (C–D, Gogo Station, W.A., A. Ewart, PERTH). E–G, diagrams of glandular hair types $\times 40$. E, type 1; F, type 2; G, type 3. H, *Pisonia aculeata*, inflorescence $\times 0.5$ (N. Byrnes 2023, DNA).

A genus of 20 species, with a wide distribution in the tropics and subtropics; 8 species in Australia, 5 of which appear to be endemic. All the Australian species belong to sect. *Boerhavia*. The fleshy roots of some species are reported to be eaten by the Aborigines.

F. R. Fosberg, Studies in the genus *Boerhavia* L. (Nyctaginaceae), 1–5, *Smithsonian Contr. Bot.* 39: 1–20 (1978).

The glandular hairs are of three main types: 1. less than 0.5 mm long; terminal gland-cell large, elongate, usually oriented parallel to support structure, not persisting with exudate (Fig. 2E); 2. more than 0.5 mm long, needle-like, rigid or weak, often with cells collapsed at right-angles when dry; terminal gland cell small, not persisting with exudate (Fig. 2F); 3. ± 0.5 mm long, usually rigid; terminal gland cell large, globular, usually persisting with exudate, (Fig. 2G).

Boerhavia is renowned as a difficult genus in Australia. Three of the species treated here (*B. coccinea*, *B. dominii* and *B. schomburgkiana*) must be regarded as complex. In addition several collections have not been determined and may represent undescribed taxa. A revision of the genus is needed.

- | | | |
|----|---|-----------------------------|
| 1 | Inflorescence a large diffuse cyme; flowers usually solitary | |
| 2 | Plant erect; pedicels 1–3 cm long; no long (type 2) hairs on stem | 7. <i>B. paludosa</i> |
| 2: | Plant prostrate; pedicels 1–1.5 cm long; long (type 2) hairs on stem | 8. <i>B. gardneri</i> |
| 1: | Inflorescence simple or compound but not large and diffuse; flowers in glomerules or umbels | |
| 3 | Basic inflorescence unit an umbel | |
| 4 | Basic inflorescence unit a several-flowered umbel; fruit with rounded prominent ribs and wide furrows | |
| 5 | Inflorescence usually simple; stamen 1 | 3. <i>B. schomburgkiana</i> |
| 5: | Inflorescence usually compound; stamens more than 1 | 2. <i>B. dominii</i> |
| 4: | Basic inflorescence unit a 2-flowered umbel, occasionally a single flower; fruit with wide flat ribs and deep furrows | 5. <i>B. reptata</i> |
| 3: | Basic inflorescence unit a glomerule | |
| 6 | Peduncle filiform; inflorescence often including some solitary flowers | 4. <i>B. burbridgeana</i> |
| 6: | Peduncle stout, or if slender then not filiform; inflorescence rarely including solitary flowers | |
| 7 | Peduncle usually less than 3 cm long | |
| 8 | Plants with long (type 2) hairs on stem; inflorescence usually compound; stamens more than 1 | 6. <i>B. coccinea</i> |
| 8: | Plants with short (type 1) hairs on stem; inflorescence simple; stamen 1 | 3. <i>B. schomburgkiana</i> |
| 7: | Peduncle usually more than 3 cm long | |
| 9 | Glomerules crowded, many-flowered; fruit with narrow ribs, not mucous | 1. <i>B. tetrandra</i> |
| 9: | Glomerules not crowded, few-flowered; fruit with prominent ribs, mucous | 2. <i>B. dominii</i> |

1. *Boerhavia tetrandra* G. Forster, *Fl. Ins. Austr.* 2 (1786)

T: Society Islands, *G. Forster* s.n.; iso: K.

B. albiflora Fosberg, *Smithsonian Contr. Bot.* 39: 11 (1978) var. *albiflora*. T: Enderbury Island, Pacific Ocean, *F. R. Fosberg & Stoddart 54748*; holo: US n.v., *fide* F. R. Fosberg, *loc. cit.*

Illustration: W. A. Setchell, *Publ. Carnegie Inst. Wash.* 341 : t. 33B, 34A–B (1924).

Perennial herb, prostrate or decumbent, glabrous or glandular-hairy with type 1 hairs; stems 12–40 cm or more long. Leaves bluntly ovate; lamina 1–4 cm long, succulent; petiole to 2 cm long. Inflorescence axillary, often compound; basic inflorescence unit a

crowded, many-flowered glomerule; peduncle stout, 3–10 cm long; flowers almost sessile. Perianth base sparsely glandular-hairy; upper part broadly campanulate, c. 2 mm long; lobes short, blunt, white, pink or lilac. Stamens 4, rarely 3, c. 1 mm long. Style 2 mm long. Fruit fusiform, 3.5–5 mm long, 1.5–2 mm wide, mostly sparsely glandular-hairy, 3–5-ribbed; ribs narrow, acute not mucous; furrows wide, flat. Fig. 3A–D.

Widespread on islands of the Pacific, New Guinea and Cocos (Keeling). In Australia apparently confined to the offshore islands of north Qld. Grows on sandy shores of coral islands. Map 7.

Qld: North West Is., *P. Baxter 1014* (BRI, K); Cato Is., Wreck Reef, 1859, *Denham* (K); Hope Islets, July 1848, *J. MacGillivray* (K); Gannet Cay, Swain's Reef, Dec. 1979, *McNamara & Stokes* (CANB); Heron Is., *C. Slater 69* (CANB).

2. *Boerhavia dominii* Meikle & Hewson, *Fl. Australia* 4: 318 (1984)

T: Kangaroo Hills Stn, Qld, 2 Apr. 1965, *M. Lazarides 7122*; holo: CANB; iso: BRI, K.

[*B. mutabilis* auct. non R.Br. (1810): F. Muell., *Pl. Victoria* 2: t. 67 (1865) p.p.]

Illustrations: K. Domin, *loc. cit.*; F. Mueller, *Pl. Victoria* 2: t. 67 (1865) as *B. mutabilis*; N. C. W. Beadle, *Stud. Fl. N.E. New South Wales* 2: fig. 104A (1972) as *B. diffusa*.

Perennial herb, prostrate or decumbent, glabrous or glandular-hairy with type 1 hairs, rarely a few type 2 hairs at nodes or on stems and leaves; stems to 80 cm or more long. Leaves lanceolate to broadly ovate; lamina to 4 cm long; petiole to 3 cm long. Inflorescences axillary and terminal, often compound; basic inflorescence unit a few-flowered umbel, rarely solitary, sometimes a glomerule; peduncle stout, 2–16 cm, mostly 4–5 cm long. Flowers pedicellate, sometimes sessile; pedicels to 10 mm long, slender. Perianth base glandular in furrows; upper part, campanulate, 1–2 mm long, white, pink or mauve. Stamens 2–4, 1–2 mm long. Style not exceeding stamens. Fruit fusiform, c. 4 mm long, 1.5 mm wide, glandular-hairy, mucous; ribs 5; furrows usually densely glandular-hairy. Fig. 3H–K.

Endemic, locally common in drier regions of northern W.A., N.T., S.A., Qld, N.S.W. and Vic. Map 8.

W.A.: between Derby and Fitzroy Crossing, *Y. Power 271* (PERTH). N.T.: near W Gallipoli Homestead, *G. Chippendale 5346* (BRI, K, NT). S.A.: near Port Germein, *C. R. Alcock 1338* (CANB). Qld: Theodore, *R. W. Johnson 2755* (BRI, CANB). Vic.: Yarrawonga, *H. I. Aston 2176* (CANB).

The more northerly populations tend to have diffuse cymose inflorescences, tighter glomerules and higher stamen numbers. They resemble more closely some non-Australian populations of *B. diffusa* L. *sens. lat.*

3. *Boerhavia schomburgkiana* Oliver, *Hooker's Icon. Pl.* 13: 20, t. 1225 (1877)

T: near Lake Eyre, S.A., Nov. 1875, *Andrews*; holo: K.

Illustration: D. Oliver, *loc. cit.*

Perennial herb, prostrate or decumbent, subglabrous or sparsely glandular-hairy with type 1 hairs, rarely with a few type 2 hairs at nodes; stems slender, to 60 cm long. Leaves oblong, lanceolate or ovate, obtuse or subacute; lamina to 3 cm long; petiole slender, usually less than 1 cm long, rarely to 3 cm. Inflorescence lateral, usually unbranched; basic inflorescence unit a few-flowered glomerule; peduncle approximately equal to subtending leaf, glabrous, slender to filiform; flowers 1–5, in glomerules or umbels, sessile or shortly pedicellate. Perianth glandular-hairy; upper part campanulate, c. 1.5 mm long, pale pink. Stamen 1, included. Style c. 0.5 mm long. Fruit fusiform, 3.5–6 mm long, 1.5–2 mm wide, mucous; ribs 4 or 5, prominent, glabrous or sparsely glandular-hairy; furrows wide, flat, white. Fig. 3 O–Q.

An endemic species of flood plains on clay or sand flats, or in savannah grassland, in arid regions of W.A., N.T., S.A., Qld and possibly N.S.W. Map 9.

W.A.: Minderoo Stn, A. Mitchell 730 (PERTH). N.T.: near Alice Springs, D. J. Nelson 545 (K, NT). S.A.: near Everglades Bore, W Simpson Desert, D. E. Symon 3299 (ADW, CANB, K). Qld: Monkira Stn, Diamantina R., E. C. MacDonald 466, 470 (K); 72 km W of Winton, H. Reeve 77 (CANB).

Allied to *B. repens* L., from tropical Africa, Arabia, Pakistan, Punjab, Java and Sumba, but with larger, more boldly ribbed fruits, which are often shortly but distinctly pedicellate. In all the specimens examined, the androecium has been found to consist of a single stamen, but *Boerhavia* and *Commnicarpus* both show some variation in this respect.

4. *Boerhavia burbridgeana* Hewson, *Fl. Australia* 4: 318 (1984)

T: junction of Neville Ck and Calder R., W.A., 5 May, 1983, K. F. Kenneally 8711; holo: PERTH.

Perennial herb or subshrub, diffuse or prostrate, sparsely glandular-hairy with type 1 hairs; stems to 1 m or more long. Leaves narrowly lanceolate to narrowly ovate; lamina to 3 cm long; petioles to 1 cm long; upper leaves sessile, bract-like. Inflorescences axillary and terminal, often compound and tending to be zig-zag; basic inflorescence unit a solitary flower or a few-flowered glomerule; peduncles filiform, to 1.5 cm long. Perianth with basal part glandular-hairy; upper part glabrous or puberulous, tubular to campanulate, c. 1 mm long, pink. Stamens 1 or 2, included. Stigma included. Fruit fusiform, to 4 mm long, 1.5 mm wide; ribs 5, prominent, glabrous or sparsely glandular-hairy, mucous; furrows wide, white. Fig. 2C–D.

An endemic species found in sandy soils in northern W.A. and its offshore islands, and in northern N.T. Map 10.

W.A.: Ord River Stn, T. E. H. Aplin 5414 (PERTH); Lyons R., C. A. Gardner 6117 (PERTH); Kununurra, K. T. Richards 49 (PERTH); Legendre Is., R. D. Royce 7331 (PERTH). N.T.: Settlement Creek, L. J. Brass 55 (BRI, CANB).

5. *Boerhavia repleta* Hewson, *Fl. Australia* 4: 319 (1984)

T: 102 miles (c. 161 km) S of Wiluna on road to Leonora, W.A., 22 Mar. 1968, S. G. M. Carr 505; holo: PERTH.

Annual or perennial herb, prostrate or trailing, glandular-hairy with type 1 hairs, sometimes with scattered type 2 hairs; stems slender, to 1 m or more long. Leaves narrowly lanceolate to ovate; lamina to 3.5 cm long; petiole to 1 cm long; upper leaves reduced, often sessile. Inflorescences lateral or terminal, usually compound; basic inflorescence unit a 2-flowered umbel, sometimes a solitary flower; peduncle usually less than 5 mm long; pedicels 5–10 mm long, filiform, glabrous. Perianth base glandular-hairy; upper part glabrous, tubular to campanulate, c. 1.5 mm long, pink. Stamens 2 or 3, slightly exserted. Stigma included. Fruit obconical, truncate, to 5 mm long and 1.5 mm wide, sparsely glandular-hairy, mucous; ribs 4 or 5, wide, flat with deep very narrow furrows giving inflated appearance to fruit. Fig. 2A–B.

An endemic species on loam in central W.A., central N.T. and central western Qld. Map 11.

W.A.: near Mt Aloysius, A. S. George 4823 (PERTH); Polelle, Meekatharra, Apr. 1955, D. G. Wilcox (PERTH); Belele, D. G. Wilcox MT19 (PERTH). N.T.: c. 77 km N of Tennant Creek, R. A. Perry 618 (BRI, PERTH). Qld: Boatman Stn, S. L. Everist 2893 (BRI, CANB).

6. *Boerhavia coccinea* Miller, *Gard. Dict.* 8th edn, 4 (1768)

T: Chelsea Physic Garden, cultivated, from Jamaica, 1730, W. Houstoun; neo: BM, *vide* R. D. Meikle, *Fl. Australia* 4: 318 (1984).

B. mutabilis R.Br., *Prodr.* 422 (1810) *p.p.* T: island a, near Groote Island, R. Brown 10; lecto: BM, *vide* F. R. Fosberg, *Smithsonian Contr. Bot.* 39: 8 (1978).

B. pubescens R.Br., *Prodr.* 422 (1810); *B. repens* var. *pubescens* (R.Br.) Fosberg, *Smithsonian Contr. Bot.* 39: 6, 10 (1978). T: Gulf of Carpentaria, R. Brown s.n.; holo: BM.

B. diffusa var. *xerophila* Domin, *Biblioth. Bot.* 89: 92, t. 21, figs 1–5 (1926). T: near Chillagoe, Qld, Feb. 1910, K. Domin; holo: PR.

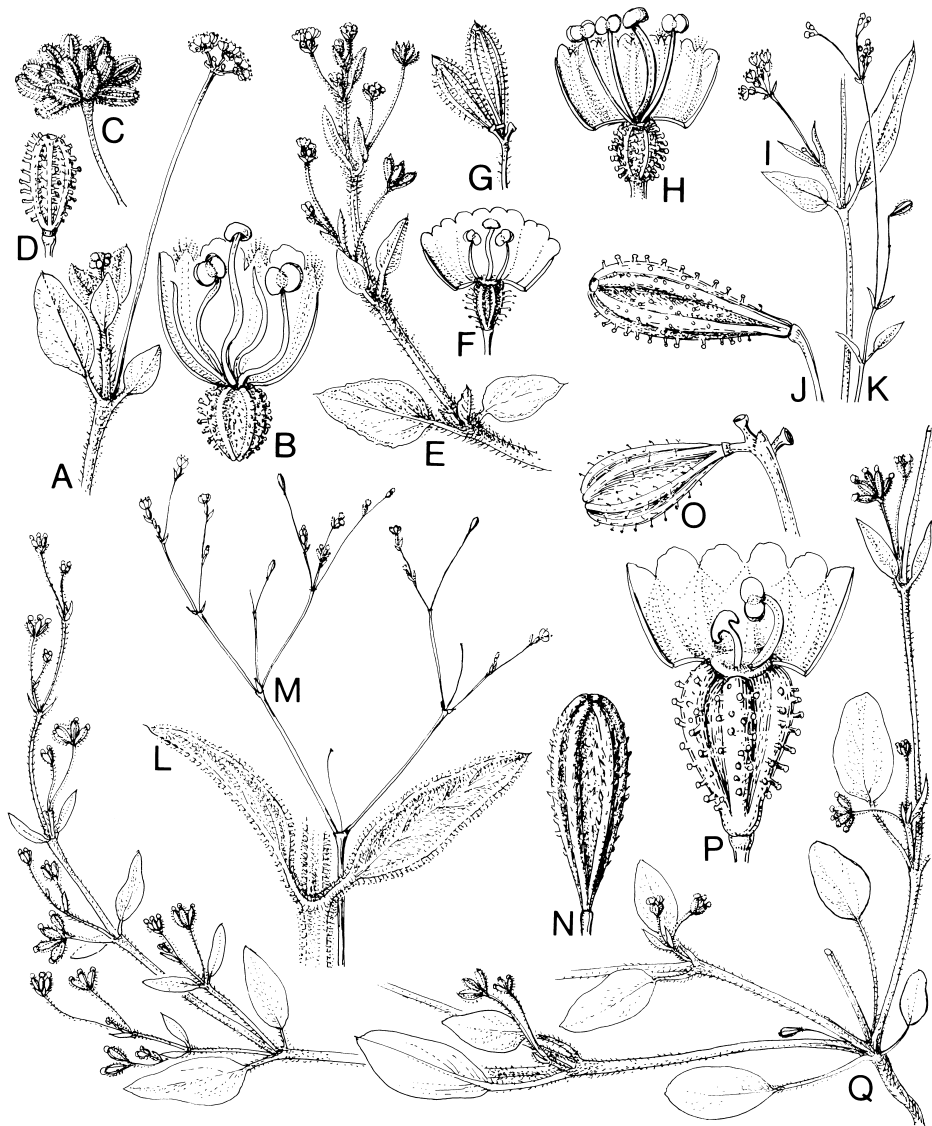


Figure 3. *Boerhavia*. **A–D.** *B. tetrandra*. **A**, inflorescence $\times 0.7$; **B**, flower with half corolla removed $\times 10$ (**A–B**, Phoenix Islands, R. Fosberg & Stoddart 54747, K); **C**, infructescence $\times 2$; **D**, fruit $\times 4$ (**C–D**, Phoenix Islands, R. Fosberg 55788, K). **E–G.** *B. coccinea*. **E**, inflorescence $\times 0.7$; **F**, flower with corolla opened out $\times 4$; **G**, infructescence $\times 4$ (**E–G**, between Ashburton & Yule Rivers, W.A., E. Clement, K). **H–K.** *B. dominii*. **H**, flower with corolla opened out $\times 8$; **I**, inflorescence $\times 0.7$ (**H–I**, R. Melville 3427, K); **J**, fruit $\times 6$; **K**, infructescence $\times 0.7$ (**J–K**, M. Lazarides 7122, K). **L–N.** *B. paludosa*. **L**, leaves $\times 1.3$; **M**, inflorescence $\times 0.7$; **N**, fruit $\times 6$ (**L–N**, I. Wilson 26, K). **O–Q.** *B. schomburgkiana*. **O**, fruit $\times 4$; **P**, flower with corolla opened out $\times 10$; **Q**, habit $\times 0.7$ (**O–Q**, E. MacDonald 470, K). Drawn by L. Mason.

B. diffusa f. *crassifolia* Domin, *Biblioth. Bot.* 89: 92 (1926). T: Lappa Junction, Qld, Feb. 1910, K. Domin; holo: PR.

[*B. diffusa* auct. mult. non L.: G. Bentham, *Fl. Austral.* 5: 277 (1870) p.p.]

[*B. repens* auct. non L.: B. D. Jackson, *Index Kewensis* 1: 318 (1895); *B. diffusa* var. *eurepens* Domin, *Biblioth. Bot.* 89: 91 (1926) nom. inval.]

Annual or perennial herb, sprawling or ascending, 10–80 cm tall, usually densely glandular-hairy; hairs a mixture of type 1 and type 2, the latter usually predominant or rarely absent. Leaves ovate or oblong, obtuse or shortly acute; lamina 0.5–6 cm long; petiole to 2.5 cm long. Inflorescences terminal and lateral, often compound; basic inflorescence unit a glomerule of 3–10 flowers; peduncle rigid, stout, to 3 cm long. Perianth glandular-hairy, the upper part campanulate, c. 2 mm long. Stamens usually 3, c. 1.5 mm long. Style 3 mm long, exserted. Fruit fusiform or narrowly clavate, c. 4 mm long, 1.5 mm wide, mucous; ribs 5, obtuse, glandular-hairy; furrows narrow. Fig. 3E–G.

Widespread throughout the tropics; common in northern Australia extending into arid regions in W.A., N.T., S.A., Qld and N.S.W. A very variable weed of disturbed soils. Map 12.

W.A.: Fraser R., Aug. 1930, *R. H. Pulleine* (K). N.T.: near Katherine, *M. Lazarides 6985* (CANB, K). S.A.: Calperum Stn, *D. E. Symon 11545* (ADW). Qld: 32 km E of St George, *L. Pedley 2191* (BRI, K). N.S.W.: Mt Harris Stn, Apr. 1952, *E. F. Constable* (K, NSW).

Type material of *B. coccinea* Miller is said to have red flowers, but throughout the tropics of the Old World the flowers are pink, mauve or white. The species is polymorphic for several characters. Intraspecific analysis would call for monographic research and may reveal that more than one taxon is included.

7. *Boerhavia paludosa* (Domin) Meikle, *Fl. Australia* 4: 319 (1984)

B. diffusa var. *paludosa* Domin, *Biblioth. Bot.* 89: 92, t. 21, figs 6–7 (1926). T: Rolling Downs, Hughenden, Richmond to Cloncurry, Qld, Feb.–Mar. 1910, K. Domin; syn: PR; Pentland, Qld, Mar. 1910, K. Domin; lecto: PR, *vide* H. J. Hewson, *Fl. Australia* 4: 319 (1984).

Illustrations: K. Domin, *loc. cit.*

Perennial herb, robust, erect or ascending, c. 40–50 cm tall, subglabrous or glandular-hairy; hairs a mixture of type 1 and type 3, predominantly type 3. Leaves ovate to linear-lanceolate; lamina 2–6 cm long; petiole to 1.5 cm long. Inflorescence a terminal, repeatedly branched, diffuse cyme; basic inflorescence unit a solitary flower; pedicels slender to filiform, 10–30 mm long. Perianth glabrous or sparsely glandular-hairy, the upper part trumpet-shaped, c. 2 mm long, mauve-pink. Stamens 2 or 3, sometimes 4 or 5; filaments 1–2.5 mm long. Style 1–3 mm long. Fruit broadly fusiform or clavate, 4–5 mm long, 2–2.5 mm wide, subglabrous or sparsely glandular-hairy; ribs 5, prominent, blunt, mucous; furrows narrow. Fig. 3L–N.

Endemic in W.A., N.T. and Qld; grows on open ground in sand, clay or limestone agglomerate, commonly in seasonally flooded areas. Map 13.

W.A.: near Glenroy Meatworks, *M. Lazarides 5149* (BRI, CANB, K, PERTH); near Noonkanbah Stn, *Y. Power 341* (PERTH). N.T.: Bishops Bore, *G. Chippendale 5014* (BRI, K, NT); near Katherine, *I. B. Wilson 26* (CANB, K, L, NSW, NT, US). Qld: 48 km from Lawn Hill on road to Riversleigh, *L. Pedley 2060* (BRI, CANB, K).

8. *Boerhavia gardneri* Hewson, *Fl. Australia* 4: 318 (1984)

T: Python Pool, W.A., 14 Oct. 1941, *C. A. Gardner 6275*; holo: PERTH.

Perennial, prostrate, spreading to 2 m diam., glandular-hairy; hairs usually a dense mixture of type 1 and type 2 hairs, usually predominantly type 2; stems branching almost at right angles. Leaves ovate or elliptic, often broadly so; lamina to 4 cm long; margins irregular, undulate; petiole 0–1.5 cm long. Inflorescence a terminal, erect, repeatedly branched, diffuse cyme; basic inflorescence unit usually a solitary flower, sometimes a few-flowered glomerule; pedicels slender, 1–15 mm long, glabrous or sparsely glandular-

hairy. Perianth glandular below, glabrous, trumpet-shaped above, c. 3 mm long, pink. Stamens 3–6; anthers slightly exserted. Style not exceeding anthers. Fruit fusiform, 3–4 mm long, 1–1.5 mm wide, somewhat glandular-hairy; ribs 5, mucous; furrows narrow.

Occurs in north-western W.A., northern N.T. and adjacent offshore islands, in sandy soils. Map 14.

W.A.: Packer Is., *K. F. Kenneally 6237* (CANB, PERTH); near Kununurra, *D. H. Mackenzie 690312–31* (CANB); 97 km SE of Derby, *Y. Power 83* (PERTH); Abydos Stn, near Port Hedland, Apr. 1954, *A. M. Stewart* (PERTH). N.T.: Lee Point, Darwin, *D. Morgan 66* (CANB, NT).

Doubtful and excluded names

B. acutifolia (Choisy) J. W. Moore, *Bernice P. Bishop Mus. Occ. Papers* 10(19): 6 (1934); *B. diffusa* var. *acutifolia* Choisy in A. DC., *Prodr.* 13(2): 453 (1849); *B. diffusa* f. *acutifolia* (Choisy) Domin, *Biblioth. Bot.* 89: 92 (1926). T: described from several places including Timor, Java and Western Australia, *Drummond 735*; syn: *n.v.*

Type material must be studied before this name can be assigned.

B. diandra L., *Sp. Pl.* 2: 1194 (1753). T: from India, *O. Munchausen*; holo: *n.v.*

It is probable that this name has been misapplied to Australian material.

B. diffusa L., *Sp. Pl.* 1: 3 (1753). T: from India; *n.v.*

This species does not occur in Australia. The name has been widely misapplied.

B. diffusa var. *pubescens* Choisy in A. DC., *Prodr.* 13(2): 453 (1849); *B. pubescens* Decne, *Nouv. Ann. Mus. Hist. Nat.* 3: 373 (1834) *nom. illeg.* non R. Br. (1810). T: none designated but described as part of the flora of Timor; *n.v.*

This name has been misapplied to Australian material by K. Domin, *Biblioth. Bot.* 89: 92 (1926).

B. diffusa var. *vulgaris* Domin, *Biblioth. Bot.* 89: 92 (1926). T: from several places in Qld including near Townsville and near Winton, 1910, *K. Domin*; all *n.v.*

B. diffusa var. *vulvariifolia* (Poir.) Heimerl, *Beitr. Syst. Nyctaginaceae* 26 (1897); *B. vulvariifolia* Poir. in Lam., *Encycl.* 5: 55 (1804). T: Egypt, *Delisle*; *n.v.*

Type material must be studied before this name can be assigned.

B. elegans Choisy in A. DC., *Prodr.* 13(2): 453 (1849). T: from Arabia and Oman; syn: *n.v.*

This species does not occur in Australia. The name has been misapplied.

3. COMMICARPUS

Commicarpus Standley, *Contr. U.S. Natl. Herb.* 12: 373 (1909); from the Greek *commi* (gum) and *carpus* (fruit), referring to the viscid fruits.

Type: *C. scandens* (L.) Standley (*Boerhavia scandens* L.).

Subshrubs, diffuse or scandent, glabrous, pubescent or glandular-pilose. Leaves opposite, those at each node often of unequal size, often fleshy. Flowers inconspicuous or showy, in capitula, or umbels or in branched or unbranched verticels; bracteoles small, herbaceous or membranous, often glandular. Perianth tubular, the upper part caducous, trumpet-shaped, 5-lobed, white, pink or magenta-purple. Stamens 2–6, anthers suborbic-



Figure 4. *Commicarpus australis*. **A**, flower, L.S. $\times 6$ (F. Hill 584, K). **B**, infructescence $\times 2$; **C**, fruit $\times 6$ (**B–C**, A. Morrison 15257, K). **D**, habit $\times 0.7$ (F.Hill, K; A. Morrison 15257, K). Drawn by L. Mason.

ular, exerted. Style slender, exerted; stigma capitate. Fruit indehiscent, obscurely 10-sulcate, studded with large, viscid, sessile or stipitate gland-warts. Seed 1, erect.

A genus of 25 species, widely distributed in the tropics and subtropics with concentrations of species in arid areas of NE tropical Africa and tropical Arabia. 2 species endemic in Australia.

This genus is included in *Boerhavia* by some workers, see A. L. Bogle, *J. Arnold Arbor.* 55: 25–26 (1974).

R. D. Meikle, A Key to *Commicarpus*, *Notes Roy. Bot. Gard. Edinburgh* 36: 253–249 (1978).

Flowers pink or mauve; perianth 8–10 mm diam. at apex; fruit with gland-warts irregularly dispersed

1. *C. australis*

Flowers white; perianth c. 4 mm diam. at apex; fruit with gland-warts near apex

2. *C. insularum*

1. *Commicarpus australis* Meikle, *Notes Roy. Bot. Gard. Edinburgh* 36: 248, fig. 2H (1978)

T: Trimouille Is., Monto Bello Islands, W.A., *F. H. Pavry* 15; holo: K.

[*Boerhavia repanda* auct. non Willd.: G. Benth, *Fl. Austral.* 5: 278–279 (1870) p.p.]

[*C. chinensis* auct. non (L.) Heimerl: J. Jessop ed., *Fl. Centr. Australia* 35 (1981)]

Subshrub, scrambling or prostrate; stems to 1.5 m long, irregularly branched, often forming intricate mats, flexuose near inflorescences. Leaves ovate-deltoid, acute, to 4.5 cm long, 3.5 cm wide, glabrous; base cuneate to subcordate; margins sinuate or entire, often undulate; petiole usually less than 1 cm long, glabrous or crispate-pubescent. Inflorescence an irregularly branched verticel, sometimes umbelliform; peduncle stout, to 8 cm long, exceeding bracts, glabrous; pedicels mostly less than 7 mm long, glabrous or sparsely glandular-viscid. Perianth c. 10 mm long, 8–10 mm wide, glabrous outside, pink or mauve. Stamens 3 or 4, shortly exerted. Style to 1.5 cm long. Fruit broadly clavate, c. 8 mm long, 3–3.5 mm wide, studded irregularly with viscid gland-warts. Fig. 4.

Endemic in W.A. and S.A.; on coastal sand dunes and edges of mangrove swamps and on sandy or gravelly ground inland. Map 15.

W.A.: between Denham and Monkey Mia, *J. S. Beard* 6771 (NSW, PERTH); Shark Is., 1854, *W. G. Milne* (K); Carnarvon, *A. Morrison* 15257 (K). S.A.: entrance to Brachina Gorge, *T. R. N. Lothian* 965 (AD, K); Everard Park Stn, *D. E. Symon* 3344 (ADW, CANB, K).

2. *Commicarpus insularum* Meikle, *Kew Bull.* 34: 341, fig. 1 (1979)

T: Emu Park, Qld, *S. T. Blake* 15338; holo: BRI.

[*Boerhavia repanda* auct. non Willd.: G. Benth, *Fl. Austral.* 5: 278–279 (1870) p.p.]

Subshrub, creeping or scandent; stems to 1 m long, repeatedly branched, glabrous or scabridulous. Leaves ovate, acute or acuminate, 1.5–5 cm long, 1–4 cm wide, subglabrous or minutely puberulous; base rounded or subcordate; margins sinuate or entire, often undulate; petiole to 2.5 cm long, minutely puberulous. Flowers 3–6, in axillary umbels, sometimes in verticels; peduncle slender, to 10 cm long, exceeding bracts; pedicels to 7 mm long. Perianth to 8 mm long and 4 mm wide, crispate-pubescent externally, white. Stamens usually 3, distinctly exerted. Style exceeding stamens. Fruit narrowly clavate, 8–10 mm long, 1.5–2 mm wide; gland-warts prominent near apex.

Endemic in Qld in littoral scrub. Map 16.

Qld: Heron Is., *A. B. Cribb* 3398 (BRI); Masthead Is., 27 Oct. 1965, *H. S. Curtis* (BRI); One Tree Is., 1970, *H. Heatwole* (BRI); Lady Elliot Is., *G. Robinson* 11 (MEL); Heron Is., Jan. 1948, *Syd. Univ. Biol. Soc.* (CANB, NSW).

4. PISONIA

Pisonia L., *Sp. Pl.* 2: 1026 (1753); *Gen. Pl.* 5th edn, 451 (1754); named in honour of the Dutch doctor Willem Piso (fl. 1648) who wrote a book about medicinal plants from Brazil.

Type: *P. aculeata* L.

Ceodes Forster & G. Forster, *Char. Gen. Pl.* 141 (1776). T: *C. umbellifera* Forster & G. Forster

Calpidia Thouars, *Pl. Iles Afrique Austr.* 37 (1804). T: *C. oblonga* J. St Hill.

Heimerliodendron Skottsbb., *Svensk Bot. Tidskr.* 35: 364 (1941). T: *H. brunoniana* (Endl.) Skottsbb. (*Pisonia brunoniana* Endl.)

Shrubs or trees without spines, or climbers with spines, monoecious or dioecious, mostly glabrescent. Leaves opposite, alternate, sometimes crowded towards ends of twigs. Inflorescences axillary or terminal. Flowers bisexual or unisexual. Perianth campanulate, urceolate or funnel-shaped, 5-, rarely 10-lobed, the upper part coloured, often caducous. Stamens 2–20, mostly exserted. Style longer than ovary; stigma capitate, lobed or fimbriate. Fruit smooth or ribbed; ribs 5 or 6, often glandular-viscid, sometimes the glands developing into viscid prickle-like glandular hairs.

A tropical genus of 35 species, predominantly in America and SE Asia; 3 are native in Australia.

J. F. Stemmerik, Notes on *Pisonia* L. in the Old World (Nyctaginaceae), *Blumea* 12: 275–284 (1964).

- | | | |
|----|---|---------------------------------|
| 1 | Plants spinose, climbing | 1. <i>P. aculeata</i> |
| 1: | Plants not spinose, erect | |
| 2 | Leaves hairy below; fruit with viscid prickle-like glandular hairs | 2. <i>P. grandis</i> |
| 2: | Leaves glabrous below; fruit viscid, without prickle-like glandular hairs | 3. <i>P. umbellifera</i> |

1. *Pisonia aculeata* L., *Sp. Pl.* 2: 1026 (1753)

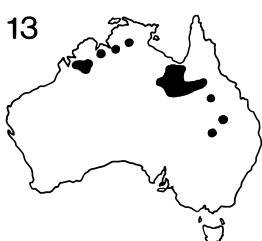
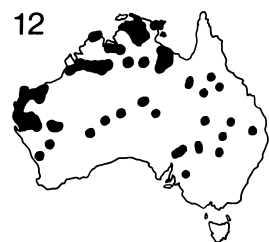
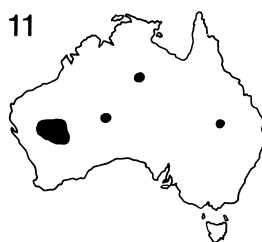
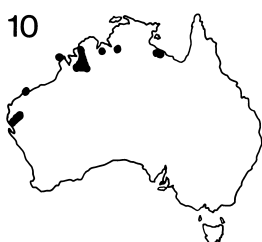
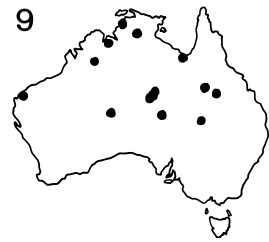
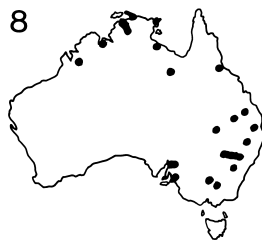
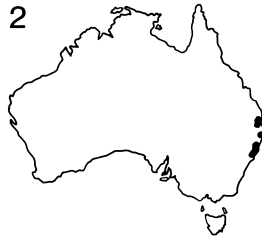
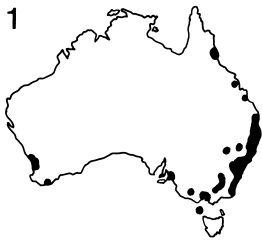
T: from central America; *n.v.*

Illustrations: J. F. Stemmerik, *Fl. Males.* ser. 1, 6: 463, fig. 9d–h (1964); N. C. W. Beadle, *Stud. Fl. N.E. New South Wales* 2: fig. 104C (1972).

Dioecious climber to 20 m, glabrous, puberulous or tomentose; stems with spreading, opposite and decussate branches, bearing axillary thorns; thorns 5–10 mm long, usually recurved. Leaves petiolate, opposite or nearly so, elliptic, ovate or broadly ovate, to 10 cm long, to 7 cm wide; petiole to 2.5 cm long. Inflorescences dense axillary cymes which expand in fruit; peduncles 1.5–3 cm long; flowers cream or yellow, scented. Male flowers funnel-shaped, 5-lobed, c. 3 mm long; stamens 6–8, exserted; gynoecium vestigial. Female flowers campanulate or urceolate, 5-lobed, c. 2 mm long; androecium vestigial; stigma fimbriate, exserted. Fruit clavate, usually 1 cm long, 2–2.5 mm wide, ribbed; ribs with double row of glands which develop into soft viscid, prickle-like glandular hairs, c. 0.5 mm long. Fig. 2H.

Occurs in rainforest and forest edges in tropical and subtropical regions around the world; in W.A., N.T., Qld and N.S.W. in Australia. Map 17.

W.A.: Drysdale River National Park, A. S. *George* 14024 (BRI). N.T.: Yirkala, R. L. *Specht* 1008 (BRI, CANB); 250 km ENE of Darwin, R. *Story* 8407 (BRI, CANB, DNA). Qld: near Helenvale, C. H. *Gittins* 2161 (BRI); Woolston, J. H. *Simmonds* 393 (BRI).



- 1. *Phytolacca octandra*
- 4. *Monococcus echinophorus*
- 7. *Boerhavia tetrandra*
- 10. *Boerhavia burbridgeana*
- 13. *Boerhavia paludosa*

- 2. *Phytolacca americana*
- 5. *Rivina humilis*
- 8. *Boerhavia dominii*
- 11. *Boerhavia repleta*
- 14. *Boerhavia gardneri*

- 3. *Phytolacca dioica*
- 6. *Mirabilis jalapa*
- 9. *Boerhavia schomburgkiana*
- 12. *Boerhavia coccinea*
- 15. *Commicarpus australis*

2. *Pisonia grandis* R.Br., *Prodr.* 422 (1810)

T: northern Australia, *R. Brown s.n.*: holo: BM *n.v.*, *fide* J. F. Stemmerik, *Blumea* 12: 283 (1964).

[*P. inermis* auct. non Jacq.: G. Benth, *Fl. Austral.* 5: 280 (1870)]

Shrub or tree to 30 m, subglabrous to puberulous. Stems without thorns, often with obvious leaf-scars. Leaves opposite or sometimes subopposite, petiolate, elliptic, oblong or ovate, to 30 cm long, to 18 cm wide, puberulous, glabrescent; petiole to 6 cm long. Inflorescences in terminal cymose clusters; flowers bisexual or (?)unisexual; peduncle c. 1.5 cm long. Perianth funnel-shaped, 5-lobed, c. 4 mm long. Stamens 6–10, exserted. Stigma fimbriate, not exserted. Fruit cylindrical to clavate, 8–12 mm long, 2–2.5 mm wide, ribbed; ribs with a row of viscid prickly-like hairs c. 0.5 mm long.

Occurs along the coasts of islands of the Indian Ocean, SE Asia, Malesia, the western Pacific and northern Australia. Map 18.

Qld: Fairfax Is., Jan. 1965, *A. B. Cribb* (BRI); Heron Is., June 1958, *M. Gillam* (BRI); Heron Is., *C. Slater* 65 (CANB); Heron Is., Jan. 1948, *Syd. Univ. Biol. Soc.* (CANB).

Described by R. Brown as having polygamous flowers, by G. Benth as having ‘flowers dioecious’ and by J. F. Stemmerik as having ‘flowers bisexual’. The sexuality is unresolved and further observation is required to resolve this.

3. *Pisonia umbellifera* (Forster & G. Forster) Seemann, *Bonplandia* 10: 154 (1862)

Ceodes umbellifera Forster & G. Forster, *Char. Gen. Pl.* 141, t. 71 (1776). T: from Tanna, *Forster s.n.*; holo: BM *n.v.*, *fide* J. F. Stemmerik, *Blumea* 12: 280 (1964).

P. excelsa Blume, *Bijdr.* 14: 735 (1826). T: from W Java; *n.v.*

P. brunoniana Endl., *Prodr. Fl. Norfolk.* 43 (1833); *Heimerliodendron brunonianum* (Endl.) Skottsb., *Svensk Bot. Tidskr.* 35: 364 (1941). T: Norfolk Island, *F. Bauer s.n.*; holo: K *n.v.*, *fide* J. F. Stemmerik, *Blumea* 12: 280 (1964).

P. mooriana F. Muell., *Fragm.* 1: 20 (1858). T: Illawarra, N.S.W., *C. Moore s.n.*; *n.v.*

Illustrations: J. H. Maiden, *Forest Fl. New South Wales* 8: 71–73, pl. 288 (1925); N. C. W. Beadle, *Stud. Fl. N.E. New South Wales* 2: fig. 104D (1972).

Shrub or tree to 28 m tall, tomentose or glabrous; stems without thorns. Leaves opposite or sub-opposite, sometimes crowded towards ends of twigs or in pseudo-whorls, petiolate, ovate to elliptic-oblong, to 35 cm long, to 15 cm wide; petiole to 5 cm long. Inflorescence of terminal, branched, many-flowered cymose umbels; flowers unisexual or bisexual, white, yellow or pink, scented; peduncle 3.5–4 cm long. Perianth campanulate, 2.5–7 mm long; stamens 6–14, exserted; stigma fimbriate, exserted. Fruit elongate, somewhat spindle-shaped, 2–4 cm long, c. 6 mm wide, 5-ribbed; ribs viscid, without prickly-like glandular hairs. *Bird Lime Tree*. Fig. 7.

Widespread especially in wet gullies and rainforest of coastal areas in tropical, subtropical and temperate regions from Africa to the western Pacific including New Zealand; in Australia in Qld, N.S.W., on Lord Howe Is., Norfolk Is. and Christmas Is. Map 19.

Qld: Mossman R., *L. J. Brass* 2137 (BRI); near Mission Beach, *F. H. J. Chrome* 242 (CANB); Clump Point, *L. S. Smith* 4915 (BRI). N.S.W.: Palm Jungle, Royal National Park, *R. Coveny* 10106 (CANB, NSW); Cabbage Tree Is., *P. Martensz* 4005 (CANB, NSW).

This species has been commonly named the *Bird Lime Tree* because many birds die when their feathers are gummed with the viscid fruits. It is possible that *P. umbellifera* *s. lat.* embraces two taxa in Australia, with *P. umbellifera* *s.str.* having a northern distribution and *P. brunoniana* Endl. a southern distribution. Sexuality, bud morphology, perianth colour and stamen insertion require critical observation in the field.

AIZOACEAE

A. Prescott and J. Venning

Herbs or shrubs, glabrous, papillose, hairy or scaly. Leaves alternate or opposite, simple, flat, terete or triquetrous, often with expanded membranous base, usually succulent. Flowers terminal or axillary, sessile or pedicellate, solitary, clustered or in thyrses; bracts present or absent; flowers actinomorphic, bisexual. Perianth segments 4 or 5, equal or unequal, persistent, often coloured inside. Petals 0. Stamens 4 to many, alternate with perianth segments or evenly distributed; staminodes 0 to many, often petal-like. Ovary superior, half-inferior or inferior; styles as many as locules; locules 1 to many; ovules 1 to many per locule; placentation axile and apical or basal, or parietal. Fruit a capsule opening loculicidally or septicidally, or circumsciss (and then with a cap or operculum), or indehiscent, smooth or variously winged or ridged; placenta often enlarged in fruit to form a tubercle. Seeds 1 to many, often pea-shaped or comma-shaped, usually patterned or papillose.

A cosmopolitan family of c. 150 genera and possibly more than 2 000 species. Represented in Australia by 18 genera and 60 species, of which 8 genera and 39 species are native. The family contains the succulents known as pigfaces.

Those genera with petaloid staminodes are usually referred to as mesembryanthemums. This group has sometimes been recognised as a closely related but separate family, see H. Herre (ed.) *The Genera of the Mesembryanthemaceae* (1971). Until the 1920s *Mesembryanthemum s. lat.* was regarded as a single large genus but work by N. E. Brown, L. Bolus and G. Schwantes led to the creation of many genera based on the form and dehiscence of the capsule. It is now generally recognised that the splitting of *Mesembryanthemum s. lat.* was excessive, and new work is tending to combine genera.

The centre of distribution of the family is South Africa but there is good representation in Australia, South America and the Mediterranean. The plants occupy a wide range of habitats but are common in arid areas and saline inland and coastal habitats.

The following terms are used in the descriptions of capsular-fruited genera: 1) 'expanding keel' — tissue along the suture between two locules (formed from the epidermal lining of the locules) which expands when wet and assists the opening of the capsule; 2) 'roof' — a membranous, elastic cover over the locules of the capsule.

G. Bentham, Ficoideae *p.p.*, *Fl. Austral.* 3: 322–334 (1866); R. S. Adamson & L. Bolus in R. S. Adamson & T. M. Salter, *Fl. Cape Penins.* 363–390 (1950); H. Herre (ed.), *The Genera of the Mesembryanthemaceae* (1971).

KEY TO GENERA

- 1 Petal-like staminodes present
- 2 Placentation axile
 - 3 Sepals 4 1. APTENIA
 - 3: Sepals 5
 - 4 Plants conspicuously papillose; if leaves caducous, leaf-bases not persisting 2. MESEMBRYANTHEMUM
 - 4: Plants minutely papillose; leaf laminae caducous, the leaf-bases persisting 3. PSILOCAULON
- 2: Placentation parietal or basal
 - 5 Fruit fleshy, indehiscent

- | | | |
|-----|---|------------------------|
| 6 | Styles 7–16 | 4. CARPOBROTUS |
| 6: | Styles 4 or 5 | 5. SARCOZONA |
| 5: | Fruit a capsule | |
| 7 | Capsule dehiscent when dry | 6. CONICOSIA |
| 7: | Capsule hygroscopic, dehiscent when wet | |
| 8 | Plants annual | |
| 9 | Ovary with 5, rarely 4, locules | 7. MICROPTERUM |
| 9: | Ovary with 12–20 locules | 8. CARPANTHEA |
| 8: | Plants perennial | |
| 10 | Leaves densely papillose, clavate | 9. DROSANTHEMUM |
| 10: | Leaves smooth, clavate or triquetrous | |
| 11: | Placental tubercle none | 10. LAMPRANTHUS |
| 11 | Placental tubercle present | |
| 12 | Plants erect | 11. RUSCHIA |
| 12: | Plants prostrate, rooting at nodes | 12. DISPHYMA |
| 1: | Petal-like staminodes absent | |
| 13 | Fruit indehiscent | 13. TETRAGONIA |
| 13: | Fruit dehiscent | |
| 14 | Fruit opening by slits or valves | |
| 15 | Leaves opposite | 14. GUNNIOPSIS |
| 15: | Leaves alternate | 15. GALENIA |
| 14: | Fruit a circumsciss capsule | |
| 16 | Bracts associated with flowers | |
| 17 | Ovary 1-locular | 16. TRIANTHEMA |
| 17: | Ovary 2-locular | 17. ZALEYA |
| 16: | Bracts absent | 18. SESUVIUM |

1. APTENIA

J. Venning

Aptenia N. E. Br., *Gard. Chron.* ser. 3, 78: 412 (1925); from the Greek *apten* (wingless), referring to the lack of wings on the valves of the capsule.

Type: *A. cordifolia* (L.f.) Schwantes

Succulent perennials with long, prostrate stems, densely papillose. Branches angular. Leaves opposite, the pairs equal in size, ovate or cordate, acute or obtuse, entire; petiole broad, partly ensheathing stem. Flowers solitary, axillary, shortly pedicellate. Sepals 4, 2 larger and opposite. Petal-like staminodes many, purplish-red; stamens many. Styles 4; ovary inferior; locules 4; placentation axile. Fruit a hygroscopic capsule; valves not winged; expanding keels contiguous; locules without roofs; placental tubercles absent. Seeds many, compressed, circular, tuberculate.

A genus of 2 species, endemic in South Africa; 1 species introduced into Australia.

****Aptenia cordifolia* (L.f.) Schwantes, *Gartenflora* 77: 69 (1928)**

Mesembryanthemum cordifolium L.f., *Suppl. Pl.* 260 (1782). T: Cape of Good Hope, [Herb.] *D. Montin*; n.v.

Illustrations: H. Herre (ed.), *Gen. Mesembryanthemaceae* 79 (1971); H. Jacobsen, *Handb. Succ. Pl.* 3, fig. 1205 (1960); F. P. Morris, *Victorian Naturalist* 50: t. I (1933) (as *Mesembryanthemum cordifolium*).

Low shrub with spreading stems, minutely papillose. Leaves ovate or cordate, 8–26 mm long, 5–18 mm wide. Capsule narrowly obconical, 9–12 mm long, 4–9 mm wide; peduncle 5–8 mm long. *Heart-leaf Ice-plant*. Fig. 5C–D.

Confined to coastal areas. A garden escape and possibly not naturalised, though generally regarded as such. Map 20.

S.A.: Grange, *J. Venning* 411 (AD). Vic.: Cheltenham, 17 Sept. 1940, *J. C. Goudie* (MEL). Tas.: Creek Road, New Town, 2 May 1978, *D. J. Morris* (HO); Yellow Beach, Flinders Is., Bass Strait, *J. S. Whinray* 1323 (AD).

This species consistently has 4 sepals, unlike other representatives of the *Mesembryanthemum* group found in Australia which have 5.

According to J. M. Black, *Fl. S. Australia* 2nd edn, 2: 337 (1948), it is 'an escape around our coasts at Port Lincoln and elsewhere' in S.A., and J. H. Willis, *Handb. Pl. Victoria* 2: 122 (1972), regarded it as naturalised in Vic., but there are no herbarium collections to verify this. W. M. Curtis, *Stud. Fl. Tasmania* (1953), did not regard *A. cordifolia* as naturalised in Tas.

2. MESEMBRYANTHEMUM*J. Venning*

Mesembryanthemum L., *Sp. Pl.* 1: 480 (1753); *Gen. Pl.* 5th edn, 215 (1754); from the Greek *mesembria* (midday) and *antheon* (flower), referring to opening of flowers in full sunlight.

Type: *M. crystallinum* L.

Prostrate or erect succulent herbs, annual or biennial, conspicuously papillose. Branches angled or terete. Leaves opposite on lower branches, alternate on flowering branches, fleshy, semiterete or flat, sessile or petiolate. Flowers solitary, axillary, sessile or shortly pedicellate. Sepals 5, 2 large and 3 small, the smaller with membranous margins. Petal-like staminodes many, white; stamens many. Styles 5; ovary inferior or partly superior; locules 5; placentation axile. Fruit a hygroscopic capsule; valves winged; expanding keels contiguous; locules without roofs; placental tubercles absent. Seeds many, D-shaped, minutely tuberculate, light or dark brown.

A genus of 74 species, distributed along the coasts of western North America, southern Europe, the Middle East and Africa; 3 species naturalised in Australia.

This genus, often incorrectly spelt *Mesembrianthemum*, has been split into many genera containing c. 2'000 species (see H. Herre (ed.), *Gen. Mesembryanthemaceae*, 1971); the first 12 genera dealt with in this treatment belong to this complex.

H. Herre (ed.), *The Genera of the Mesembryanthemaceae* (1971); H. Jacobsen, *A Handbook of Succulent Plants* 3 (1960); G. Schwantes, *Flowering Stones and Mid-day Flowers* (1957).

1 Leaves semiterete

3. ***M. nodiflorum***

1: Leaves flat, ovate or spatulate

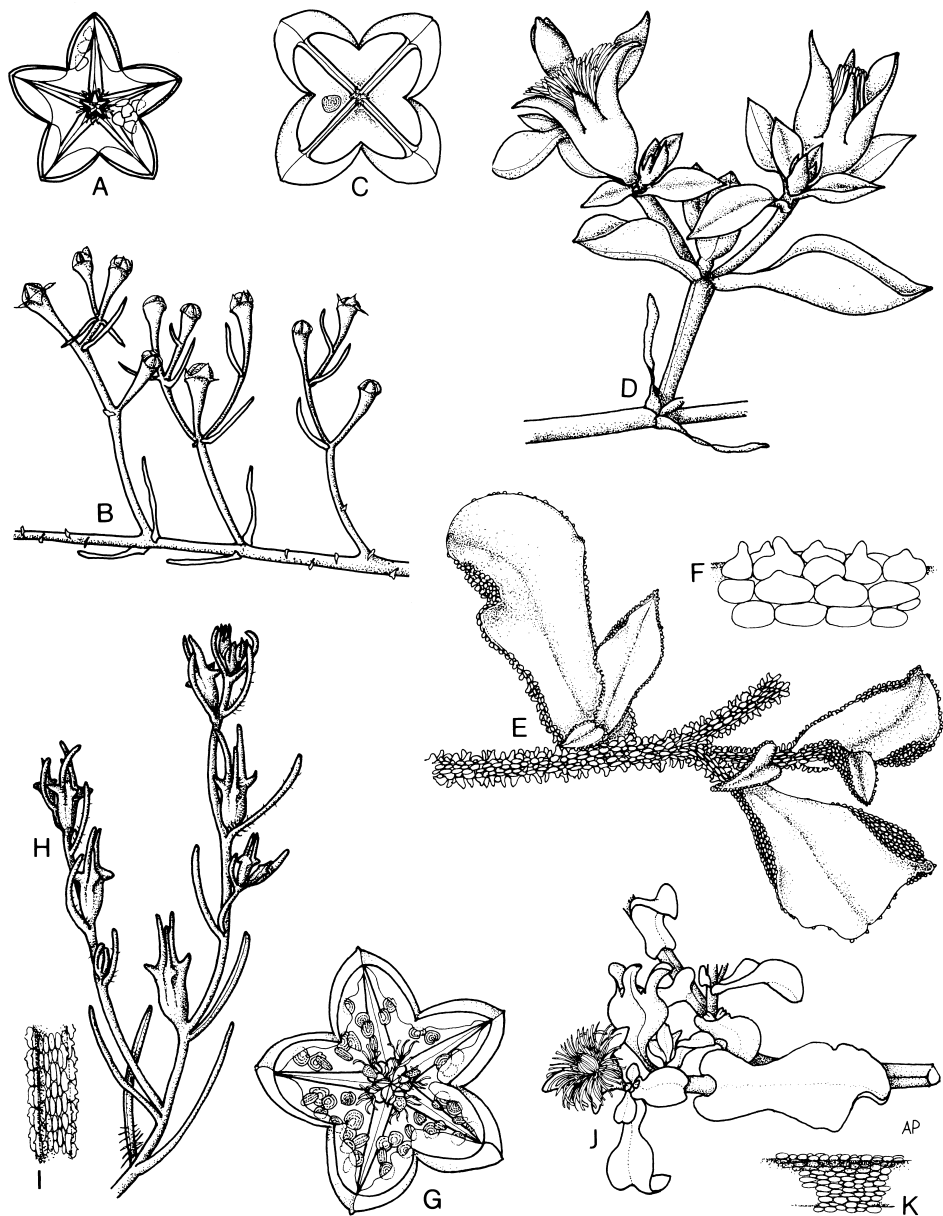


Figure 5. A–B, *Psilocaulon tenue*. A, open capsule $\times 3$; B, habit $\times 1$ (A–B, B. Copley 1669, AD). C–D, *Aptenia cordifolia*. C, open capsule $\times 3$; D, habit $\times 1$ (C–D, J. Venning 411, AD). E–K, *Mesembryanthemum*. E–G, *M. crystallinum*. E, habit $\times 1$; F, papillae $\times 3.5$; G, open capsule $\times 3$ (E–G, J. Venning 408, AD). H–I, *M. nodiflorum*. H, habit $\times 1$; I, papilla $\times 3.5$ (J. Venning 406, AD). J–K, *M. aitonis*. J, habit $\times 1$; K, papillae $\times 3.5$ (J–K, R. Chinnock 5488, AD).

2 Sepals distinctly keeled; plant covered with inconspicuous papillae; branches angled

1. *M. aitonis*

2: Sepals not keeled; plant densely covered with conspicuous papillae; branches terete

2. *M. crystallinum*

1. **Mesembryanthemum aitonis* Jacq., *Hort. Vindob.* 3: t. 8 (1776)

Cryophytum aitonis (Jacq.) N.E. Br., *Gard. Chron.* 84: 128 (1928); *Gasoul aitonis* (Jacq.) H. Eichler, *Suppl. J. M. Black's Fl. S. Australia 2nd edn.*, 133 (1965). T: grown from seed sent from Kew by W. Aiton; *n.v.*

[*Mesembryanthemum angulatum* auct. non Thunb.: J. R. Tovey, *Proc. Roy. Soc. Victoria* n.s., 22: 24 (1909)]

Illustration: F. P. Morris, *Victorian Naturalist* 50: t. I (1933) (as *Cryophytum aitonis*).

Low shrub with erect or trailing stems, densely papillose with small papillae. Branches angled, tinged with red. Leaves ovate or spatulate, acute or obtuse, reflexed, the adaxial surface concave; lamina 10–50 mm long, 4–28 mm wide, red or green; margins undulate; papillae on adaxial surface smaller than those on other parts of plant; petiole broad, partly ensheathing stem. Flowers pedicellate. Sepals spatulate, keeled, the edges tinged with red. Petal-like staminodes white. Ovary distinctly 5-lobed. Capsule broadly oblong, 5–7 mm long, 4–6 mm wide; sepals sharply reflexed at maturity. *Angled Ice-plant.* Fig. 5J–K.

Native to South Africa; distributed widely throughout southern Australia. Commonly found on samphire flats and saline areas inland. Map 21.

W.A.: Culham Inlet, 7 km WNW of Hopetoun, 14 Oct. 1961, *J. H. Willis* (MEL, PERTH). S.A.: 2 km N of Watson on Maralinga road, *T. Dennis 161* (AD); near Bute, Yorke Peninsula, *D. J. E. Whibley 1658* (AD).

2. **Mesembryanthemum crystallinum* L., *Sp. Pl.* 1: 480 (1753)

Cryophytum crystallinum (L.) N.E. Br. in E. P. Phillips, *Gen. S. Afr. Fl. Pl.* 245 (1926); *Gasoul crystallinum* (L.) Rothm., *Notizbl. Bot. Gart. Berlin-Dahlem.* 15: 413 (1941). T: not designated.

Illustrations: J. M. Black, *Fl. S. Australia 2nd edn.*, 2: fig. 479 (1948) (as *Cryophytum crystallinum*); H. M. L. Bolus, *Notes Mesembryanthemum* 1: fig. 31 (1928) (as *Cryophytum crystallinum*); H. Herre (ed.), *Gen. Mesembryanthemaceae* 205 (1971); H. Jacobsen, *Handb. Succ. Pl.* 3: figs 1506a, b (1960); F. P. Morris, *Victorian Naturalist* 50: t. I (1933) (as *Cryophytum crystallinum*).

Dense prostrate shrub to 1 m wide, densely papillose with rounded and horned papillae 1–2 mm diam.; basal rosette often present. Branches terete. Leaves ovate or spatulate, acute or obtuse, 7–145 mm long, 2–85 mm wide, tinged with red; margins undulate; papillae smaller on adaxial surface than elsewhere; petiole broad, partly ensheathing stem. Flowers shortly pedicellate. Sepals semicircular, tinged with red. Petal-like staminodes white with red to pale pink apices. Fruit broadly oblong, 6–11 mm long, 5–8 mm wide, the sepals sharply reflexed exposing valves at maturity. *Common Ice-plant.* Fig. 5E–G.

Native to Europe and Africa; distributed widely throughout southern Australia. Common on samphire flats and saline areas inland. Map 22.

W.A.: Coogee, *R. J. Cranfield 387* (PERTH). S.A.: between Mildura and Renmark, Nov. 1973, *D. E. Symon* (AD, ADW, CANB); East Wellington, 50 km N of Meningie, *P. G. Wilson 1442* (AD, E, G). Vic.: W of Red Cliffs, S of Mildura, *A. C. Beaglehole 39128* (MEL). Tas.: Erith Is., Kent Group, Bass Strait, *J. S. Whinray 252* (MEL).

3. **Mesembryanthemum nodiflorum* L., *Sp. Pl.* 1: 480 (1753)

Cryophytum nodiflorum (L.) L. Bolus, *S. Afr. Gard.* 17: 327 (1927); *Gasoul nodiflorum* (L.) Rothm., *Notizbl. Bot. Gart. Berlin-Dahlem.* 15: 413 (1941). T: not designated.

[*Mesembryanthemum caducum* auct. non Ait.: J. M. Black, *Fl. S. Australia* 2: 219 (1924)]

[*Psilocaulon caducum* auct. non. (Ait.) N.E. Br.: J. M. Black, *Fl. S. Australia 2nd edn.*, 2: 337 (1948)]

Illustrations: J. M. Black, *Fl. S. Australia* 2nd edn, fig. 481 (1948) (as *Psilocaulon caducum*); H. M. L. Bolus, *Notes Mesembrianthemum* 1: fig. 34 (1928) (as *Cryophytum nodiflorum*).

Erect or prostrate shrub to 20 cm high, densely papillose, often red-tinged. Branches terete. Leaves sessile, semiterete, flat on adaxial surface, 5–22 mm long, 1–2 mm wide, sparsely villous, papillose, soon withering. Flowers sessile. Sepals semiterete with a prominent horn at base; villous in lower half. Petal-like staminodes white. Ovary faintly ribbed. Fruit oblong, 4–8 mm long, 3–4 mm wide, the sepals not reflexed at maturity. Fig. 5H–I.

Native to South Africa; distributed widely throughout southern Australia. Common on samphire flats and saline areas inland. Map 23.

W.A.: 50 km W of 90 Mile Tank, *H. Demarz 5369* (PERTH); Karana Stn, *E. Wittwer 1597* (PERTH). S.A.: 16 km S of Port Wakefield, *T. R. N. Lothian 1501* (AD, M, NSW); Yorke Peninsula, Innes National Park track, *D. E. Symon 9765* (ADW, CANB). Vic.: Kulkyn Forest, 20 km E of Hattah P.O., *A. C. Beauglehole 40552* (MEL).

3. PSILOCAULON

J. Venning

Psilocaulon N. E. Br., *Gard. Chron.* ser. 3, 78: 412 (1925); from the Greek *psilos* (bare), and *kaulon* (stalk), in reference to the caducous stem leaves.

Type: *P. articulatum* (Thunb.) N. E. Br.

Semi-erect to trailing perennial shrub, minutely papillose. Branches terete, appearing jointed from the persistent leaf-bases. Leaves terete, opposite on lower branches, alternate on flowering branches, partly ensheathing stem, soon falling leaving only the broad base. Flowers solitary, terminal or axillary on short shoots. Sepals 5. Petal-like staminodes many, white; stamens many. Styles 5; ovary inferior; locules 5; placentation axile. Fruit a hygroscopic capsule; valves winged along edges; expanding-keels contiguous; locules without roofs; placental tubercles absent. Seeds many, D-shaped, laterally compressed, tuberculate, brown.

A genus of 72 species endemic in South Africa; 1 species naturalised in Australia.

****Psilocaulon tenue*** (Haw.) Schwantes, *Gartenflora* 77: 69 (1928)

Mesembryanthemum tenue Haw., *Saxifrag. Enum.* 2: 175 (1821). T: grown at Kew from seed from the Cape of Good Hope; *n.v.*

Semi-erect or prostrate shrub. Leaves terete, 4–15 mm long, 1 mm wide. Capsule globular, 2–4 mm diam.; peduncle 2–8 mm long. Fig. 5A–B.

Common along the Murray River in S.A., N.S.W. and Vic. Map 24.

S.A.: 5 km E of Berri, *D. E. Symon 1879* (ADW); Morgan, *L. D. Williams 4148* (AD). Vic.: Sunny Cliffs, *A. C. Beauglehole 16006* (MEL).

This species resembles *Mesembryanthemum* in the form of the capsule but may be distinguished from Australian representatives of that genus by the persistent leaf bases and minute papillae. The alternate arrangement of the leaves on the flowering branchlets would appear atypical for *Psilocaulon*.

4. CARPOBROTUS*J. Venning*

Carpobrotus N. E. Br., *Gard. Chron.* ser. 3, 78: 433 (1925); from the Greek *karpos* (fruit), and *brotos* (edible things), referring to the edible fruits.

Type: *C. edulis* (L.) N. E. Br.

Succulent glabrous perennials with prostrate stems to 2 m long, rooting at nodes. Leaves triquetrous, opposite, connate, ensheathing stem; keel acute, smooth or denticulate, often denticulate only on upturned part. Flowers solitary, on short shoots in axils, sessile or pedicellate. Sepals 5, 2 large and opposite, 3 smaller with broad membranous margins. Petal-like staminodes many, yellow, pink, purple or white; stamens many. Styles 6–14, free or shortly fused at base; ovary inferior; locules 6–14; placentation parietal. Fruit indehiscent, fleshy. Seeds many, ovate, elliptic or oblong, laterally compressed, mucilaginous, light to dark brown.

A genus of 23 species distributed along the west coast of North America and in western South America, South Africa and Australia; 4 native and 2 naturalised species in Australia.

S. T. Blake, A revision of *Carpobrotus* and *Sarcozona* in Australia, genera allied to *Mesembryanthemum* (Aizoaceae), *Contr. Queensland Herb.* 7 (1969).

Key adapted from S. T. Blake, *loc. cit.*

- | | | |
|----|---|----------------------------------|
| 1 | Petal-like staminodes yellow, later turning pink, densely streaked overall when dry | 2. <i>C. edulis</i> |
| 1: | Petal-like staminodes purple, paler to white near base, not densely streaked overall when dry | |
| 2 | Petal-like staminodes pale but never white at base, streaked when dry | 1. <i>C. aequilaterus</i> |
| 2: | Petal-like staminodes white at base, streaked only near midline when dry | |
| 3 | Styles shortly united at base; flower up to 20 mm diam. | 4. <i>C. modestus</i> |
| 3: | Styles not united at base; flower 35–85 mm diam. | |
| 4 | Leaves equilateral near middle; stamens 300–400 | 3. <i>C. glaucescens</i> |
| 4: | Leaves not equilateral near middle; stamens 100–300 | |
| 5 | Stamens 250–300 | 6. <i>C. virescens</i> |
| 5: | Stamens 100–250 | 5. <i>C. rossii</i> |

Species 3, 5 and 6, regarded as distinct by Blake (*loc. cit.*), are difficult to distinguish in dried specimens, especially since stamens cannot be accurately counted. Recent collections have extended the known ranges of these species and reduced the morphological disjunctions between them; of the characters considered specific by Blake, only stamen number remains useful. Without a good selection of fresh material, however, it has not been possible to revise the status of these species.

1. **Carpobrotus aequilaterus* (Haw.) N. E. Br., *J. Bot.* 66: 324 (1928)

Mesembryanthemum aequilaterum Haw., *Observ. Mesembryanthemum* 390 (as '*equilaterum*'), 477 (1794); *Mesembryanthemum edule* var. *aequilaterum* (Haw.) Moss, *Cambr. Brit. Fl.* 2: 151 (1914); *Mesembryanthemum aequilaterale* Willd., *Sp. Pl.* 4th edn, 2: 1051 (1799), *nom. illeg.*; *Carpobrotus aequilateralis* (Willd.) J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 56: 40 (1932). T: 'I have been told, it is a native of the country about Botany Bay'. Drawing of material cultivated in England designated as neotype (K); *fide* S. T. Blake, *Contr. Queensland Herb.* 7: 19 (1969).

Mesembryanthemum aequilaterale var. *decagynum* Haw. ex DC., *Prodr.* 3: 429 (1828), *nom. illeg.* T: introduced c. 1801, communicated by Howard; *n.v.*

C. disparilis N. E. Br., *J. Bot.* 66: 324 (1928). T: fig. 20 in Salm-Dyck, *Monogr. Aloes Mesembryanthemi* fasc. 1 (1836).

Illustration: S. T. Blake, *op. cit.* fig. 3.

Stems spreading, prostrate, to 2 m long. Leaves 3.5–9 cm long, 5–12 mm wide, bright green or grey-green, sometimes tinged red; adaxial surface concave or flat; lateral surfaces flat or barely concave; keel denticulate along entire length or only upper portion. Flowers 3.5–8 cm diam.; pedicels 5–40 mm long. Petal-like staminodes purple, paling near base but not white, streaked when dry; stamens 150–550, 4–6-seriate. Styles 6–14, free; ovary conical, laterally compressed, 2-ridged; ovary concave on top. *Angled* or *Angular Pigface*.

Native of Chile, naturalised over a wide range of soil types and climatic regions in W.A., S.A., N.S.W., Vic. and Tas.; commonly planted on embankments to control soil erosion. Map 25.

W.A.: 40 km ESE of Lake King, *P. G. Wilson 6876* (PERTH). S.A.: near Goolwa Barrage Settlement, *L. D. Williams 5689* (AD); 22 km SSE of Port Lincoln, *P. G. Wilson 2727* (AD).

2. **Carpobrotus edulis* (L.) L. Bolus, *Fl. Pl. S. Afr.* 7: sub t. 247 (1927)

Mesembryanthemum edule L., *Syst. Nat.* 10th edn, 1060 (1759). T: not designated.

[*Carpobrotus acinaciformis* auct. non (L.) L. Bolus: Hj. Eichler, *Suppl. J. M. Black's Fl. S. Australia 2nd edn*, 134 (1965)]

Illustrations: S. T. Blake, *Contr. Queensland Herb.* 7: fig. 2 (1969); R. Marloth, *Fl. S. Afr.* 1: t. 50 (as *Mesembryanthemum edule*) (1913).

Stems spreading or prostrate, to 2 m long. Leaves 4–8 cm long, 8–17 mm wide, bright green, often tinged red along edges; adaxial and lateral surfaces distinctly concave; keel denticulate, sometimes only in upper portion. Flowers 7–8.5 cm diam.; pedicels 10–20 mm long. Petal-like staminodes yellow changing to pink, usually densely streaked when dry; stamens 400–600, 6–7-seriate. Styles 8–10, free; ovary conical, barely compressed, convex on top. *Hottentot Fig.* Fig. 6C–D.

A native of South Africa. Widely planted as a soil binder on embankments and as an ornamental in coastal districts; naturalised along parts of the coast of southern and eastern Australia. Map 26.

W.A.: Yanchep National Park, *J. W. Wrigley 4086* (A, CANB, PERTH). S.A.: Wright Is., Encounter Bay, *T. R. N. Lothian 745* (AD). Qld: Warwick, Oct. 1962, *D. Rossen* (BRI).

3. *Carpobrotus glaucescens* (Haw.) Schwantes, *Gartenflora* 77: 69 (1928)

Mesembryanthemum glaucescens Haw., *Syn. Pl. Succ.* 236 (1812). T: cultivated from material from Botany Bay, N.S.W., *S. T. Blake 19677*; neo: BRI, *vide* S. T. Blake, *Contr. Queensland Herb.* 7: 23 (1969).

Illustrations: S. T. Blake, *op. cit.* figs 4, 5.

Stems prostrate, to 2 m long. Leaves 35–100 mm long, 9–15 mm wide, equilateral near middle, somewhat glaucous; adaxial and lateral surfaces flat, convex towards base; keel crenulate in upper portion, smooth below. Flowers 4–6 cm diam.; pedicels 20–30 mm long. Petal-like staminodes purple, white at base, streaked only near midline when dry; stamens 300–400, 5–6-seriate. Styles 7–10, free; ovary conical or oblong, compressed, 2-ribbed, concave on top.

An indigenous species found along the coast of eastern Australia in sandy and rocky situations. Map 27.

Qld: Stradbroke Is., Swan Bay, 5 Jan. 1962, *P. H. Baxter* (BRI). N.S.W.: Tilba Tilba, 1881, *M. Bate* (MEL). Vic.: coast opposite SE extremity of Mallacoota National Park, 4 Nov. 1969, *J. H. Willis* (MEL).

4. *Carpobrotus modestus* S. T. Blake, *Contr. Queensland Herb.* 7: 30, figs 1(K), 8, 13 (1969)

T: grown in the author's garden, Brisbane, Qld, from specimens sent by R. L. Specht from Yumali, S.A., *S. T. Blake 19876*; holo: BRI.

Illustration: S. T. Blake, *loc. cit.*

Stems prostrate, to 35 cm long. Leaves 35–70 mm long, 4.5–7 mm wide, glaucous, often red-tinged; adaxial surface flat, lateral surfaces flat or convex; keel smooth or upper portion barely crenulate. Flowers 16–19 mm diam.; pedicels 3–7 mm long. Petal-like staminodes purple, white at base, streaked only near midline when dry; stamens 20–100, 1–3-seriate. Styles 6–10, fused at base; ovary oblong, barely compressed, flat on top with a prominent transverse ridge. *Inland Pigface*.

A native species found in various inland habitats in southern Australia. Map 28.

W.A.: 24 km S of Lake Grace, *R. D. Royce 6715* (BRI, PERTH). S.A.: 'Coonalpyn Downs', Inglewood, Oct. 1954, *F. Chippendale & R. L. Specht* (BRI); 41 km S of Pinnaroo, *T. Henshall 3804* (NT); 1 km N of Nuriootpa, *D. N. Kraehenbuehl 1637* (AD).

5. *Carpobrotus rossii* (Haw.) Schwantes, *Gartenflora* 77: 68 (1928)

Mesembryanthemum rossii Haw., *Rev. Pl. Succ.* 120 (1821). T: Salm-Dyck, *Monogr. Aloes Mesembryanthemi* fasc. 3: fig. 13 (1840); neo, *vide* S. T. Blake, *Contr. Queensland Herb.* 7: 27 (1969).

Illustrations: S. T. Blake, *op. cit.* fig. 7; W. M. Curtis, *Stud. Fl. Tasmania* 2: fig. 64 (1963).

Stems prostrate, to 1 m long. Leaves 3.5–10 cm long, 6–11 mm wide, not equilateral near middle, green or glaucous, sometimes tinged red; adaxial surface concave or flat; lateral surfaces slightly concave or flat; keel smooth, or crenulate in upper portion. Flowers 3.5–5.5 cm diam.; pedicels 5–28 mm long. Petal-like staminodes purple, white at base, streaked only near midline when dry; stamens 100–250, 3–4-seriate. Styles 6–10, free; ovary conical, compressed laterally, 2-ribbed, flat or slightly convex on top. *Karkalla*.

A native species found primarily in coastal areas in S.A., Vic. and Tas. S. T. Blake, *loc. cit.* also recorded this species on Nancy Peak in the Porongurup Range and south of Carnarvon in Western Australia, a considerable distance from the main distribution. Map 29.

S.A.: Lake Newland, *Hj. Eichler 19460* (AD, PR, PRE, RSA); 51–54 km N of Overland Corner, *D. E. Symon 3783* (ADW); Island of Dorothee, Investigator Group, *D. E. Symon 6648* (ADW, CANB). Tas.: Bellerive, Dec. 1895, *L. Rodway* (HO).

6. *Carpobrotus virescens* (Haw.) Schwantes, *Gartenflora* 77: 69 (1928)

Mesembryanthemum virescens Haw., *Syn. Pl. Succ.* 236 (1812); *Mesembryanthemum edule* var. *virescens* (Haw.) Moss, *Cambr. Brit. Fl.* 2: 151 (1914). T: King George Sound, W.A., Sept. 1959, *S. T. Blake 20910*; neo: BRI, *vide* S. T. Blake, *Contr. Queensland Herb.* 7: 25 (1969).

Mesembryanthemum abbreviatum Haw., *Philos. Mag.* 68: 329 (1826). T: Salm-Dyck, *Monogr. Aloes Mesembryanthemi* fasc. 5: fig. 7 (1849).

Illustration: S. T. Blake, *op. cit.* fig. 6.

Stems prostrate, to 1.5 m long; older branches greyish-white. Leaves 3.5–9 cm long, 9–17 mm wide, not equilateral near middle, green; adaxial and lateral surfaces slightly convex; keel crenulate in upturned part, smooth below. Flowers 4–6 cm diam.; pedicels 5–15 mm long. Petal-like staminodes purple, white at base, streaked only near midline when dry; stamens 250–300, 4–5-seriate. Styles 7–10, free; ovary conical or oblong-ellipsoidal, laterally compressed, flat on top. Fig. 8.

An indigenous species occurring in coastal areas of southern W.A. Map 30.

W.A.: Garden Is., *S. T. Blake 20644* (BRI); Esperance, at the Esplanade, *Hj. Eichler 20299* (AD, PERTH).

5. SARCOZONA

J. Venning

Sarcozona J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 58: 176 (1934); from the Greek *sarkos* (flesh), and *zônê* (involucre), referring to the fleshy involucre which surrounds the calyx tube.

Type: *S. pulleinei* (J. Black) J. Black

Small erect or semi-prostrate, succulent, perennial, glabrous shrubs. Leaves triquetrous, opposite, connate, ensheathing stem, densely covered with small warts or pellucid dots; basal portion persistent; keel smooth or denticulate. Flowers single or in threes, terminal, pedicellate or sessile, partly or entirely enclosed in a bilobed fleshy involucre. Sepals 5, 2 larger and opposite, 3 smaller with membranous margins. Petal-like staminodes many, pale pink to white; stamens many. Styles 4 or 5; ovary inferior; locules 4 or 5; placentation parietal. Fruit fleshy, indehiscent. Seeds many, ovoid or D-shaped, laterally flattened, light brown to brown.

A genus of 2 species endemic in Australia.

S. T. Blake, A revision of *Carpobrotus* and *Sarcozona* in Australia, genera allied to *Mesembryanthemum* (Aizoaceae), *Contr. Queensland Herb.* 7 (1969).

Key adapted from S. T. Blake, *op. cit.* 34.

Styles 4, rarely 5; calyx tube enclosed for at least half its length in involucre, terete

1. *S. praecox*

Styles 5, rarely 4; calyx tube enclosed for less than half its length in involucre, acutely 2-keeled

2. *S. bicarinata*

1. *Sarcozona praecox* (F. Muell.) S. T. Blake ex H. Eichler, *Suppl. J. M. Black's Fl. S. Australia 2nd edn*, 134 (1965)

Mesembryanthemum praecox F. Muell., *Linnaea* 25: 384 (1853). T: plains W of Flinders Ranges, S.A., Oct. 1851, *F. Mueller s.n.*; holo: MEL.

Carpobrotus pulleinei J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 56: 40 (1932); *Sarcozona pulleinei* (J. Black) J. Black, *op. cit.* 58: 176 (1934). T: Pine Creek near Broken Hill, N.S.W., *A. Morris s.n.*; lecto: AD, *fide* S. T. Blake, *Contr. Queensland Herb.* 7: 34 (1969).

Illustrations: S. T. Blake, *op. cit.* figs 9, 10.

Erect shrub to 30 cm; branches angled; branchlets often tinged pink. Leaves acute or obtuse, 30–100 mm long, 4.5–7 mm wide, densely covered with small warts, glaucous with pink tinge at apex and along edges; adaxial surface flat; lateral surfaces convex; keel either smooth or denticulate throughout. Flowers sessile or pedicellate, on branchlets at right angles to main stem, almost enclosed in a bilobed oblong involucre except petal-like staminodes. Sepals 4, rarely 5; ovary oblong, terete, concave on top. *Sarcozona*. Fig. 6A–B.

Widely distributed through southern Australia favouring sandy soils. Map 31.

W.A.: 5.6 km S of Morawa, 29 Aug. 1945, *C. A. Gardner* (PERTH). S.A.: Port Germain Gorge, 14 Aug. 1937, *J. B. Cleland* (AD); Aroona Valley, Orparinna National Park, *D. E. Symon* 7349 (ADW, CANB, K, NSW). Vic.: near Nowingi, 14 Aug. 1969, *G. W. Anderson* (MEL).

2. *Sarcozona bicarinata* S. T. Blake, *Contr. Queensland Herb.* 7: 37 (1969)

T: Cultivated in Brisbane, Qld, from material collected near Lock, S.A., by R. L. Specht, *S. T. Blake 21514*; holo: BRI.

Illustration: S. T. Blake, *op. cit.* fig. 11.

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16. *Commicarpus insularum*19. *Pisonia umbellifera*22. *Mesembryanthemum crystallinum*25. *Carpobrotus aequilaterus*28. *Carpobrotus modestus*17. *Pisonia aculeata*20. *Aptenia cordifolia*23. *Mesembryanthemum nodiflorum*26. *Carpobrotus edulis*29. *Carpobrotus rossii*18. *Pisonia grandis*21. *Mesembryanthemum aitonis*24. *Psilocaulon tenue*27. *Carpobrotus glaucescens*30. *Carpobrotus virescens*

Erect shrub to 10 cm. Leaves 25–50 mm long, 5–9 mm wide, dull green, the margins tinged pink, smooth; numerous pellucid dots evident beneath surface; adaxial surface flat; lateral surfaces convex; keel smooth, sometimes denticulate on upturned portion. Flowers sessile or very shortly pedicellate, free (usually the first flowers) or shortly enclosed in fused bases of uppermost leaves. Styles 5, rarely 4; ovary oblong, slightly compressed, acutely 2-keeled, slightly convex or nearly flat on top.

Occurs on Yorke Peninsula and Eyre Peninsula, S.A. Map 32.

S.A.: 1 km S of Redcliff Point, *R. J. Chinnock 1578* (AD); Hincks National Park, *D. E. Symon 6214* (ADW).

6. CONICOSIA

J. Venning

Conicosia N. E. Br., *Gard. Chron.* 78: 433 (1925); from the Greek *konikos* (cone-shaped), referring to the form of the capsules.

Type: *C. pugioniformis* (L.) N. E. Br.

Succulent glabrous perennial herbs with erect or prostrate stems arising from a dense basal rosette of leaves; root cylindrical, fleshy. Leaves opposite, crowded, triquetrous to almost cylindrical, long and narrow, tapering, acute, partly ensheathing stem. Flowers solitary, terminal, on long pedicels. Sepals 5, equal in size, broad at base tapering sharply to an elongate terete tip, 3 with membranous margins. Petal-like staminodes many, yellow; stamens many. Styles 10–20; ovary inferior or partly superior; locules 10–20; placentation parietal. Fruit a capsule dehiscent when dry; upper conical half separating into 10–20 narrow segments; valves winged; expanding keels absent; locules without roofs, placental tubercles absent. Seeds subglobose or lenticular, smooth.

A genus of 10 species endemic in South Africa; 1 species recorded in Australia.

**Conicosia bijlii* N. E. Br., *Gard. Chron.* 90: 14 (1931)

T: not designated.

Herb to 30 cm high. Leaves triquetrous to terete, 4–8 cm long, 1–4 mm wide. Capsule transversely rhomboid, 10–14 mm long, 27–32 mm wide. Peduncle 7–20 cm long.

Only collected from an area E of Drysdale, near Indented Head, Vic., growing over several acres of wind blow. No recent collections have been made from this locality and it is not known if it has become naturalised. Map 33.

Vic.: near Indented Head, 3 Oct. 1959, *F. W. Smith* (MEL); 8 km E of Drysdale, near Indented Head, 11 Nov. 1956, *H. C. E. Stewart* (MEL).

The identity of the above-listed material is uncertain and requires verification.

This species is characterised by its cone-shaped capsule which dehisces when dry. Other Australian representatives of *Mesembryanthemum s. lat.* have hygroscopic capsules or fleshy indehiscent fruits.

7. MICROPTERUM*J. Venning*

Micropterum Schwantes, *Möller's Deutsche Gartn.-Zeitung* 43: 17 (1928); from the Greek *micros* (small) and *pteron* (wing), referring to the very small wings on the locule roof.

Type: *M. schlechteri* Schwantes

Small, densely papillose, succulent annuals. Leaves opposite, spatulate to linear-spathulate, entire. Flowers solitary, terminal, pedicellate. Sepals 5, unequal in size, the 2 smaller with membranous margins. Petal-like staminodes many, yellow; stamens 5–10. Styles 5; ovary inferior; locules 5, or sometimes 4; placentation parietal. Fruit a hygroscopic capsule; valves winged; expanding keels contiguous; locule roofs very small or absent; placental tubercles absent. Seeds many, triangular, compressed, minutely tuberculate, light brown.

A genus of 7 species native to South Africa; 1 species naturalised in Australia.

****Micropterum papulosum* (L.f.) Schwantes, *Feddes Repert.* 43: 257 (1938)**

Mesembryanthemum papulosum L.f., *Suppl. Pl.* 259 (1782). T: not designated.

Semi-erect annual to 15 cm high. Leaves spatulate to linear-spathulate, 8–34 mm long, 3–8 mm wide. Capsule obconical, 3–7 mm long, 5–10 mm wide; pedicel 4–13 mm long. Fig. 6I.

Isolated occurrences in hilly areas of W.A., S.A. and N.S.W. Map 34.

W.A.: Fowlers Gully, Wongan Hills, *K. F. Kenneally* 2272 (PERTH). S.A.: Bremer R., N of Kanmantoo, *R. Bates* 753 (AD).

The capsules resemble those of *Mesembryanthemum* but are distinguished by parietal placentation.

8. CARPANTHEA*J. Venning*

Carpanthea N. E. Br., *Gard. Chron.* 78: 412 (1925); from the Greek *karpos* (fruit), and *anthe* (flower).

Type: *C. pomeridiana* (L.) N. E. Br.

Succulent, villous, annual herbs. Leaves opposite, lanceolate, narrowed slightly to a broad petiole, partly ensheathing stem. Flowers 1–3, terminal, pedicellate. Sepals 5, 2 large and leaf-like, 3 short and broad with membranous margins. Petal-like staminodes many, yellow; stamens many. Styles 12–20; ovary inferior; locules 12–20; placentation basal or parietal. Fruit a hygroscopic capsule; valves without wings; expanding keels contiguous, ending in awns; locules without roofs; placental tubercles absent. Seeds roundish, compressed.

A genus of 2 species endemic in South Africa; 1 species recorded in Australia.

***Carpanthea pomeridiana** (L.) N. E. Br. in E. P. Phillips, *Gen. S. Afr. Fl. Pl.* 245 (1926)

Mesembryanthemum pomeridianum L., *Sp. Pl.* 2nd edn, 1: 698 (1762). T: not designated.

Illustrations: H. Herre (ed.), *Gen. Mesembryanthemaceae* 101 (1971); M. M. Kidd, *Wildfl. Cape Penins.* t. 64 (1950).

Leaves 5–11 cm long, 1–2 cm wide. Pedicels 4–9 cm long, pubescent. Flowers c. 5 cm diam.

Three collections late last century from the junction of the Murray and Darling Rivers but no later records. Map 35.

N.S.W.: junction of Darling and Murray Rivers, 1887, *Mrs Holding* (MEL).

This species is easily distinguished as it has a hygroscopic capsule with 12–20 locules. Other Australian representatives of *Mesembryanthemum s. lat.* with hygroscopic capsules have only 5 locules in the fruit. Description based on H. Herre, *op. cit.* 100.

9. DROSANTHEMUM

J. Venning

Drosanthemum Schwantes, *Z. Sukkulantenk.* 3: 29 (1927); from the Greek *drosos* (dew), and *antheon* (flower), referring to the glistening appearance of the flowers.

Type: *D. hispidum* (L.) Schwantes

Low, succulent perennial herbs with terete, hirsute trailing stems. Leaves clustered on short shoots, opposite, connate, semi-cylindrical, the upper portion somewhat expanded, glaucous, densely papillose. Flowers solitary, terminal on erect short shoots, pedicellate. Sepals 5, papillose. Petal-like staminodes many, white; stamens many. Styles 5; ovary inferior; locules 5; placentation parietal. Fruit a hygroscopic capsule; valves winged; expanding keels parallel or divergent; locules roofed; placental tubercle very small or absent. Seeds many, small, rough, light brown.

A genus of about 95 species native to South Africa; 1 species recorded in Australia.

***Drosanthemum candens** (Haw.) Schwantes, *Z. Sukkulantenk.* 3: 30 (1927)

Mesembryanthemum candens Haw., *Saxifrag. Enum.* 2: 186 (1821). T: based on a specimen grown in the Salm-Dyck garden near Dusseldorf., *n.v.*

[*Mesembryanthemum floribundum auct. non* Haw.: J. M. Black, *Fl. S. Australia* 2: 220 (1924)]

[*D. floribundum auct. non* (Haw.) Schwantes: J. M. Black, *Fl. S. Australia* 2nd edn, 2: 338 (1948)]

Illustration: J. M. Black, *Fl. S. Australia* 2nd edn, fig. 482 (1948) as *Drosanthemum floribundum*.

Semi-erect shrub with trailing branches. Stems hirsute. Leaves clavate, 3–10 mm long, 1–2 mm wide, densely papillose. Capsule shallowly obconical, 2–3 mm long, 4–5 mm wide; peduncle 12–28 mm long. *Redondo Creeper*.

Often grown as an ornamental on rockeries and embankments in W.A., S.A. and Vic., especially near the sea where sometimes established; possibly not fully naturalised in S.A. and Vic. Map 36.

W.A.: Hamelin Bay, *R. D. Royce 3936* (PERTH). S.A.: near Horse-shoe Beach, Port Elliot, *J. Z. Weber 336* (AD). Vic.: coastal cliffs at Beaumaris, 1 Jan. 1952, *V. Jacobs* (MEL).

10. LAMPRANTHUS

J. Venning

Lampranthus N. E. Br., *Gard. Chron.* ser. 3, 87: 211 (1930); from the Greek *lampros* (bright) and *anthos* (flower), referring to the profusion and colour of the flowers.

Type: *L. tenuifolius* (L.) Schwantes

Erect or prostrate shrubs, glabrous, succulent; branchlets compressed. Leaves opposite, shortly connate, triquetrous, laterally compressed, acutely keeled. Flowers solitary, terminal, pedicellate. Sepals 5, approximately equal in size, 3 with membranous margins, the membranous part drying dark brown. Petal-like staminodes many, white, yellow or purple; stamens many. Styles 5; ovary inferior; locules 5; placentation parietal. Fruit a hygroscopic capsule; valves winged; expanding keels divergent; locules roofed; placental tubercles absent. Seeds many, pear-shaped, rough, dark brown.

A genus of 178 species endemic in South Africa; 3 species recorded in Australia.

1 Plant prostrate; flowers 1.5–2 cm diam.

2. *L. tegens*

1: Plant erect; flowers 4–5 cm diam.

2 Flowers yellow

1. *L. glaucus*

2: Flowers white or purple

3. *L. multiradiatus*

1. **Lampranthus glaucus* (L.) N. E. Br., *Gard. Chron.* ser. 3, 87: 212 (1930)

Mesembryanthemum glaucum L., *Sp. Pl.* 1: 486 (1753). T: not designated.

Illustration: M. M. Kidd, *Wildfl. Cape Penins.* t. 64 (1950).

Erect shrub to 30 cm high. Branches terete, grey; branchlets reddish. Leaves acute, 9–14 mm long, 2–3 mm wide, dark-green or glaucous, the surface densely dotted giving leaf edges a denticulate appearance; keel sharply acute. Flowers yellow, 4–5 cm diam.; pedicels 9–21 mm long. Fig. 6G.

Occurs in W.A., S.A., and Tas. Map 37.

W.A.: Albany, 27 July 1922, C. A. Gardner (PERTH); Yoongarillip, R. D. Royce 3908 (PERTH); upper Swan River, Dec. 1884, J. Sewell (MEL). Tas.: Devonport, Oct. 1943, W. M. Curtis (HO).

2. **Lampranthus tegens* (F. Muell.) N. E. Br., *Gard. Chron.* ser. 3, 87: 212 (1930)

Mesembryanthemum tegens F. Muell., *Fragm.* 5: 157 (1866). T: near Melbourne, Vic., collector unknown; n.v.

Illustration: F. P. Morris, *Victorian Naturalist* 50: t. I (1933).

Low shrub with prostrate branches, rooting at nodes. Branchlets reddish. Leaves slightly incurved, acute, glaucous, 8–9 mm long, 1–3 mm wide, smooth, minutely dotted; keel acute. Flowers on short shoots, purple, 15–20 mm diam.; pedicels 4–10 mm long. *Little Noonflower*.

Found around harbours of Sydney and Melbourne but rarely collected in recent years. Map 38.

N.S.W.: Homebush Bay, Dec. 1917, A. A. Hamilton (NSW); E bank of Lane Cove River just above Epping Highway Bridge, 6 Sept. 1965, A. Rodd (NSW).

J. H. Willis (*Handb. Pl. Victoria* 2: 123, 1972) suggested that this species may have been brought to Melbourne in the ballast of an early sailing ship.

L. tegens was described in Australia long before being described in its native country. *L. caespitosus* (L. Bolus) N. E. Br., from brackish soil in Paarden Island near Cape Town, is probably identical, see N. E. Brown, *Proc. Roy. Soc. Victoria* ser. 2, 21: 544 (1909).

3. *Lampranthus multiradiatus (Jacq.) N. E. Br., *Gard. Chron.* ser. 3, 87: 212 (1930)

Mesembryanthemum multiradiatum Jacq., *Fragm. Bot.* 44 (1801). T: not known.

[*Lampranthus albus* auct. non. (L. Bolus) L. Bolus: S. W. L. Jacobs & J. Pickard, *Pl. New South Wales* 62 (1981)]

Erect shrub. Leaves acute, shortly mucronate, 15–38 mm long, 15–25 mm wide, smooth, dotted; keel acute. Flowers pedicellate, purple or white, 4–5 cm diam.

Frequently grown on rockeries and embankments; possibly naturalised in W.A., S.A. and N.S.W. Map 39.

W.A.: Albany, Jan. 1903, *C. Andrews* (PERTH). N.S.W.: Henry Heads near Cape Banks, *R. H. Goode* 345 (NSW).

11. RUSCHIA

J. Venning

Ruschia Schwantes, *Z. Sukkulentenk.* 2: 186 (1926); named after Ernst Rusch, Sen., a southern African farmer.

Type: *R. rupicola* (Engl.) Schwantes

Erect, glabrous, perennial shrubs. Branches terete, grey; branchlets compressed, red. Leaves opposite, triquetrous, shortly connate, shortly mucronate, partly ensheathing branch, glaucous, densely dotted; keel denticulate. Flowers in a many-flowered inflorescence, pedicellate, subtended by leaf-like bracts. Sepals 5, equal in size, 3 with membranous margins. Petal-like staminodes many, purple; stamens many. Styles 5; ovary inferior; locules 5; placentation parietal. Fruit a hygroscopic capsule; valves winged; expanding keels divergent; locules with roofs; placental tubercle present. Seeds many, spherical, compressed, rough, yellow or brown.

A genus of c. 350 species endemic in southern Africa; 1 species recorded in Australia.

***Ruschia tumidula** (Haw.) Schwantes, *Z. Sukkulentenk.* 3: 20 (1927)

Mesembryanthemum tumidulum Haw., *Syn. Pl. Succ.* 286 (1812). T: Cultivated in Europe from material from South Africa; *n.v.*

[*Mesembryanthemum laxum* auct. non. Willd.: A. J. Ewart, *Fl. Victoria* 481 (1931)]

Illustration: F. P. Morris, *Victorian Naturalist* 50: t. I (1933) (as *Mesembryanthemum laxum*).

Erect shrub. Leaves 3-angled, recurved, 10–36 mm long, 1–2 mm wide. Capsule obconical to shallowly obconical, 2–4 mm long, 4–5 mm wide; peduncle 4–8 mm long. *Loose-flowered Pig Face.* Fig. 6H.

Grown as an ornamental on rockeries and embankments near the sea, and occasionally found along the coast near Adelaide, Melbourne and Perth, but probably not fully naturalised. Map 40.

W.A.: Upper Swan R., 1884, *Sewell* (MEL). Vic.: Sandringham, 20 Sept. 1940, *J. C. Goudie* (MEL).

This species closely resembles *Lampranthus multiradiatus* (Jacq.) N. E. Br. in vegetative features. However, it is readily distinguished from the latter by having a many-flowered inflorescence and a placental tubercle in each locule.



Figure 6. A–B, *Sarcozona praecx*. A, flower $\times 1$; B, habit $\times 1$ (A–B, R. Chinnock 5486, AD). C–D, *Carpobrotus edulis*. C, flower $\times 1$; D, habit $\times 1$ (C–D, J. Venning 401, AD). E–F, *Disphyma crassifolium*. E, open capsule $\times 3$; F, habit $\times 1$ (E–F, R. Chinnock 5485, AD). G, *Lampranthus glaucus*, open capsule $\times 3$ (R. Royce 3908, PERTH). H, *Ruschia tumidula*, open capsule $\times 3$ (Upper Swan River, W.A., 1884, Sewell, MEL). I, *Micropterum papulosum*, open capsule $\times 3$ (R. Chinnock 4087, AD).

12. DISPHYMA

J. Venning

Disphyma N. E. Br., *Gard. Chron.* ser. 3, 78: 412 (1925); from the Greek *dis* (twice) and *phyma* (tubercle), referring to the two-lobed placental tubercle in each locule.

Type: *D. crassifolium* (L.) L. Bolus

Prostrate, succulent, glabrous perennial. Branches to 1.5 m long, rooting at nodes. Leaves opposite, clustered on erect short shoots, acute or obtuse, triquetrous, somewhat expanded in upper half, smooth, green or glaucous, often with a yellow or red tinge; keel rounded, occasionally acute. Flowers solitary, terminal on short shoots, pedicellate, rarely sessile. Sepals 5, 2 large and opposite, 3 smaller with broad membranous margins. Petal-like staminodes many, purple, white at base; stamens many. Styles 5; ovary inferior; locules 5; placentation parietal. Fruit a hygroscopic capsule; valves winged; expanding keels divergent; locules roofed; placental tubercles bilobed. Seeds many, comma-shaped, laterally compressed, smooth or verrucose, pale to dark brown.

A genus of 1 species widely distributed in South Africa, Australia and New Zealand.

R. J. Chinnock, Studies in *Disphyma* — a genus related to *Mesembryanthemum*. 1. A revision of *Disphyma australe* (Ait.) J. M. Black, *New Zealand J. Bot.* 9: 331–334 (1971).

Disphyma crassifolium (L.) L. Bolus, *Fl. Pl. S. Afr.* 7: t. 276 (1927)

Mesembryanthemum crassifolium L., *Sp. Pl.* 1: 484 (1753). T: not designated.

?*Mesembryanthemum australe* Ait., *Hort. Kew.* 2: 187 (1789); ?*Disphyma australe* (Ait.) N.E. Br., *Gard. Chron.* ser. 3, 87: 14 (1930). T: specimen cultivated at Kew from material from New Zealand (K, *n.v.*). If the New Zealand and Australian species are not synonymous this name has been incorrectly applied in Australia.

Disphyma blackii Chinnock, *New Zealand J. Bot.* 9: 338 (1971). T: The Bluff, Petrol Cove side, Victor Harbor, S.A., 22 Nov. 1968, R. J. Chinnock *s.n.*; holotype: CHR, *n.v.*

Disphyma clavellatum (Haw.) Chinnock, *New Zealand J. Bot.* 14: 78 (1976); *Mesembryanthemum clavellatum* Haw., *Misc. Nat.* 79 (1803). T: Goose Bay, Middle Is., near Cape Arid, [W.A.], R. Brown *s.n.*, *n.v.*

Illustrations: H. M. L. Bolus, *loc. cit.*; H. Herre (ed.), *Gen. Mesembryanthemaceae* 137 (1971); H. Jacobsen, *Handb. Succ. Pl.* 3: fig. 1331 (as *Disphyma australe*) (1960); F. P. Morris, *Victorian Naturalist* 50: t. I (1933) (as *Disphyma australe*).

Shrub with prostrate branches. Leaves triquetrous, 5–70 mm long, 1–7 mm wide; keel rounded. Capsule obconical, 4–14 mm long, 5–12 mm wide; pedicels up to 10 cm long. *Round-leaved Pigface*. Fig. 6E–F.

Commonly found on samphire flats and dunes of coastal areas, and in saline areas inland. Map 41.

W.A.: Lake Austin, N of Mt Magnet, A. S. *George* 918 (PERTH). S.A.: Kangaroo Is., Hanson Bay, H. J. *Eichler* 15337 (AD, MEL); At creek mouth, Second Valley, D. E. *Symon* 3216 (ADW). N.S.W.: 110 km N of Wentworth, 26 July 1955, E. F. *Constable* (NSW, NT). Vic.: Point Nepean, J. D. M. *Pearson* 579 (MEL).

Easily distinguished by the clavate leaves with generally rounded keel, the long terete pedicels and the bilobed placental tubercle in each locule.

H. F. Glen, Botanical Research Institute, Pretoria, (pers. comm.) has concluded, using multivariate analysis, that *Disphyma* is monotypic. Observations of South African herbarium material has supported this finding with respect to Australian representatives of this genus and consequently the name change from *D. clavellatum* has been adopted.

13. TETRAGONIA

A. Prescott

Tetragonia L., *Sp. Pl.* 1: 480 (1753); *Gen. Pl.* 5th edn, 215 (1754); from the Greek *tetra* (four), and *gonia* (angle), in reference to the 4-angled fruit of some species.

Type: *T. fruticosa* L.

Sprawling or climbing herbs or shrublets, usually papillose. Leaves alternate, flat, entire, somewhat succulent. Flowers in axillary clusters of 1–5, sessile or pedicellate; bracts absent. Perianth segments 4 or 5, coloured inside. Stamens 4 to many, alternating with perianth lobes or scattered; staminodes 0. Ovary inferior; styles 2–10, free; locules as many as styles; ovules 1 per locule; placentation apical. Fruit indehiscent, dry or succulent, with hard endocarp, ridged, winged or horned, sometimes papillose. Seeds 1 or several, pear-shaped, light-brown.

A genus of about 50 species worldwide, found largely in the southern hemisphere and centred in southern Africa. Eight species in Australia, 3 of which were introduced from S Africa.

R. S. Adamson, *The South African Species of Aizoaceae. II. Tetragonia*, *J. S. African Bot.* 21: 109–154 (1955).

The species are very variable in plant size, in leaf size and shape and in fruit size and shape. Leaf characteristics are insufficient to distinguish species. The fruits of typical specimens are characteristic but extreme variants are sometimes difficult to determine.

- | | | |
|----|--|-----------------------------------|
| 1 | Flowers pedicellate; pedicels at least 4 mm long | |
| 2 | Fruit succulent | 1. <i>T. implexicoma</i> |
| 2: | Fruit dry, variously winged | |
| 3 | Fruit dark, not papillose; wings thin | |
| 4 | Leaves lanceolate or oblanceolate | 2. <i>T. fruticosa</i> |
| 4: | Leaves ovate to orbicular | 3. <i>T. nigrescens</i> |
| 3: | Fruit pale, papillose; wings thick | 4. <i>T. decumbens</i> |
| 1 | Flowers sessile or subsessile | |
| 5 | Anthers 4 | |
| 6 | Fruit with 2 large and 2 smaller woody wings extending laterally | 5. <i>T. eremaea</i> |
| 6: | Fruit with 2 thin wings extending above ovary | 6. <i>T. diptera</i> |
| 5: | Anthers twice number of perianth lobes or more | |
| 7 | Fruit with horns extending upwards, sparsely papillose | 7. <i>T. tetragonoides</i> |
| 7: | Fruit many-ridged but without horns, densely papillose | 8. <i>T. cristata</i> |

1. *Tetragonia implexicoma* (Miq.) J. D. Hook., *Fl. Tasmaniae* 1: 148 (1856)

Tetragonella implexicoma Miq. in Lehmann, *Pl. Preiss.* 1: 246 (1845); printed in error as *T. amplexicoma*. T: Rottneest Is., W.A., 19 Aug. 1839, J. G. C. Lehmann s.n.; iso: U.

Trianthema maidenii S. Moore, *J. Linn. Soc., Bot.* 45: 207 (1920). T: Port Lincoln, S.A., *J. H. Maiden*; lecto: BM n.v., fide H. Eichler *Suppl. J. M. Black's Fl. S. Australia 2nd edn*, 135 (1965); same locality, *Rev. T. S. Lea*; syn: BM n.v.

[*Trianthema turgidifolia* auct. non F. Muell.: J. M. Black, *Fl. S. Australia 2nd edn*, 342 (1948)]

Prostrate, scrambling or climbing herb or undershrub with long branches. Branchlets alternate, densely papillose; young stems also with vesicular hairs. Leaves clustered or scattered, lanceolate, oblanceolate, rhomboid, ovate or obovate, 1–5 cm long, 2–40 mm wide, narrowing into petiole up to 10 mm long; midvein visible below; base conspicuously

persistent. Flowers solitary or in pairs; pedicels 5–30 mm long, filiform, drying black. Perianth segments 4, oblong with incurved apex, c. 3 mm long, papillose outside, hairy towards apex, yellow inside. Stamens 12–20. Ovary glabrous; styles 2, rarely 3, robust, 1.5–2.5 mm long. Fruit succulent, globular, 5–8 mm long, red. Seed 1, truncate, pear-shaped, c. 2 mm long, faintly reticulate, brown. *Bower Spinach*. Fig. 11E.

Occurs along southern coasts from W.A. to Vic. and Tas., on limestone and sand dunes. Map 42.

W.A.: Wilson Bluff, W.A.–S.A. border, Great Australian Bight, *A. S. George* 8529 (PERTH); Thomas River, Cape Arid National Park, *R. D. Royce* 9957 (PERTH). S.A.: c. 3 km W of Head of Bight, 21 Aug. 1960, *H. Turner* (AD); Carpenters Rocks, near Mt Gambier, *I. B. Wilson* 732 (AD, CANB, M). Tas.: Big Low Islet, Furneaux Group, *J. S. Whinray* 2397 (MEL).

Plants in the south-east are more succulent, the leaves are more ovate and are scattered rather than clustered.

The New Zealand *Tetragonia trigyna* Banks & Sol. ex J. D. Hook. is similar to the plants found in south-eastern Australia but has 4–8 stamens.

2. **Tetragonia fruticosa* L., *Sp. Pl.* 1: 480 (1753)

T: locality unknown; *n.v.*

Prostrate or sprawling herb with stout branches, papillose. Leaves lanceolate to oblanceolate with midvein visible below, 1–4.5 cm long, 2–10 mm wide, sessile. Flowers in groups of 2–5 in upper axils, occasionally single; pedicels 4–15 mm long, papillose, elongating in fruit. Perianth segments 4, ovate, 3–4 mm long, papillose outside, yellow inside. Stamens many. Ovary papillose; styles and locules 3 or 4. Fruit with 4 large membranous wings rounded at apex and extending above fruit, cuneate at base, 8–25 mm long, 10–30 mm broad, becoming black.

Introduced from southern Africa, collected twice in what is now suburban Melbourne but probably not naturalised. Map 43.

Vic.: Coode Island, 1908, *J. R. Tovey* (MEL); Coode Island, 29 Oct. 1908, *J. R. Tovey & C. French* (MEL).

3. **Tetragonia nigrescens* Ecklon & Zeyher, *Enum. Pl. Afric. Austral.* 323 (1837)

T: Grootepost, South Africa, *Zeyher s.n.*; lecto: *S n.v.*, *fide* R. S. Adamson, *J. S. African Bot.* 21: 136 (1955).

Tetragonia heterophylla Ecklon & Zeyher, *Enum. Pl. Afric. Austral.* 324 (1837). T: Brakfontein, South Africa, *Zeyher* 2119; iso: *S n.v.*

Soft, prostrate, slightly succulent herb with underground tuber, much branched, glabrous or papillose or with hair-like scales, green or purplish, drying black. Leaves broadly ovate to orbicular, 1–8 cm long, 6–35 mm wide, upper leaves narrower, narrowing to petiole 5–30 mm long. Flowers grouped; pedicels 5–25 mm long, papillose. Perianth segments 4 or 5, ovate, acute, c. 3 mm long, papillose or hairy, green. Stamens many. Styles and locules 3 or 4. Fruit dry, with 4 thin smooth wings, 5–15 mm long, indented at apex, slightly narrowed at base.

Introduced from southern Africa. Recorded from coastal N.S.W. by S. W. L. Jacobs and J. Pickard, *Pl. New South Wales* (1981) but no specimens have been seen. Map 44.

4. **Tetragonia decumbens* Miller, *Gard. Dict.* 8th edn, 2 (1768)

T: Miller, *Fig. Pl. Gard. Dict.* 2: t. 263 (1760), *n.v.*

Tetragonia zeyheri Fenzl. in Harvey, *Fl. Cap.* 2: 465 (1862). T: Rietvalley, South Africa, *C. Thunberg s.n.*; *Zeyher s.n.*; both *n.v.*

Decumbent or trailing undershrub with stout pale stems, densely papillose and with some vesicular hairs on young growth. Leaves thick, obovate, orbicular or oblong on lateral



Figure 7. *Pisonia umbellifera*.
Photograph — M. Fagg.

Figure 8. *Carpobrotus virescens*.
Photograph — A. S. George.



Figure 9. *Gunniopsis quadrifida*.
Photograph — R. W. Purdie.

Figure 10. *Tetragonia decumbens*.
Photograph — M. Fagg.

branches, with midvein and sometimes lateral veins visible below, 1–6 cm long, 5–30 mm wide, tapering to base, decurrent. Flowers in groups of 3–5 in upper axils; pedicels 5–15 mm long, stout, papillose. Perianth segments 4, broadly ovate, 5 mm long, papillose outside, yellow inside. Stamens many, in 2 ranks. Ovary papillose; styles 4, stout, recurved, 2–3 mm long. Fruit dry, with 2 large and 2 smaller coriaceous or woody lateral wings alternating with small ridges, c. 10 mm long and 15 mm broad, papillose, pale. Seeds 4, pear-shaped, c. 3 mm long, smooth, brown. Figs 10, 11B.

Introduced from southern Africa. Naturalised on coastal and estuarine sand dunes near Perth and Geraldton, W.A. and on the coast near Adelaide, S.A. Also collected from Coode Island, Melbourne, Vic., between 1908 and 1912. Map 45.

W.A.: City Beach, 12 km W of Perth, 14 Sept. 1947, *J. H. Willis* (MEL); Mandurah, *R. A. Saffrey* 880 (PERTH). S.A.: Myponga, 6 Nov. 1966, *H. Amsberg* (AD); West Beach, *P. G. Wilson* 2769 (AD). Vic.: Coode Island, 29 Oct. 1908, *J. R. Tovey* (MEL).

5. *Tetragonia eremaea* Ostenf., *Biol. Meddel. Kongel. Danske Vidensk. Selsk.* 3(2): 59 (1921)

T: Kalgoorlie, W.A., 7 Oct. 1914, *C. H. Ostenfeld* 640; n.v.

Illustration: C. H. Ostenfeld, *op. cit.* t. 8.

Prostrate annual, branching from base, papillose and with a few vesicular hairs. Leaves thick, succulent, lanceolate to rhomboid to ovate, 1–5 cm long, 4–15 mm wide, tapering to petiole 2–15 mm long. Flowers solitary or occasionally paired, sessile or almost so. Perianth segments 4, ovate, 2 c. 1 mm long, 2 smaller, papillose outside towards apex, green inside. Stamens 4, alternating with perianth lobes. Ovary papillose; styles and locules 3–6, often 4. Fruit dry, compressed, c. 4 mm long, 4–8 mm diam., with 2 large and 2 smaller woody lateral triangular wings not extending above fruit, sometimes with 4 smaller ridges between wings. Seeds 3–8, gourd- or pear-shaped, c. 2 mm long, honey-coloured. Fig. 11C.

Widely distributed through central Australia, occasionally coastal. One specimen (MEL 522149) supposedly from the Snowy Mountains seems an error. Map 46.

W.A.: near Paddington, N of Kalgoorlie, *C. A. Gardner* 2101 (PERTH); 29 km NE of Menzies on road to Leonora, *T. E. H. Aplin* 2277 (PERTH). S.A.: Lake Everard, c. 16 km W of Lake Everard Homestead, *E. N. S. Jackson* 2090 (AD); c. 8 km SE of Coward Springs around Margaret Creek, *J. Z. Weber* 5668 (AD).

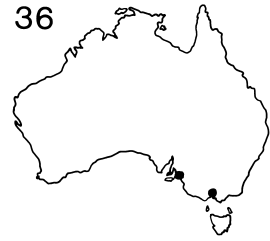
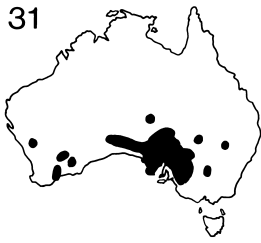
6. *Tetragonia diptera* F. Muell., *Fragm.* 11: 8 (1878)

T: Shark Bay, W.A., Oct. 1877, *F. Mueller*; iso: MEL.

Prostrate or semi-erect herb, branching from base, papillose but stems almost glabrous. Leaves lanceolate to rhomboid, 3–30 mm long, 2–10 mm wide, tapering to petiole up to 10 mm long. Flowers solitary or occasionally paired, sessile, very small. Perianth segments 4, lanceolate, acute, c. 1 mm long, sparsely papillose. Stamens 4, alternating with perianth lobes. Ovary 4-angled; styles 4, 0.5 mm long. Fruit cuneate at base, heart-shaped, 5–8 mm long, 5–10 mm wide, with 2 thin membranous wings which are round at apex and extend above fruit. Seeds 4, pear-shaped, c. 1.5 mm long, honey-coloured. Fig. 11A.

Occurs around Shark Bay, W.A. Map 47.

W.A.: 10.9 km N of Sandy Point Outcamp, Dirk Hartog Is., *A. S. George* 11553 (CANB, K, PERTH); 34 km N of Carnarvon on road to Quobba, *P. G. Wilson* 8377 (PERTH); Peron Peninsula, *W. E. Blackall* 4665 (PERTH).



- 31. *Sarcozona praecox*
- 34. *Micropterum papulosum*
- 37. *Lampranthus glaucus*
- 40. *Ruschia tumidula*
- 43. *Tetragonia fruticosa*

- 32. *Sarcozona bicarinata*
- 35. *Carpanthea pomeridiana*
- 38. *Lampranthus tegens*
- 41. *Disphyma crassifolium*
- 44. *Tetragonia nigrescens*

- 33. *Conicosia bijlii*
- 36. *Drosanthemum candens*
- 39. *Lampranthus multiradiatus*
- 42. *Tetragonia implexicoma*
- 45. *Tetragonia decumbens*

7. *Tetragonia tetragonoides* (Pallas) Kuntze, *Revis. Gen. Pl.* 1: 264 (1891)

Demidovia tetragonoides Pallas, *Enum. Hort. Demidof* 150 (1781); *Tetragonia expansa* Murray, *Commentat. Soc. Regiae Sci. Gott.* 6: 13 (1781) *nom. illeg.* based on *Demidovia tetragonoides* Pallas. T: grown in the garden of A. Demidov; *n.v.*

Prostrate or semi-erect annual or perennial, branching from base. Stems stout, papillose; young stems with vesicular hairs. Leaves ovate to rhomboid, 10–100 mm long, 5–50 mm wide, dark green above, paler below with larger papillae; midvein and pinnate lateral veins raised below; petiole 10–30 mm long, decurrent as a line of papillae. Flowers solitary, sessile or on pedicels up to 2 mm long. Perianth segments 5, lanceolate, unequal, up to 2 mm long, green and papillose outside, yellow and minutely papillose inside. Stamens at least twice as many as sepals, clustered or scattered. Ovary papillose; styles 5–10, 2 mm long. Fruit subglobose or top-shaped, c. 12 mm long, c. 10 mm broad, bony, dry, with 2 large and a number of smaller straight or incurved erect or spreading horns, occasionally angled but not horned. Seeds several in two rows, pear-shaped, smooth, amber or light brown. *New Zealand Spinach*. Fig. 11F.

Native to New Zealand, naturalised in many parts of the world. Found scattered throughout Australia, where it is considered native. An agricultural weed in parts of Qld. Map 48.

S.A.: Cooper Creek Basin, c. 5 km S of Patchawara Creek, *J. Z. Weber 4681* (AD); near Qld border c. 16 km NE of Innamincka, *D. J. E. Whibley 2414* (AD). Qld: Blackall, *S. L. Everist 1347* (BRI).

Adventitious buds occasionally develop from the persistent calyx and produce new flowers which are sometimes fertile.

8. *Tetragonia cristata* C. Gardner ex A. Prescott, *J. Adelaide Bot. Gard.* 6: 181, figs 1J, 2 (1983)

T: between Gidgee & Youno Downs, W.A., 22 Aug. 1963, *C. A. Gardner 14467* (cited in error as 24467); holo: PERTH.

Prostrate, annual, succulent herb, papillose on leaves and stems and with vesicular hairs on young growth. Leaves alternate, usually ovate or rhomboid, with midvein visible below. 1–5 cm long, 3–20 mm wide, narrowing to petiole 5–20 mm long, densely papillose or crystalline. Flowers solitary, sessile. Perianth segments 4, lanceolate, c. 3 mm long, papillose outside, yellow inside. Stamens 12–20. Ovary densely papillose; styles 3–8, filiform, c. 3 mm long. Fruit top-shaped, 15 mm long, 10 mm broad, densely papillose, purplish, bony, dry, usually with 4 wings extending above fruit but without horns, cuneate at base, with a number of convoluted ridges between wings. Seeds 3–8, pear-shaped, pale brown. Fig. 11D.

Occurs in the Meekatharra area, W.A. Grows in red sand, clay or rocky areas. Map 49.

W.A.: Woodleigh Stn, *R. O'Farrell 42* (PERTH); Yagahong Hill, 50 km SSE of Meekatharra on Sandstone road, *R. J. Chincock 1031* (AD).

14. GUNNIOPSIS

J. Venning

Gunniopsis Pax, *Nat. Pflanzenfam.* 3(1b): 44 (1889); from *Gunnia* and the Greek *opsis* (resemblance), referring to the similarity of *Gunniopsis* to *Gunnia*.

Type: *G. quadrifida* (F. Muell.) Pax

Shrubs or ephemeral herbs, prostrate or up to 1 m high, glabrous, pubescent or papillose. Branchlets terete or somewhat compressed. Leaves opposite, terete or flattened, lanceolate, ovate, spatulate or linear, sessile or gradually tapering to a broad petiole. Flowers solitary or in cymes, sessile or pedicellate. Perianth segments 4, ovate, equal in

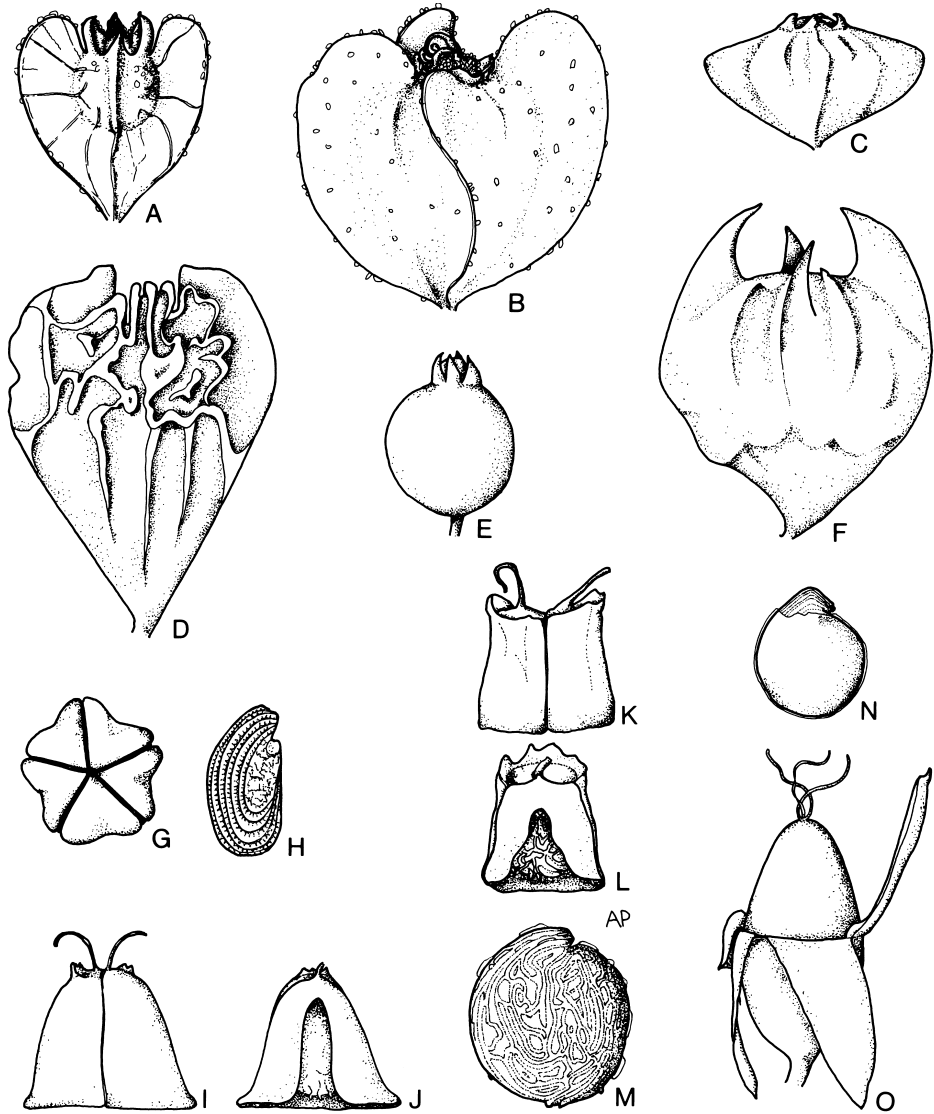


Figure 11. A–F, *Tetragonia*, fruits. A, *T. diptera* $\times 3.5$ (W. Blackall 4665, PERTH). B, *T. decumbens* $\times 3.5$ (City Beach, near Perth, W.A., J. Willis, MEL). C, *T. eremaea* $\times 3.5$ (T. Weber 5668, AD). D, *T. cristata*, (papillae not shown) $\times 3.5$ (C. Gardner 2330, PERTH). E, *T. implexicoma* $\times 3.5$ (Piersons Point, Tas., C. Lord, AD). F, *T. tetragonoides* $\times 3.5$ (35 km SW of Cowarie Homestead, S.A., R. Chalmers & H. Disney, AD). G–H, *Galenia pubescens*. G, capsule $\times 5$; H, seed $\times 15$ (G–H, E. Jackson 844, AD). I–M, *Zayleya galericulata*. I, operculum $\times 5$; J, half operculum $\times 5$ (I–J, P. Milthorpe & G. Cunningham 1703, NSW). K, operculum $\times 5$; L, half operculum $\times 5$; M, seed $\times 15$ (K–M, S. Pearson 162, BRI). N–O, *Sesuvium portulacastrum*. N, seed $\times 15$ (T. McDonald & G. Batianoff 1450, BRI); O, capsule $\times 5$ (L. Durrington 1369, BRI).

length or with an opposite longer pair, free to the base or fused for up to half their length, usually papillose inside, white, yellow or pink inside, green outside, apex cuspidate. Stamens 4 to many, evenly distributed around ovary or in 4 groups alternate with perianth segments. Styles 4, at first erect, later reflexed; ovary superior, 4-angled; locules 4; placentation axile. Fruit a hygroscopic capsule, dehiscent either septicidally, or septicidally and also partly loculicidally, depressed in centre; valves simple or bifid. Seeds many, comma-shaped, ovoid or club-shaped, laterally dilated or compressed, smooth, papillose, tuberculate or ridged, whitish to hyaline, light brown to black.

A genus of 14 species endemic in Australia.

R. J. Chinnock, The Australian genus *Gunnipopsis* Pax (Aizoaceae), *J. Adelaide Bot. Gard.* 6: 133–179 (1983).

- 1 Stamens 30 or more
- 2 Capsule dehiscent septicidally; valves simple 1. *G. divisa*
- 2: Capsule dehiscent septicidally and also partly loculicidally; valves bifid
- 3 Leaves terete, or flattened only near base
- 4 Leaves and stems densely pubescent 2. *G. quadrifida*
- 4: Leaves and stems glabrous 3. *G. tenuifolia*
- 3: Leaves flat
- 5 Leaves lanceolate; stems and leaves covered with peltate scales 4. *G. calcarea*
- 5: Leaves spatulate, ovate or linear; if stems and leaves pubescent, trichomes not peltate scales
- 6 Plant with well-developed fleshy taproot; stems rarely branched; flowers solitary, terminal 5. *G. glabra*
- 6: Plant without fleshy taproot, stems much-branched; flowers in cymes
- 7 Perennial, densely pubescent 6. *G. zygophylloides*
- 7: Ephemeral, glabrous
- 8 Papillae sparse on leaves and branchlets or absent
- 9 Perianth yellow inside 7. *G. intermedia*
- 9: Perianth white inside
- 10 Seeds club-shaped, dark brown or black; W.A. species 8. *G. rodwayi*
- 10: Seeds oblong, light brown; S.A. species 9. *G. calva*
- 8: Papillae many on leaves and branchlets, sometimes lacking on lower branchlets
- 11 Perianth yellow or white inside 10. *G. papillata*
- 11: Perianth pink inside 11. *G. kochii*
- 1: Stamens 4–12
- 12 Leaves oblong; perianth lobes green inside
- 13 Valves of capsule bifid; seeds white, brown on radicular edge 13. *G. septifraga*
- 13: Valves of capsule simple; seeds light brown 12. *G. rubra*
- 12: Leaves linear, perianth lobes white or pink inside 14. *G. propinqua*

1. *Gunnipopsis divisa* Chinnock, *J. Adelaide Bot. Gard.* 6: 164, figs 7, 14, 45 (1983)

T: Murchison River, W.A., 1898, *I. Tyson* 3; holo: MEL; iso: K, MEL (2 sheets), NSW.

Illustrations: R. J. Chinnock, *loc. cit.*

Glabrous ephemeral. Branchlets terete. Leaves linear, flattened, 5–12 mm long, 1–2 mm wide. Flowers in cymes; pedicels 1–2 mm long. Perianth segments equal in length, free

almost to base, white inside. Stamens many, evenly distributed; filaments terete, hirsute at base, papillose above. Capsule septical with simple valves. Seeds comma-shaped, laterally expanded, tuberculate at the radicle end, otherwise ridged, black. Fig. 12Q.

Known only from the type. Map 50.

2. *Gunnipopsis quadrifida* (F. Muell.) Pax, *Nat. Pflanzenfam.* 3(1b): 44 (1889)

Sesuvium quadrifidum F. Muell., *Rep. Pl. Babbage's Exped.* 9 (1859); *Aizoon quadrifidum* (F. Muell.) F. Muell., *Fragm.* 2: 148 (1861). T: 10 km S of Stuart Creek homestead, S.A., 6 Oct. 1978, J. Z. Weber 5790; neo: AD, *fide* R. J. Chinnock, *J. Adelaide Bot. Gard.* 6: 149 (1983); iso: BRI, CANB, K, MEL, PERTH, PRE.

Illustrations: R. J. Chinnock, *op. cit.* figs 16, 21, 22, 36.

Compact perennial shrub to 60 cm high, pubescent. Branchlets terete. Leaves terete, sometimes semiterete at base, 3–79 mm long, 1–3 mm wide, pale green. Flowers in cymes; pedicels 6–34 mm long. Perianth segments equal in length or 2 opposite segments up to twice as long as other 2 with terete upper portions, fused for up to half their length, white inside. Stamens many, in 4 clusters alternate with perianth segments; filaments terete, papillose. Capsule with bifid valves. Seeds comma-shaped, laterally compressed, papillose, dark brown. Figs 9, 12L.

Widely distributed in southern W.A., S.A., southern N.T., south-western Qld and north-western N.S.W. Common in drainage areas and by salt lakes. Map 51.

N.T.: Lake Neale, *J. R. Maconochie 1894* (CANB, DNA, K, NT, PERTH). S.A.: Pipeline road, 100–105 km S of Moomba, *S. Jacobs 3602* (AD, NSW).

3. *Gunnipopsis tenuifolia* Chinnock, *J. Adelaide Bot. Gard.* 6: 152, figs 11, 37 (1983)

T: 22.6 km N of Leigh Creek South, S.A., 27 Jan. 1982, *R. J. Chinnock 5492*; holotype: AD; iso: CANB, K, NSW, NT.

Illustrations: R. J. Chinnock, *loc. cit.*

Perennial rounded glabrous shrub to 1 m high. Branchlets compressed, tinged red. Leaves terete, 8–62 mm long, 0.5–2 mm wide, minutely papillose, villous at base, yellow-green. Flowers in cymes; pedicels 12–15 mm long. Perianth segments equal in length, free almost to base, white inside. Stamens many, in 4 clusters alternate with perianth segments; filaments terete, papillose. Capsules with bifid valves. Seeds comma-shaped, laterally compressed, minutely and densely papillose, dark brown to black. Fig. 12 O.

Endemic in northern S.A., growing on rocky slopes and in depressions. Map 52.

S.A.: Arckaringa Amphitheatre, *T. R. N. Lothian 2125* (AD, NT); Arckaringa Hills, *D. E. Symon 11478* (AD, ADW, CANB).

4. *Gunnipopsis calcarea* Chinnock, *J. Adelaide Bot. Gard.* 6: 156, figs 13, 40 (1983)

T: 4.2 km NW of Eucla, W.A., 7 Oct. 1981, *R. J. Chinnock 5086*; holotype: AD; iso: BRI, CANB, K, MEL, NSW, NT, US.

Illustrations: R. J. Chinnock, *loc. cit.*

Erect perennial to 30 cm high, covered with peltate scales. Branchlets terete. Leaves lanceolate, 8–30 mm long, 2–4 mm wide, bright green. Flowers in cymes; pedicels 6–10 mm long. Perianth segments equal in length, fused for up to half their length, yellow inside. Stamens many, evenly distributed; filaments dilated at base, terete above, papillose. Capsules with bifid valves. Seeds comma-shaped, laterally compressed, ridged, dark brown to black. Fig. 12J.

Common along roadsides and in saline areas of the southern Nullarbor Plain in south-eastern W.A. and south-western S.A. Map 53.

W.A.: 16 km W of Eucla, *G. Howard 5799* (ADW, CANB, PERTH). S.A.: near Koonalda Caves, *D. E. Symon 4670* (ADW, NSW); 2 km W of Cook, *D. J. E. Whibley 660* (AD, E, M, UC).

5. Gunnipopsis glabra (Luehm. ex Ewart) C. Gardner, *Enum. Pl. Austral. Occ.* 42 (1930)

Aizoon glabrum Luehm. ex Ewart, *Proc. Roy. Soc. Victoria* ser. 2, 20: 128 (1908). T: 'Salt Lakes', W.A., no date, *M. Heal s.n.*; lecto: MEL 99596, *fide* R. J. Chinnock, *J. Adelaide Bot. Gard.* 6: 168 (1983); near Mt Caroline, W.A., 1891, *Sewell s.n.*; syn: MEL; Murchison R., W.A., 1898, *I. Tyson s.n.*; syn: MEL (3 sheets).

Illustration: R. J. Chinnock, *op. cit.* figs 17, 32, 33, 34, 46.

Glabrous perennial with fleshy tap root; stems erect, terete, wiry, rarely branched. Leaves sparse along stems except at base and near apex where often clustered, linear or linear-lanceolate, 3–26 mm long (basal leaves up to 40 mm long), 1–4 mm wide, glaucous. Flowers solitary, terminal; pedicels up to 8 mm long. Perianth segments equal in length, free almost to base, white inside. Stamens many, evenly distributed; filaments terete, hirsute at base, papillose above. Capsule with bifid valves. Seeds club-shaped, tuberculate, dark brown. Fig. 12P.

Endemic in south-western W.A., growing around salt lakes. Map 54.

W.A.: Lake Barker Nature Reserve, Nov. 1971, *W. H. Butler* (PERTH); W edge of Lake De Cowey, *R. J. Chinnock 5256* (AD).

6. Gunnipopsis zygophylloides (F. Muell.) Diels, *Bot. Jahrb. Syst.* 35: 197 (1904)

Aizoon zygophylloides F. Muell., *Fragm.* 7: 129 (1871). T: towards Mt Margaret, S.A., 1871, *B. Herschel Babbage s.n.*; holotype: MEL, *fide* R. J. Chinnock, *J. Adelaide Bot. Gard.* 6: 154 (1983).

Illustration: R. J. Chinnock, *op. cit.* fig. 39.

Erect or decumbent perennial shrub to 60 cm high, pubescent. Branchlets terete. Leaves broadly ovate or spatulate, 11–58 mm long, 2–24 mm wide, grey-green. Flowers in cymes; pedicels 7–12 mm long. Perianth segments equal in length, fused for up to 1/3 their length, yellow inside. Stamens many, evenly distributed; filaments dilated at base, terete above, papillose. Capsule with bifid valves. Seeds comma-shaped, laterally compressed, ridged, black. Fig. 12E–F.

Widespread through southern N.T. and northern S.A., growing on rocky slopes. Map 55.

N.T.: 0.8 km E of Henbury Stn, *M. Lazarides 6111* (AD, BRI, CANB, NSW, NT). S.A.: 1.6 km N of Wintinna Stn, *D. E. Symon 2728* (AD, ADW, K).

7. Gunnipopsis intermedia Diels, *Bot. Jahrb. Syst.* 35: 197 (1904)

Aizoon intermedia (Diels) Ewart, *Proc. Roy. Soc. Victoria* ser. 2, 20: 128 (1908). T: Gilmores, W.A., 6 Nov. 1901, *L. Diels 5462*; iso: MEL.

Illustrations: R. J. Chinnock, *J. Adelaide Bot. Gard.* 6: figs 5, 6, 18, 41 (1983).

Glabrous ephemeral to 20 cm high, sparsely papillose. Branchlets terete, ridged. Leaves linear or spatulate, 7–55 mm long, 1–11 mm wide, bright green. Flowers in cymes; pedicels 4–12 mm long. Perianth segments equal in length, fused for up to 1/3 their length, yellow inside. Stamens many, evenly distributed; filaments dilated at base, terete above, papillose. Capsules with bifid valves. Seeds comma-shaped, laterally compressed, papillose, dark brown. Fig. 12A–B.

Endemic in south-western W.A. where common in saline areas. Map 56.

W.A.: Cunderdin, Nov. 1903, *W. V. Fitzgerald* (NSW, PERTH); E of York, 1890, *Mrs Heal* (MEL); Mortlock River bed near Waeel, *P. G. Wilson 6400* (CANB, PERTH).

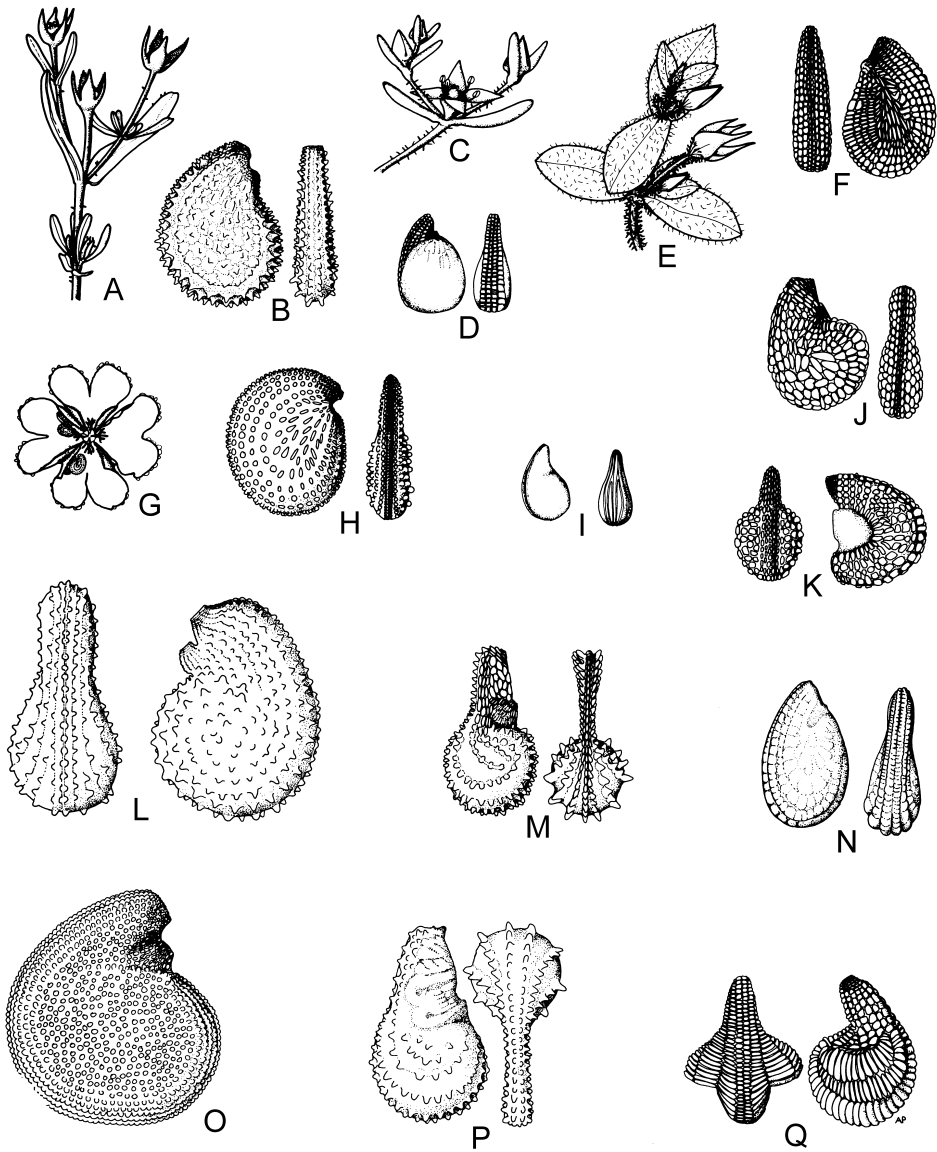


Figure 12. *Gunniopsis*. **A–B**, *G. intermedia*. **A**, habit $\times 0.7$; **B**, seeds $\times 20$ (**A–B**, R. Chinnock & P. Wilson 4416, AD). **C–D**, *G. septifraga*. **C**, habit $\times 0.7$ (R. Chinnock 5286, AD); **D**, seeds $\times 20$ (R. Chinnock 2727, AD). **E–F**, *G. zygophylloides*. **E**, habit $\times 0.7$; **F**, seeds $\times 20$ (**E–F**, 140 km N of Coober Pedy, S.A., N. McFarland, AD). **G–H**, *G. papillata*. **G**, open capsule $\times 2$; **H**, seeds $\times 20$ (**G–H**, F. Badman 161, AD). **I–Q**, seeds $\times 20$. **I**, *G. rubra* (G. Keighery 3318, AD). **J**, *G. calcarea* (R. Chinnock 5463, AD). **K**, *G. kochii* (T. Lothian 1429/55, AD). **L**, *G. quadrifida* (N. of Lyndhurst, S.A., J. Cleland, AD). **M**, *G. rodwayi* (R. Chinnock 5169, AD). **N**, *G. calva* (R. Specht & B. Carrodus 110, AD). **O**, *G. tenuifolia* (T. Lothian 123, AD). **P**, *G. glabra* (R. Chinnock 5250, AD). **Q**, *G. divisa* (Murchison R., W.A., I. Tyson, MEL).

8. Gunnioopsis rodwayi (Ewart) C. Gardner, *Enum. Pl. Austral. Occ.* 42 (1930)

Aizoon rodwayi Ewart, *Proc. Roy. Soc. Victoria* ser. 2, 20: 128 (1908). T: Desdemona, W.A., 1907, F. A. Rodway s.n.; lecto: MEL, fide R. J. Chinnock, *J. Adelaide Bot. Gard.* 6: 170 (1983); Nannine, W.A., 1893, I. Tyson s.n.; syn: MEL.

Illustrations: R. J. Chinnock, *op. cit.* figs 19, 47.

Glabrous semi-erect ephemeral to 30 cm high. Branchlets terete, wiry. Leaves linear or ovate, the lower ones oblong, 5–30 mm long, 2–6 mm wide, glaucous. Flowers in cymes; pedicels 4–18 mm long. Perianth segments equal, fused for up to half their length, white inside. Stamens many, evenly distributed; filaments terete, hirsute at base, papillose above. Capsule with bifid valves. Seeds club-shaped or comma-shaped, tuberculate, dark brown or black. Fig. 12M.

Endemic in W.A., growing in saline areas. Map 57.

W.A.: 5 km SE of Morawa, 1 Oct. 1960, B. G. Briggs (NSW); 29 km W of Yelma, N. H. Speck 1430 (AD, CANB, PERTH); Lake Carey, P. G. Wilson 7290 (K, MEL, PERTH).

9. Gunnioopsis calva Chinnock, *J. Adelaide Bot. Gard.* 6: 164, figs 8, 44 (1983)

T: Sweet Nell Mines, c. 5 km ENE of Woocalla Railway Siding, S.A., 22 Oct. 1966, Hj. Eichler 18818; holotype: AD; isotype: CANB.

Illustrations: R. J. Chinnock, *loc. cit.*

Glabrous ephemeral to 20 cm high, sparsely papillose. Branchlets terete, striated. Leaves ovate, spatulate or oblong, 7–32 mm long, 2–10 mm wide, yellow-green. Flowers in cymes; pedicels 2–12 mm long. Perianth segments equal in length, fused for up to half their length, white inside. Stamens many, evenly distributed, filaments dilated at base, terete above, papillose. Capsule with bifid valves. Seeds oblong, laterally compressed, distinctly ridged on keel, light brown. Fig. 12N.

Endemic in lower central S.A., growing around salt lakes. Map 58.

S.A.: Lake Hart, E. N. S. Jackson 537 (AD); 55 km N of Nonning Homestead, R. L. Specht & B. B. Carrodus 110 (AD).

10. Gunnioopsis papillata Chinnock, *J. Adelaide Bot. Gard.* 6: 160, figs 15, 42 (1983)

T: 10 km S of Curdamurka along creek to Stuart Creek homestead, S.A., 3 Oct. 1978, J. Z. Weber 5747; holotype: AD; isotype: BRI, K, MEL, NSW, NT, P, PERTH, US.

Illustration: R. J. Chinnock, *loc. cit.*

Ephemeral to 20 cm high, papillose. Branchlets terete. Leaves spatulate or ovate, 10–30 mm long, 3–11 mm wide, yellow-green to grey-green. Flowers in cymes; pedicels 2–12 mm long. Perianth segments equal in length, fused for 1/3 their length, white or yellow inside. Stamens many, evenly distributed; filaments terete, papillose. Capsule with bifid valves. Seeds comma-shaped, laterally compressed, papillose, dark brown. Fig. 12G–H.

Occurs in S.A., Qld and N.S.W., usually in creek beds and depressions. Map 59.

S.A.: Mt Lyndhurst, M. Koch 224 (AD, BRI, HO); 15 km W of Leigh Creek on road to Myrtle Springs Stn, R. Schodde 971 (AD, CANB, G, K, P).

Atypical forms from Mt Isa, Qld, are glabrous and smooth and the seed is covered with broad shallow papillae, unlike the distinctly elevated papillae on seeds of plants from more southern localities.

11. Gunnioopsis kochii (Wagner) Chinnock, *J. Adelaide Bot. Gard.* 6: 162 (1983)

Aizoon kochii Wagner, *Ann. K. K. Naturhist. Hofmus.* 19: 80, figs 1, 2 (1904). T: Mt Lyndhurst, S.A., M. Koch 354; holotype: W; isotype: AD, MEL, NSW, PERTH.

Illustrations: R. J. Chinnock, *op. cit.* figs 12, 43; R. Wagner, *loc. cit.* (as *Aizoon kochii*).

Ephemeral to 30 cm high, sparsely papillose. Branchlets terete. Leaves spatulate or ovate, 9–28 mm long, 3–11 mm wide, grey-green. Flowers in cymes; pedicels 2–7 mm long. Perianth segments equal in length, lower quarter to one third fused, pink inside. Stamens many, evenly distributed; filaments dilated at base, terete above, papillose. Capsule with bifid valves. Seeds comma-shaped, laterally expanded, ridged, dark brown to black. Fig. 12K.

Endemic in central-eastern S.A., growing in rocky soil. Map 60.

S.A.: 3 km E of Curdimurka, *F. Badman 261* (AD, HO, NT); Beltana, no date, *Mrs Richards* (NSW); 4 km NW of Copley, *R. Schodde 970* (AD, CANB, K, M, UC).

Gunneriopsis kochii and *G. papillata* are vegetatively similar but can be separated by perianth colour and seed characters. In *G. papillata* the perianth is yellow or white inside, never pink. In one collection (ADW51978) of *G. kochii*, however, both pink and white flowers were recorded, but the population may have been a mixed one. Population sampling of *G. kochii* is required to confirm if flower colour is constant for the species.

12. *Gunneriopsis rubra* Chinnock, *J. Adelaide Bot. Gard.* 6: 174, figs 9, 49 (1983)

T: 20 km SE of Perenjori, W.A., 21 Oct. 1981, *R. J. Chinnock 5268*; holotype: AD; isotypes: K, MEL, NT, PERTH, US.

Illustrations: *R. J. Chinnock, loc. cit.*

Glabrous, prostrate ephemeral, all parts eventually turning red. Branchlets terete, smooth when fresh but striate when dry. Leaves oblong, subterete, flattened above, 3–10 mm long, c. 1 mm broad. Flowers solitary, sessile or pedicellate. Perianth lobes free to base, triangular with papillose margins, smooth inside, green outside and inside. Stamens 4, alternate with lobes; filaments terete, glabrous. Capsule ovoid with simple valves, membranous; stigma persistent. Seeds comma-shaped, light brown, striated along radicle edge, otherwise smooth, shiny. Fig 12 I.

Collected only from the upper SW of W.A., between Yalgoo and Perenjori, but possibly overlooked elsewhere on account of its small size. Grows in light brown sandy loam and red loam in mallee and open woodland. Map 61.

W.A.: 60 km E of Mullewa on Yalgoo road, *G. J. Keighery 3318* (AD, PERTH).

13. *Gunneriopsis septifraga* (F. Muell.) Chinnock, *J. Adelaide Bot. Gard.* 6: 172 (1983)

Gunnia septifraga F. Muell., *Rep. Pl. Babbage's Exped.* 9 (1859); *Neogunnia septifraga* (F. Muell.) Pax & K. Hoffm., *Nat. Pflanzenfam.* 2nd edn, 16c: 225 (1934). T: Stuarts Creek, S.A., 1858, *Hergolt s.n.*; holotype: MEL.

Gunnia drummondii Benth., *Fl. Austral.* 3: 327 (1867); *Neogunnia drummondii* (Benth.) Pax & K. Hoffm., *loc. cit.* T: Swan River, W.A., *J. Drummond 241*; n.v.

Illustrations: *R. J. Chinnock, op. cit.* figs 10, 23, 24, 48.

Glabrous or sparsely pubescent, ephemeral. Branchlets terete, smooth. Leaves oblong to oblanceolate, obtuse, 5–15 mm long, 1–5 mm wide, vivid green turning yellow-green. Flowers solitary, sessile or shortly pedicellate. Perianth fused for one third their length; lobes triangular, green-yellow outside and green inside. Stamens 4 or rarely 8, alternate with lobes; filaments terete, glabrous. Capsule with 4 bifid valves, often appearing 8-valved; stigma not persistent. Seeds comma-shaped, whitish to hyaline but normally brown along radicle edge and faintly patterned. Fig 12C–D.

Widespread from south-western W.A. to N.S.W. Grows in saline soils around salt lakes or depressions, often forming dense carpets on flats or associated with *Halosarcia*. Map 62.

W.A.: S margin of Lake Barlee, *P. G. Wilson 8810* (PERTH). N.T.: Lake Neale, *J. R. Maconochie 1895* (AD, BRI, DNA, MEL, NSW, NT, PERTH); Palmer Valley Stn, 6 km NNE of Kingston No. 2 Dam, *T. S. Henshall 2114* (AD, NT, PERTH). S.A.: Ifould Lake, Nullarbor Plain, *R. J. Chinnock 2727* (AD).

14. Gunnioipsis propinqua Chinnock, *J. Adelaide Bot. Gard.* 6: 175, fig. 50 (1983)

T: von Treuer Tableland, S of Lake Carnegie, W.A., 28 Aug. 1968, *P. G. Wilson 7436*; holo: PERTH; iso: K.

Illustration: R. J. Chinnock, *loc. cit.*

Herb to 10 cm, glabrous. Branchlets often pustulate. Leaves linear, slightly channelled above, 8–12 mm long, 1–2 mm wide, pustulate. Flowers solitary, shortly pedicellate. Perianth lobes ovate to triangular, free almost to base, acuminate, green outside, white or pink inside. Stamens 4–12, in 4 bundles alternate with lobes; filaments slightly dilated towards base. Capsule ovoid, sometimes ribbed, 3 mm diam.; valves deeply bifid when open, membranous. Seeds comma-shaped, light to dark brown, colliculate.

Endemic in W.A., between the upper Gascoyne R. and Laverton; grows in rocky loam and on lateritic outcrops. Map 63.

W.A.: 16 km S of 10 Mile tank on Bandy–Banjiwarn road, *R. J. Chinnock 741* (AD).

15. GALENIA*A. Prescott*

Galenia L., *Sp. Pl.* 1: 359 (1753); *Gen. Pl.* 5th edn, 169 (1754); after Claudius Galenius, the Roman Physician and writer on medicine about 130–200 A.D.

Type: *G. africana* L.

Prostrate or semi-prostrate perennial herbs, semi-woody at base. Stems with vesicular peltate hair-like scales. Leaves alternate, entire, flat, papillose, large early in growing season but later smaller. Flowers solitary, axillary, sessile; bracts none. Perianth segments 5, free, coloured inside. Stamens 10, in pairs between perianth lobes; filaments flared at base; staminodes 0. Ovary superior, 5-angled; styles and locules 5; ovules 1 per locule with long funicle; placentation apical-axile. Fruit a dry leathery 5-angled truncate capsule, opening loculicidally at apex of angles. Seeds triangular to compressed, reniform, with parallel rows of tubercles, shiny, black, c. 1 mm long.

A genus of c. 27 species in southern Africa, 2 of which have become established in southern Australia.

R. S. Adamson, *The South African Species of Aizoaceae. III. Galenia* L., *J. S. African Bot.* 22: 87–127 (1956).

Leaves and stems grey-green; hair-like scales sparse, closely appressed, c. 0.5 mm long; flowers white to pink

1. *G. pubescens*

Leaves and stems grey-white; hair-like scales dense, loosely appressed, c. 1.5 mm long; flowers white to yellow

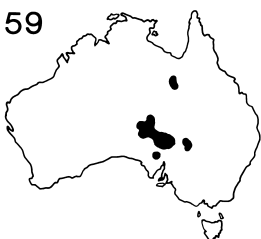
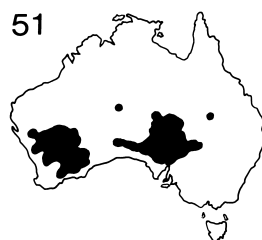
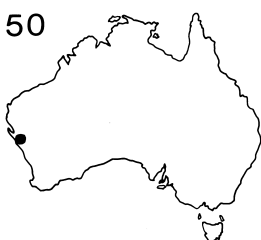
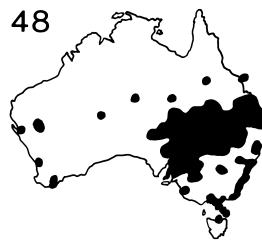
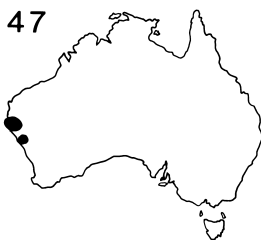
2. *G. secunda*

1. **Galenia pubescens* (Ecklon & Zeyher) Druce, *Bot. Soc. Exch. Club. Brit. Isles* 1916: 624 (1917)

var. **pubescens**

Aizoon pubescens Ecklon & Zeyher, *Enum. Pl. Afric. Austral.* 326 (1837). T: Swartkops River, South Africa, *Zeyher 2638*; iso: *S n.v.*

Stems procumbent, to 1 m long, papillose with coarse, tightly appressed, rhomboid, peltate white hair-like scales 0.3–0.7 mm long. Flowering branches long. Leaves scattered, broadly obovate-spathulate with midvein visible below, 5–20 mm long, 2–20 mm wide, those on main stem falling at about flowering time; leaves on lateral branches smaller, more acute. Flowers evident. Perianth segments 2–3 mm long, hairy outside, white or pink inside. Anthers often pink. Capsule conspicuous, 2.5–3 mm wide, 1 mm long, persistent with leaf bases. Fig. 11G–H.



- 46. *Tetragonia eremaea*
- 49. *Tetragonia cristata*
- 52. *Gunniopsis tenuifolia*
- 55. *Gunniopsis zygophylloides*
- 58. *Gunniopsis calva*

- 47. *Tetragonia diptera*
- 50. *Gunniopsis divisa*
- 53. *Gunniopsis calcarea*
- 56. *Gunniopsis intermedia*
- 59. *Gunniopsis papillata*

- 48. *Tetragonia tetragonoides*
- 51. *Gunniopsis quadrifida*
- 54. *Gunniopsis glabra*
- 57. *Gunniopsis rodwayi*
- 60. *Gunniopsis kochii*

Scattered around settled areas in southern Australia. Map 64.

W.A.: Bunbury, Sept. 1942, *C. A. Gardner* (PERTH). S.A.: Two Wells, *E. N. S. Jackson 844* (AD); Henley Beach, c. 10 km W of Adelaide, *E. H. Ising 3976* (AD, CANB); 20 km NE of Port Pirie on road between Telowie and Nelshaby, *L. Haegi 595* (AD).

2. *Galenia secunda (L.f.) Sond. in Harvey, *Fl. Cap.* 2: 474 (1862)

Aizoon secundum L.f., *Suppl. Pl.* 261 (1781). T: South Africa, *C. Thunberg s.n.*; iso: UPS n.v.

Stems prostrate, to 50 cm long, papillose, and covered with numerous coarse loosely appressed yellow or white hair-like peltate scales, 1–2 mm long. Flowering branches short, clustered, secund. Leaves appressed, clustered, or scattered on the alternate lateral branches, obovate to spatulate, acute, 2–20 mm long, 2–8 mm wide, thick, folded inward, with a recurved apex; leaf bases persistent. Flowers concealed by leaves. Perianth segments oblong-lanceolate, 2–3 mm long, coarsely hairy outside except incurved apex, often 3-veined, yellow or white inside. Anthers yellow. Capsule concealed among leaf bases, persistent.

Scattered around Adelaide and N to Port Augusta, S.A., and around Melbourne, Vic. Map 65.

S.A.: 15 km W of Murray Bridge, *J. Carrick 3802* (AD); Port Augusta, head of Spencer Gulf, 8 Dec. 1954, *E. H. Ising* (AD); Redcliff Survey Area, *R. J. Chinnock 1610* (AD).

16. TRIANTHEMA

A. Prescott

Trianthema L., *Sp. Pl.* 1: 223 (1753); *Gen. Pl.* 5th edn, 105 (1754); from the Greek *treis* (three) and *anthesis* (flower); the inflorescence is often three-flowered.

Type: *T. portulacastrum* L.

Prostrate or diffuse herbs, glabrous, papillose or hairy, sometimes woody at base. Leaves opposite, unequal, entire, terete, linear or flat; petiole dilated at base. Flowers solitary or clustered, axillary, sessile or pedicellate, each subtended by one or more scarious bracts. Perianth of 5 shortly-fused segments; lobes unequal with scarious margins, sometimes with a dorsal mucro behind apex, coloured inside. Stamens 5 to many, adnate to upper edge of perianth tube; staminodes absent. Ovary superior; style and locule 1; ovules 2 to many; placentation basal. Fruit a capsule, membranous or woody, circumsciss usually near base, the upper part (operculum) flat, ovoid, or subglobular; perianth usually persistent. Seeds 1 to many, triangular, reniform or comma-shaped, smooth or patterned, often papillose, black.

A genus of c. 20 species, some widely distributed in the tropics and subtropics; 12 species in northern and arid Australia, of which 10 are endemic, 1 is pantropical and 1 is naturalised.

- | | | |
|----|---|------------------------------|
| 1 | Plant very hairy with stiff hairs | |
| 2 | Flowers solitary in each axil, even when axils crowded | |
| 3 | Flowers sessile | |
| 4 | Operculum of fruit subovoid, tapering into style | 1. T. rhynchocalyptra |
| 4: | Operculum of fruit depressed dish-shaped with hyaline cover | 4. T. patellitecta |
| 3: | Flowers pedicellate | 2. T. megasperma |
| 2: | Flowers in axillary clusters | 3. T. pilosa |
| 1: | Plant glabrous or slightly pubescent | |
| 5 | Flowers on pedicels at least 2 mm long | |

- 6 Flowers in cymes 5. *T. cypseleoides*
- 6: Flowers solitary or in twos or threes
- 7 Stamens 5–7; seeds smooth, shiny black; style short, thick 6. *T. compacta*
- 7: Stamens 10–25; seeds patterned or papillose
- 8 Style terete
- 9 Seeds with parallel ridges; leaves terete or clavate 8. *T. turgidifolia*
- 9: Seeds studded with large elongate papillae; leaves flat 10. *T. oxycalyptra*
- 8: Style flattened, tongue-like; seeds shiny black, furrowed 7. *T. glossostigma*
- 5: Flowers sessile or on thick pedicels to 1 mm long
- 10 Flowers solitary at most nodes, occasionally 2 or 3 at a few nodes
- 11 Flowers hidden in leaf axil by fusion with leaf bases; fruit cylindrical, with raised edge 12. *T. portulacastrum*
- 11: Flowers obvious; fruit ovoid 10. *T. oxycalyptra*
- 10: Flowers grouped, at least 2 at most nodes
- 12 Stamens 5, fruit turbinate with depressed hyaline cover 11. *T. triquetra*
- 12: Stamens 10, fruit globular 9. *T. cussackiana*

1. *Trianthema rhynchocalyptra* F. Muell., *Fragm.* 1: 174 (1859)

T: near Victoria River, N.T., *F. Mueller s.n.*; iso: MEL.

Prostrate; densely branched herb with perennial rootstock, densely hairy or leaves glabrous except ciliate margin. Leaves clustered, lanceolate, ovate or obovate, acute; lamina 4–20 mm long, 2–8 mm wide, shiny above, pale below; petiole c. 4 mm long, expanded into a denticulate sheath. Flowers sessile, solitary but nodes crowded; bracts ovate, apiculate. Perianth tube obconical, c. 4 mm long; lobes triangular, c. 3 mm long, white, pink, or green inside. Stamens 10; filaments c. 2 mm long. Ovary oblong; style excentric, recurved, c. 2 mm long; ovules 4–6. Operculum subovoid, gradually tapering to persistent style, hard, brown. Seeds compressed, pea-shaped, c. 2 mm wide, shiny black, finely striated but initially with both minute papillae and larger elongated papillae along dorsal edge. Fig. 13E.

Scattered occurrences in northern N.T. and Qld, in sandy soil. Map 66.

N.T.: Woolaning, *C. R. Dunlop & L. Craven 5888* (CANB, DNA, MEL, PERTH); Mataranka Stn, *M. O. Rankin 2534* (CANB, DNA, NT); Rum Jungle, *N. Byrnes NB46* (DNA, NT).

2. *Trianthema megasperma* A. Prescott, *J. Adelaide Bot. Gard.* 6: 183, figs 1A–D, 3 (1983)

T: c. 17 miles (27 km) N of Mt Evelyn, N.T., 13°31'S, 132°E, 3 Mar. 1973, *M. Lazarides 7990*; holo: CANB; iso: BRI, NT.

Prostrate perennial herb; stems to 1 m long, densely hairy. Leaves ovate to obovate or spatulate, acute or obtuse; lamina 3–30 mm long, 3–15 mm wide, light green, paler below; petiole c. 6 mm long, sometimes dilated into a membranous sheath. Flowers solitary; pedicels 2–10 mm long; bracts lanceolate, inconspicuous. Perianth tube 1–2 mm long, abruptly dilated; lobes spreading, narrowly triangular, c. 6 mm long, white to pink inside with mauve tips. Stamens 5–15; filaments 3–4 mm long. Ovary cylindrical; style recurved, c. 2.5 mm long; ovules 2. Operculum campanulate with undulating rim, 2–3 mm broad, membranous. Seed 1, compressed pea-shaped, c. 3 mm broad, reticulate or rugose, studded with small clear papillae, black, tightly enclosed in operculum. Fig. 13 O–P.

Occurs in northern N.T. around Oenpelli, Jabiru and Jim Jim Falls, in sandy soils. Map 67.

N.T.: 13 km N of Mudginberry Homestead, *N. Byrnes NB807* (BRI, NSW, NT, PERTH)

3. *Trianthema pilosa* F. Muell., *Fragm.* 1: 174 (1859)

T: on the banks of Sturt Creek, W.A., *F. Mueller s.n.*; iso: MEL.

Procumbent herb with long stems and short branchlets, densely hispid especially on young growth. Leaves ovate to obovate, obtuse or acute, 3–30 mm long, 2–10 mm wide, sometimes larger; petiole 1–15 mm long, the base expanded into an ovate sheath. Flowers in clusters of 3 or 4, sessile; bracts ovate, acute. Perianth tube obconical, c. 3 mm long; lobes deltoid-lanceolate, 2–3 mm long, white, pink, or reddish inside. Stamens 15–20; filaments c. 2 mm long. Ovary cylindrical, the apex concave; style c. 2.5 mm long; ovules 3 or 4. Operculum cylindrical, truncate, the centre depressed, 3–5 mm long, brown, thick, often reticulate-striate. Seeds 1 in base and 1 in operculum, disc-shaped, c. 1.7 mm diam., finely tuberculate and papillose, black. Fig. 13D.

Widespread in northern half of Australia, in W.A., N.T., Qld and northern S.A. Often in sandy soils. Map 68.

W.A.: 21 km W of Mt Tietkens, Great Sandy Desert, *A. S. George 8974* (PERTH). N.T.: 7 km E of Oenpelli turnoff, El Sharana–Pine Creek Road, *M. O. Parker 894* (CANB, DNA, NT); c. 33 km from Elliott, Stuart Highway, *J. Must 367* (AD, NT); Amerada Petrol Corporation No. 1, Hale River, *D. E. Symon 4345* (AD, ADW, CANB).

4. *Trianthema patellitecta* A. Prescott, *J. Adelaide Bot. Gard.* 6: 185, figs 1E–I, 4 (1983)

T: Kimberley Research Station, W.A., 26 July 1952, *R. A. Perry 3067*; holo: CANB; iso: AD, BRI, CANB, NSW.

Prostrate herb with stems to 1 m and distant short side branches, stiffly hairy. Leaves ovate, the larger ones tending to oval or spatulate, acute or obtuse, lamina 4–30 mm long, 3–15 mm wide; petiole broadly sheathing. Flowers solitary or paired, sessile; bracts 1 ovate and 2 linear. Perianth tube obconical, c. 2 mm long; lobes triangular-lanceolate, 2–2.5 mm long, unequal, 2 with narrow scarious margins, 3 wider, purple inside. Stamens c. 20; filaments, c. 1.5 mm long. Ovary cylindrical; style terete, in central depression, 1.7–2 mm long; ovules 2. Operculum dish-shaped with a fine hyaline cover across apex, c. 4 mm wide. Seeds 1 in base of operculum, 1 in base of fruit, pea-shaped, c. 1.5 mm broad, faintly reticulate, shiny black. Fig. 13G.

Occurs near Kununurra, W.A., and in adjacent areas of N.T. Map 69.

W.A.: Karunje Stn, *D. Rust 21* (PERTH); King River Pumping Stn, *E. M. Bennett 1734* (PERTH); Kimberley Research Stn, Ord River, 26 Aug. 1962, *P. J. Van Rijn* (PERTH); Kimberley Research Stn, *D. G. W. Drysdale 204* (PERTH).

5. *Trianthema cypseleoides* (Fenzl) Benth., *Fl. Austral.* 3: 331 (1867)

Ancistrostigma cypseleoides Fenzl in Endl. & Fenzl, *Nov. Stirp. Dec.* 85 (1839). T: Hawkesbury River, N.S.W., *F. Bauer s.n.*; *n.v.*

Prostrate, slender, small herb, glabrous. Leaves obovate or orbicular, c. 5 mm long; petiole slender, dilated at base with scarious margins. Flowers in loose cymes exceeding leaves; bracts scarious. Perianth tube short; lobes broad, obtuse, c. 2 mm long. Stamens 7–10. Ovary short, rounded; style slightly excentric, terminal, linear, recurved; ovules 6–12. Fruit globular. Seeds smooth.

Known only from the type, collected in N.S.W. Map 70.

This description has been taken from G. Bentham, *loc. cit.* Not listed by S. W. L. Jacobs & J. Pickard, *Pl. New South Wales* (1981). The record by F. M. Bailey, *Compr. Cat. Queensland Pl.* (1913), was a misapplication of the name to the following species.

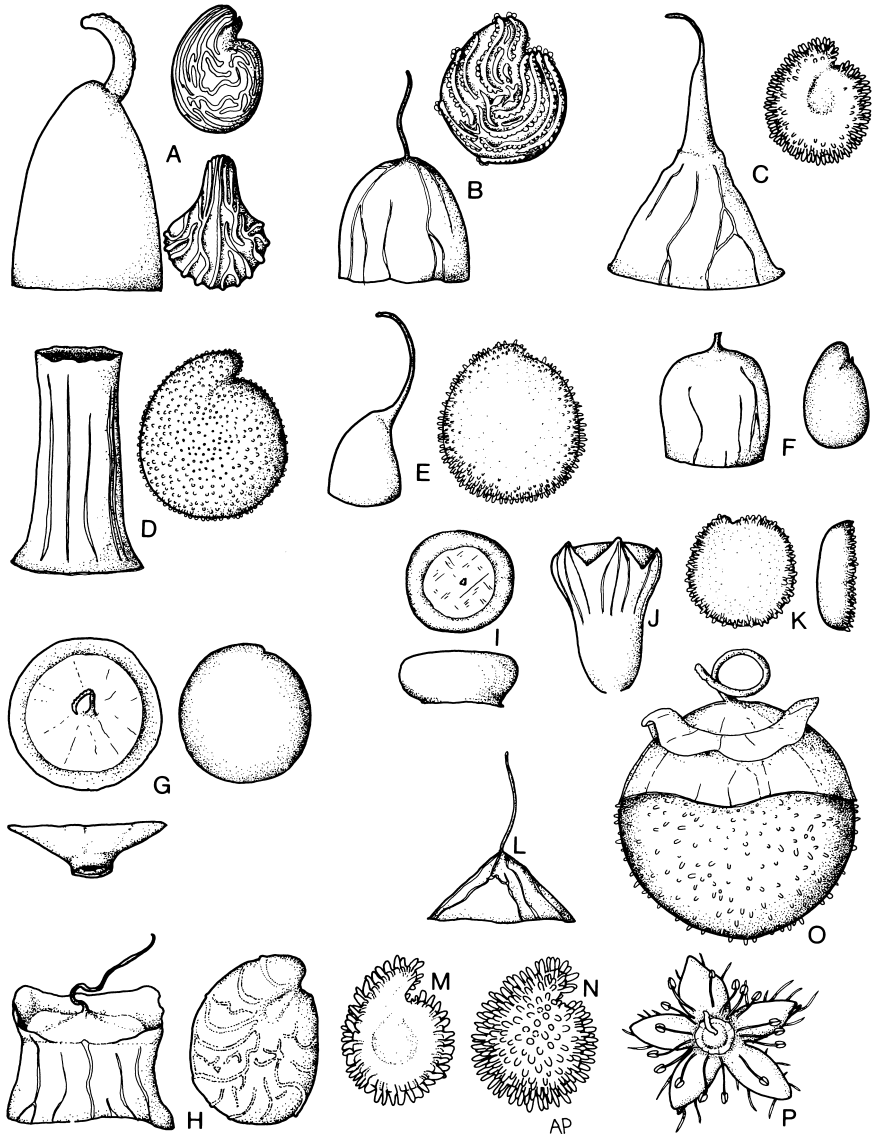


Figure 13. *Trianthema*. A–G, operculum $\times 7.5$ and seed $\times 15$. A, *T. glossostigma* (J. Beard 2928, PERTH). B, *T. turgidifolia* (A. Mitchell 1003, NT). C, *T. cussackiana* (N. Burbidge 1124, PERTH). D, *T. pilosa* (A. George 8974, PERTH). E, *T. rhynchocalypta* (I. Wilson 325, BRI). F, *T. compacta* (C. Dunlop 2881, BRI). G, *T. patellitecta* (N. Byrnes NB303, DNA). H, *T. portulacastrum*, operculum $\times 5$, seed $\times 15$ (P. Van Rijn 4526, PERTH). I–K, *T. triquetra* var. *triquetra*, I, operculum, top and side views $\times 7.5$; J, flower $\times 7.5$; K, seed $\times 15$ (I–K, R. Perry $\times 3238$, NT). L–M, *T. oxycalypta* var. *sessiliflora*. L, operculum $\times 7.5$; M, seed $\times 15$ (L–M, M. Lazarides 6331, AD). N, *T. oxycalypta* var. *oxycalypta*, seed $\times 15$ (c. 39 km N of Tanami, N.T., G. Chippendale, NT). O–P, *T. megasperma*. O, operculum and seed $\times 10$ (N. Byrnes NB807, DNA). P, flower $\times 1.5$ (M. Lazarides 7990, NT)

6. *Trianthema compacta* C. White, *Queensland Dept. Agric. Bot. Bull.* 21: 10 (1919)

T: Mornington Is., Gulf of Carpentaria, Qld, *J. F. Bailey s.n.*; holotype: BRI.

[*T. cypseloides* auct. non (Fenzl) Benth.: F. M. Bailey, *Compr. Cat. Queensland Pl.* 227 (1913)]

Illustration: C. T. White, *op. cit.* t. 4.

Small, prostrate or ascending herb, much-branched, glabrous. Leaves oblong to orbicular, 4–7 mm long and wide, the larger of each opposite pair petiolate with a large denticulate hemispherical sheath at base, the smaller a lamina and sheath only. Flowers solitary; pedicels 2–4 mm long; bract 1, ovate. Perianth tube c. 1.5 mm long; lobes semi-ovate, c. 2 mm long, pink inside. Stamens 5–7, irregularly arranged; filaments c. 1.5 mm long. Ovary globular; style thick, c. 0.5 mm long; ovules many. Operculum subglobular, c. 2 mm long, thin. Seeds several, triangular to reniform, c. 0.5 mm long, very shiny, black, smooth. Fig. 13F.

Occurs around the shores of the Gulf of Carpentaria, N.T. and Qld. Map 71.

N.T.: Maria Is., Gulf of Carpentaria, *C. R. Dunlop 2881* (BRI, DNA, NT). Qld: Wentworth–Troutbeck Stn, *J. Gasteen 182(a)* (BRI).

7. *Trianthema glossostigma* F. Muell., *S. Sci. Rec.* 3: 282 (1884)

T: near Mt Hale, near upper Murchison River, W.A., *C. Crossland s.n.*; holotype: MEL.

Prostrate herb, much-branched, glabrous. Leaves ovate or obovate, thick, acute, cuneate at base, 3–15 mm long, 3–10 mm wide; petiole 5–6 mm long; sheath scarious, with acute lobes. Flowers solitary; pedicels 3–5 mm long; bracts 2, lanceolate, denticulate, apiculate, as long as pedicel. Perianth tube very short; lobes c. 6 mm long, very unequal, the outer lanceolate-oblong, the inner broadly oval, with scarious edges, rarely with minute dorsal mucro, abruptly spreading, pink inside. Stamens 15–25; filaments c. 4 mm long. Ovary glabrous; style flattened, recurved, c. 1 mm long; ovules c. 10. Fruit dehiscing near middle. Operculum subovoid, c. 4 mm long, papery. Seeds 4–8, pear-shaped, c. 1 mm long, shiny, black, longitudinally furrowed along dorsal edge. Fig. 13A.

Scattered through the northern half of W.A. and occasionally collected in N.T. Map 72.

W.A.: Henry River, Barlee Range, *R. D. Royce 6544* (PERTH); 6 km W of Carnegie Homestead, *A. S. George 5562* (PERTH). N.T.: 61 km W of Ooratippra Homestead, *D. J. Nelson 526* (BRI, NT); 48 km NW of The Granites, *G. Chippendale 4229* (BRI, NSW, NT).

8. *Trianthema turgidifolia* F. Muell., *Fragm.* 10: 83 (1876)

T: near Nichol Bay, W.A., 1876, *Mrs Crouch*; isotype: MEL.

Semi-erect or sprawling herb, or slightly woody shrub, much-branched, glabrous except some hairs at nodes and on pedicels. Leaves distant, succulent, semiterete to almost clavate, obtuse, lamina 3–20 mm long, 3 mm wide, tapering into petiole with small scarious wings. Flowers solitary or in threes; pedicels 2–10 mm long, with 1 dentate and 2 fringed bracts. Perianth tube 2–3 mm long; lobes lanceolate, 3–5 mm long, white or purple inside. Stamens 10, adnate regularly to perianth tube; filaments slender, c. 4 mm long. Ovary ovoid; style slender, terete, c. 2.5 mm long; ovules 7 to many. Operculum subovoid. Seeds 2 or 3, comma-shaped, c. 2 mm wide, dark brown, with dorsal parallel ridges of papillae. Fig. 13B, 17.

Occurs in NW Australia from Shark Bay to Broome, extending E through the Great Sandy Desert to adjacent N.T. Map 73.

W.A.: Tobin Lake, Great Sandy Desert, *A. S. George 15638* (NT, PERTH); Dragon Tree Soak, Great Sandy Desert, *A. S. George 14746* (PERTH); 1.6 km S of Lookout Rocks, *R. D. Royce 1813* (PERTH).

Three specimens from near The Granites, Central Australia, are pubescent on all parts including perianth.

9. *Trianthema cussackiana* F. Muell., *Chem. & Druggist Australia* 10: 207 (1895)

T: near Harding River, W.A., *W. H. Cussack s.n.*; iso: MEL.

Prostrate or ascending glabrous herb. Leaves distant, succulent, terete, minutely mucronate, channelled below; lamina 5–40 mm long, 3 mm wide; petiole dilated into a rectangular membranous sheath, denticulate, sometimes persistent. Flowers in pairs or several together, occasionally single in branch axils; pedicels thick, to 1 mm long, with 1 ovate and 2 lanceolate apiculate bracts. Perianth tube 2–3 mm long, membranous; lobes thick, triangular, c. 3 mm long, violet inside. Stamens 10, adnate to perianth tube; filaments filiform, longer than perianth segments. Ovary oblong; style filiform, 2–3 mm long; ovules 4–10. Operculum somewhat broader than long. Seeds several, reniform to comma-shaped, c. 2 mm wide, finally shiny black but initially with a hyaline coating, reticulate and papillose, with larger papillae along dorsal edge. Fig. 13C.

Restricted to north-western W.A. Map 74.

W.A.: Hamersley Range, July–Aug. 1958, *P. McMillan* (PERTH); Pardoo, *N. T. Burbidge 1647* (PERTH); between Gascoyne and Fortescue Rivers, 1885, *H. S. King* (MEL).

10. *Trianthema oxycalyptra* F. Muell., *Fragm.* 1: 173 (1859)

T: banks of Sturt Creek, ?W.A., 1856, *F. Mueller*; lecto: MEL, *vide* A. Prescott, *Fl. Australia* 4: 319 (1984).

Prostrate or ascending herb, glabrous or young stems sparsely hirsute. Leaves lanceolate, ovate, obovate or spatulate; lamina 3–25 mm long, 1–8 mm wide; petiole 3–8 mm long, abruptly expanded into an oblong sheath with acuminate lobes. Flowers larger than leaves, in threes, occasionally paired or solitary, sessile or on pedicels to 10 mm long; bracts linear-lanceolate, apiculate. Perianth tube obconical, 2–3 mm long; lobes lanceolate-oblong to ovate, 5–6 mm long. Stamens 10–20, free. Ovary ovoid; style filiform, c. 2.5 mm long, recurved; ovules 10–12. Fruit dehiscent about middle, c. 6 mm long. Operculum subovoid, tapering into slender persistent style. Seeds 6–9, comma-shaped, 2 mm wide including papillae, black.

Occurs in northern W.A. There are 2 varieties.

Flowers pedicellate; filaments flared at base

10a. var. *oxycalyptra*

Flowers sessile; filaments not flared at base

10b. var. *sessiliflora*

10a. *Trianthema oxycalyptra* F. Muell. var. *oxycalyptra*

Trianthema oxycalyptra var. *pedunculata* F. Muell., *Fragm.* 1: 174 (1859), *nom. illeg.*

Flowers distinctly pedicellate. Staminal filaments flared at base. Seeds studded with elongate papillae increasing in size towards the back to 0.2 mm long. Fig. 13N.

This is the more common of the two varieties, being spread across north-western Australia. Map 75.

W.A.: 11 km SW of Lamboo Stn, Kimberleys, *M. Lazarides 6299* (AD, BRI, NSW, NT, PERTH). N.T.: 39 km N of Tanami, *G. Chippendale 5634* (AD, NT); 96 km E of Fitzroy River, *N. Byrnes 375* (DNA, NT); Too Far Swamp, Tanami Desert, *P. K. Latz 8394* (CBG, MO, NT, PERTH).

10b. *Trianthema oxycalyptra* var. *sessiliflora* F. Muell., *Fragm.* 1: 174 (1859)

T: banks of Sturt Creek, ?W.A., 1856, *F. Mueller s.n.*; neo: MEL, *vide* A. Prescott, *Fl. Australia* 4: 319 (1984).

Flowers 1–3 per axil, sessile. Filaments not flared at base. Seeds with papillae grouped together to form plates along backbone of seed, otherwise finely striate.

Collected only in a small area around Sturt Creek, SE Kimberley, W.A. Map 76.

W.A.: 8 km NNE of Margaret River Stn, *M. Lazarides 6331* (AD, BRI, NSW, PERTH).

11. *Trianthema triquetra* Willd., *Ges. Naturf. Freunde Berlin Neue Schriften* 4: 81 (1803)

T: India, *Rottler s.n.*; holotype: B–W *n.v.*; iso: K *n.v.*

T. glaucifolia F. Muell., *Fragm.* 1: 172 (1859). T: near the Burdekin River, Qld, *collector unknown*; *n.v.*

[*T. crystallina auct. non* (Forsskal) Vahl.: J. M. Black, *Fl. S. Australia* 2nd edn, 2: 342 (1948)]

Prostrate or ascending diffuse herb; stems 20–60 cm long with short lateral branches, finely papillose or almost glabrous. Leaves terete to clavate or ovate to linear, mucronate; lamina 3–30 mm long, 2–4 mm wide; petiole c. 2 mm long, expanded into a denticulate sheath. Flowers in clusters of 3–6, sessile; bracts 1 lanceolate and 2 ovate. Perianth tube 1–2 mm long; lobes ovate-triangular, c. 2 mm long, 3-nerved, pinkish inside. Stamens 5; filaments c. 0.1 mm long, sometimes more. Ovary obconical, depressed centrally; style excentric, very short; ovules 2. Operculum thick-walled, rounded, with an impressed membranous cover. Seeds 2, black, 1 in operculum, 1 in base, disc-shaped, c. 1–1.5 mm diam., rounded on one side, flat on the other, with rows of papillae along flat edge.

Widely distributed in the tropics. In Australia occurs in all States except Vic. and Tas. There are two varieties.

Leaves linear to narrowly oblanceolate-obovate

11a. var. *triquetra*

Leaves clavate

11b. var. *clavata*

11a. *Trianthema triquetra* Willd. var. *triquetra*

Leaves linear to narrowly oblanceolate-obovate, subsessile or petiolate. Perianth lobes up to 2 mm long, spreading. Operculum with a hyaline cover 1–1.5 mm diam.

Widespread in mainland Australia except in southern W.A. and Vic. Map 77.

W.A.: 9.6 km E of Noonkanbah Stn, SE of Derby, *Y. Power 348* (PERTH). N.T.: c. 1 km E of Temple Bar Homestead, *P. K. Latz 125* (AD, NT); 4 km SE of Ranken, *G. Chipendale 7240* (NT). Qld: Berricana, Apr. 1917, *C. T. White s.n.* (BRI).

11b. *Trianthema triquetra* var. *clavata* (J. Black) H. Eichler, *Suppl. J. M. Black's Fl. S. Australia* 2nd edn, 136 (1965)

T. crystallina var. *clavata* J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 47: 369 (1923). T: between Hergott and Innamincka, S.A., June 1916, *R. Cockburn*, lecto: AD, *fide* A. Prescott, *Fl. Australia* 4: 319 (1984); Lambinna Native Well, Tomorden Stn, 5 July 1914, *S. A. White*; syn: AD; Wantapella Swamp, W Musgrave Range, 18 July 1914, *S. A. White*; syn: AD.

Leaves clavate, 6–8 mm long. Flowers densely clustered. Perianth lobes c. 1 mm long. Operculum 1–1.5 mm diam., with almost no hyaline cover.

Occurs in the drier parts of Central Australia. Map 78.

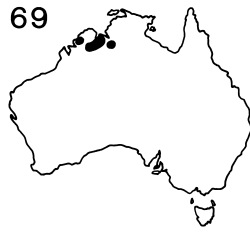
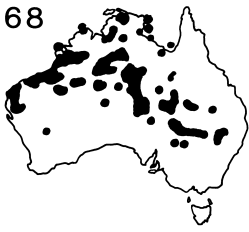
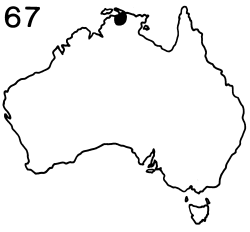
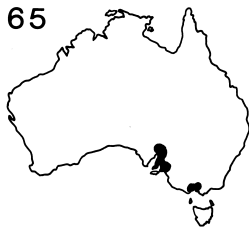
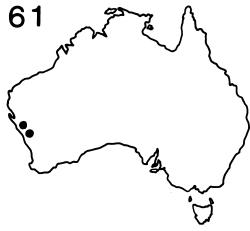
S.A.: shore of Hunt Peninsula (near N end of Jackboat Bay), Lake Eyre North, *G. C. Cornwall 17* (AD).

There is considerable confusion in the use of this varietal name. It is used here only for distinctly clavate-leaved specimens which may prove to be the extreme of the accepted range of the more common variety, reflecting only an increase in succulence in the drier areas of Australia.

12. **Trianthema portulacastrum* L., *Sp. Pl.* 1: 223 (1753)

Trianthema monogyna L., *Mant. Pl.* 69 (1767), *nom. illeg.* T: S. America, Curacao, *Hermann s.n.*; iso: BM-SL *n.v.*

Procumbent or ascending somewhat succulent herb; stems up to 50 cm or more long, glabrous or sparsely hairy. Leaves elliptic to obovate, obtuse or retuse, sometimes apiculate; lamina 4–50 mm long, 4–45 mm wide; petiole 5–25 mm long, expanded into sheath connate with opposing leaf base to form cup. Flowers solitary, sessile, largely hidden in or fused to leaf base. Perianth tube fused to leaf sheath; lobes linear to



61. *Gunniopsis rubra*

64. *Galenia pubescens*

67. *Trianthea megasperma*

70. *Trianthea cypseleoides*

73. *Trianthea turgidifolia*

62. *Gunniopsis septifraga*

65. *Galenia secunda*

68. *Trianthea pilosa*

71. *Trianthea compacta*

74. *Trianthea cussackiana*

63. *Gunniopsis propinqua*

66. *Trianthea rhynchocalyptra*

69. *Trianthea patellitecta*

72. *Trianthea glossostigma*

75. *Trianthea oxycalyptra*
var. *oxycalyptra*

narrowly triangular, 4–5 mm long, a few hairs outside, pink or white inside. Stamens 10–20; filaments c. 2 mm long. Ovary cylindrical, style c. 2 mm long; ovules 10–15. Operculum truncate with a prominent raised denticulate rim on outer side, 2–3 mm long; perianth caducous. Seeds 3–12, 1 or 2 in operculum, others in base, reniform, c. 1.5–2 mm wide, dull black, slightly ridged. Fig. 13H.

Native of tropical Africa and Asia. An introduced weed of cultivation, scattered throughout Qld, and associated with disturbed areas of N.T. and northern W.A. Map 79.

W.A.: Port Hedland, *R. D. Royce 8152* (PERTH); Kimberley Research Stn, near Kununurra, *H. I. Aston 963* (AD, MEL). N.T.: Berrimah, *N. Byrnes N449* (AD, NT); CSIRO Wildlife, Berrimah, *J. McKean B576* (CANB, DNA, K, NT). Qld: Adels Grove, *A. de Lestrang 262* (BRI).

17. ZALEYA

A. Prescott

Zaleya Burman f., *Fl. Indica* 110, t. 31 (1768); derivation not known.

Type: *Z. decandra* (L.) Burman f.

Herbs, sometimes woody at base, minutely papillose, especially young growth. Leaves opposite, flat, green above, paler below; petiole long, scariosus at base. Flowers in axillary groups of c. 20, sometimes shortly pedunculate, with one small scariosus bract and two bracteoles per flower. Perianth segments 5 with a dorsal mucro behind the apex, white, pink or purple inside; margins scariosus. Stamens 5–12, rarely more; staminodes absent. Ovary superior; styles and locules 2; ovules 2 per locule; placentation basal. Fruit a capsule, truncate with raised outer margin, circumsciss near base, the upper part (operculum) splitting into two. Seeds 4, rugose, superposed in each locule, black.

A genus of perhaps 3 closely related species widespread in the tropics and subtropics, one species in Africa, one in India and one in Australia. These may all be one species.

R. Melville, *Trianthema pentandra* L. and some related species, *Kew Bull.* 7: 261–269 (1952); C. Jeffrey, Notes on tropical African Aizoaceae, *Kew Bull.* 14: 235–238 (1960).

Zaleya galericulata (Melville) H. Eichler, *Suppl. J. M. Black's Fl. S. Australia 2nd edn*, 136 (1965)

Trianthema galericulata Melville, *Kew Bull.* 7: 267 (1952). T: Langawirra Lakes, N.S.W., 19 Apr. 1930, *A. Morris 2758*; holo: K; iso: NSW.

Trianthema australis Melville, *Kew Bull.* 7: 266 (1952). T: Narrabri, N.S.W., Apr. 1914, *Stock Inspector White*; holo: NSW; iso: K n.v.

[*Trianthema decandra* auct. non L.: J. M. Black, *Fl. S. Australia 2nd edn*, 341 (1948)]

[*Zaleya decandra* auct. non Burman f.: R. Tate, *Handbk. Fl. Extratrop. S. Australia* 87 (1898)]

Illustrations: R. Melville, *op. cit.* 266–267.

Herb, prostrate or semi-erect, fleshy, glabrous except minute papillae especially on young growth; stems up to 60 cm. Leaves oblong, elliptic or ovate, acute or obtuse, those in each pair unequal, 10–50 mm long, 5–20 mm wide, green above, lighter below; midrib distinct. Petiole 5–25 mm long. Flowers in groups of c. 20, subsessile; bract triangular, acuminate, occasionally toothed, 4 mm long. Perianth oblong, segments 3 mm long, white, pink or purple inside. Fruit a hard, truncate cylinder, c. 5 mm long, circumsciss near base; two seeds remaining in base; operculum divided into 2 bell-shaped valves, the lateral edges with raised ridge of 3–4 teeth. Seeds compressed pea-shaped, c. 2 mm across, rugose with ridges extended into papillae, black. Fig. 11 I–M.

Scattered throughout drier areas of Australia, perhaps spreading more southerly as a weed. Map 80.

W.A.: De Grey Stn, near Muccangarra Pool, Ridley R., *N. T. Burbidge 1547* (PERTH). N.T.: 6 km N of Alice Springs, *M. Parker 427* (DNA); Ooraminna Rockhole, c. 40 km S of Alice Springs, *P. K. Latz 1291* (AD, NT). Qld: Cameron Downs, Hughenden, *S. E. Pearson 162* (BRI).

Excluded name

Trianthema humillima F. Muell., *Fragm.* 10: 72 (1876). T: between the Lachlan and Darling Rivers, N.S.W., *Burkitt s.n.*; *n.v.*

This is the moss *Gigaspermum repens* (Hook.) Lindb.; see D. G. Catcheside, *Mosses S. Australia* 218 (1980).

18. SESUVIUM

A. Prescott

Sesuvium L., *Syst. Nat.* 10th edn, 1058 (1959); derivation not known.

Type: *S. portulacastrum* (L.) L.

Succulent, glabrous perennial herbs; stems rooting at nodes. Leaves opposite, fleshy, connate at base. Flowers solitary, axillary, pedicellate; bracts absent. Perianth segments 5, triangular with scarious margins, a dorsal mucro behind apex. Stamens 5 to numerous; staminodes absent. Ovary superior; styles and locules 2–5; ovules several per locule; placentation axile. Fruit a circumsciss capsule, the upper part (operculum) ovoid, smooth. Seeds several, pea-shaped to comma-shaped, smooth, black.

A genus of 6 species, one a pantropical littoral, one endemic in the Galapagos Islands, the others in the Angolan region.

C. Jeffrey, *Fl. Trop. E. Africa* 20 (1961).

***Sesuvium portulacastrum* (L.) L., *Syst. Nat.* 10th edn, 1058 (1759)**

Portulaca portulacastrum L., *Sp. Pl.* 1: 446 (1753). T: Curacao, S. America, *Hermann*; iso: BM-SL *n.v.*

Illustration: C. Jeffrey, *Fl. Trop. E. Africa* 21, fig. 7 (1961).

Suberect herb; stems to 1 m long, thick, smooth; nodes distant. Leaves linear, lanceolate or oblanceolate, connate at base, 10–70 mm long, 2–15 mm wide, smooth, fleshy, glossy green. Pedicels 3–15 mm long, thickening upwards. Perianth tube 3 mm long; lobes triangular, 6–9 mm long, with scarious margins, with a distinct fleshy dorsal mucro behind apex c. 1.5 mm long, green outside, pink to purple inside. Stamens numerous; filaments c. 6 mm long. Ovary ovoid; styles 3, c. 4 mm long; locules 3; ovules several per locule. Operculum subovoid, c. 8 mm long; smooth. Seeds several, pea-shaped to comma-shaped, c. 1.5 mm diam., smooth, black. Fig. 11 N–O

Occurs along the northern coast and islands of Australia, on mudflats or in sand, often associated with mangroves. Map 81.

W.A.: Broome, *W. V. Fitzgerald 118* (PERTH). N.T.: Wessel Islands, *P. K. Latz 3268* (CANB, MO, NT); Warangaiyu Lagoon, Elcho Is., *P. K. Latz 6276* (CANB, DNA, L, NT). Qld: Three Isles, *D. R. Stoddart 4503* (BRI).

Doubtful names

The names below have been recorded for Australia in the references cited. It has not been possible to assign them to taxa accepted in this treatment.

Galenia pallens Walp.: A. J. Ewart, *Victorian Naturalist* 24: 191 (1908) — recorded from Geelong, Vic.

Mesembryanthemum aurantiacum Haw.: J. M. Black, *Fl. S. Australia* 697 (1929) — apparently escaped from cultivation.

Mesembryanthemum capitatum Haw.: A. H. Haworth, *Revis. Pl. Suc.* 112 (1821) — ‘Habitat in Insula Van Diemen’.

Mesembryanthemum elongatum Haw.: A. H. Haworth, *Misc. Nat.* 40 (1803) — ‘raised from Botany Bay seeds’.

Mesembryanthemum sarmentosum Haw., *Syn. Pl. Succ.* 238 (1812) — ‘Habitat in Nova Hollandia’.

CACTACEAE

I. R. H. Telford

Shrubs or trees, sometimes scandent or epiphytic. Stems usually modified to succulent, compressed, angled or ridged cladodes, if present, often divided into stem-segments. Leaves alternate, subtending axillary areoles bearing hairs, glochids and spines, usually absent or rudimentary and caducous, rarely well-developed and persistent. Flowers actinomorphic or zygomorphic, hermaphrodite, mostly sessile, solitary on areoles, rarely pedicellate in panicles or corymbs. Hypanthium cup-shaped to elongate, areolate, bearing reduced or scale leaves. Perianth lobes many, appearing more or less free and inserted on hypanthium rim or united into a perianth tube, the outer lobes scale-like to sepeloid, the inner petaloid. Stamens many, inserted on hypanthium or perianth tube, free or the inner connate; anthers longitudinally dehiscent. Ovary usually inferior, immersed in hypanthium, rarely sub-superior; placentation parietal; placentas 3 to many; ovules numerous; style 1; stigmas 3 to many. Fruit mostly a fleshy berry. Seeds few to many, mostly compressed, smooth or minutely ornamented.

A family of c. 800 species in c. 85 genera, all restricted to the Americas except the genus *Rhipsalis* which occurs in Africa, Madagascar, Seychelles and Sri Lanka (perhaps by introduction). Represented in Australia only by introduction, by 8 genera and c. 32 species more or less naturalised.

Many species cultivated as ornamentals, especially species of *Cereus*, *Echinopsis*, *Mammillaria* and *Schlumbergera*. *Opuntia ficus-indica* (L.) Miller is cultivated for its edible fruit. Several species, particularly of the genera *Opuntia* (prickly pears) and *Eriocereus*, are aggressive weeds.

Generic and specific delimitation in Cactaceae has not been resolved satisfactorily. C. Backeberg, *Die Cactaceae* (1958–62) recognised 220 genera but L. Benson, *The Cacti of the United States and Canada* (1982) tentatively reduced this to 75 pending further study.

CACTACEAE

Collections of naturalised Cactaceae held in Australian herbaria are poor and several species are unrepresented. Some early distributional data are not supported by herbarium specimens.

N. L. Britton & J. N. Rose, *The Cactaceae* (1919–24), 2nd edn (1937) reprinted (1963); A. P. Dodd, *The biological campaign against prickly pear* (1940); C. Backeberg, *Die Cactaceae* (1958–62); D. R. Hunt, Cactaceae, in J. Hutchinson, *The Genera of Flowering Plants* 2: 427–467 (1967); J. Mann, *Cacti naturalised in Australia and their control* (1970); C. B. Osmond & J. Munro, Prickly Pear, in D. J. & S. G. M. Carr (eds), *Plants and Man in Australia* (1981); L. Benson, *The Cacti of the United States and Canada* (1982).

KEY TO TRIBES

- 1 Leaves more or less persistent; flowers pedicellate in panicles or corymbs (*Pereskia*) **Trib. I. PERESKIEAE**
- 1: Leaves absent or caducous; flowers more or less sessile on areoles, solitary
- 2 Areoles bearing glochids; perianth lobes and stamens inserted on hypanthium (*Opuntia*) **Trib. II. OPUNTIEAE**
- 2: Areoles lacking glochids; perianth united in elongate tube (in naturalised species); stamens inserted on perianth tube (*Acanthocereus*, *Eriocereus*, *Hylocereus*, *Nyctocereus*) **Trib. III. CACTEAE**

KEY TO GENERA

- 1 Leaves broad, persistent; upper stems not succulent; flowers in panicles or corymbs **1. PERESKIA**
- 1: Leaves mostly absent or caducous; upper stems succulent; flowers sessile on areoles, solitary
- 2 Stem-segments compressed **2. OPUNTIA**
- 2: Stem-segments not compressed, more or less cylindrical, ridged, ribbed, angled or winged
- 3 Areoles bearing glochids (spines and hairs may also be present) **2. OPUNTIA**
- 3: Areoles lacking glochids (spines and hairs usually present)
- 4 Stems short, more or less barrel-shaped **† ECHINOPSIS**
- 4: Stems elongate
- 5 Stems with 3 continuous ridges or wings (sometimes 5 or seedlings)
- 6 Stems climbing by aerial roots; hypanthium and perianth tube bearing broad scales, not spinose **3. HYLOCEREUS**
- 6: Stems lacking aerial roots; hypanthium and perianth tube bearing narrow scales, spinose **4. ACANTHOCEREUS**
- 5: Stems with 4 or more continuous ridges or ridges discontinuous
- 7 Stems 4–8-ridged or ridges discontinuous **5. ERIOCEREUS**
- 7: Stems 10-ridged
- 8 Stems 10–12-ridged; perianth white to pink **6. NYCTOCEREUS**
- 8: Stems 12–16-ridged; perianth red **† CLEISTOCACTUS**

The genera marked with a dagger (†) are keyed out here but will not be described in the text. *Echinopsis multiplex* (Pfeiffer & Otto) Zucc. persists in old gardens and has been reported near several Queensland towns. A recent sterile collection from near Jerilderie, N.S.W., may belong to this genus. *Cleistocactus baumannii* Lemaire has been reported as a garden escape (?naturalised) in Queensland.

Trib. I. PERESKIEAE

Trib. *Pereskieae* Britton & Rose, *Cact.* 1: 8 (1919).

Type: *Pereskia* Miller

Leaves mostly broad, more or less persistent. Areoles lacking glochids. Flowers epigynous or perigynous. Ovary sub-superior.

A tribe of two genera; only *Pereskia* naturalised in Australia.

1. PERESKIA

Pereskia Miller, *Gard. Dict.* abr. 4th edn (1754); named after N.F. de Peiresc (1580–1637), French scientist and patron of botany.

Type: *P. aculeata* Miller

Shrubs, trees or vines. Stems woody, not succulent. Leaves broad; axils bearing 2 stipular curved spines and short hairs, developing long straight spines with age. Flowers pedicellate, mostly in panicles or corymbs. Hypanthium subglobose to pyriform, bearing reduced leaves subtending spiny or hairy areoles. Perianth rotate. Stamens inserted on margin of cup-shaped apical depression of hypanthium. Ovary sub-superior, partly immersed in hypanthium. Fruit a spiny berry. Seeds obovate, minutely pitted; hilum oblique.

About 17 species in tropical and subtropical America. One species found occasionally in Australia as a garden escape.

**Pereskia aculeata* Miller, *Gard. Dict.* abr. 4th edn (1754)

T: not known.

Stems erect, arched or scrambling to 10 m. Spines 1 to many on older areoles, 2–6 cm long. Leaves ovate to lanceolate, 5–10 cm long, 2–5 cm wide. Flowers 2.5–5.5 cm diam.; petaloid lobes white to yellow. Fruit subglobose, 2–3 cm diam., yellow. Seeds 4 mm long, black. *Leaf Cactus*, *Barbados Gooseberry*.

Native to tropical America and the West Indies. Widely cultivated as an ornamental. Recorded as a garden escape in coastal Qld. A collection by F. Mueller s.n., without date, but possibly from the 1860s (MEL) is labelled 'Moreton's Bay, spontaneous', the first record of the species becoming naturalised in Australia. Map 82.

Qld: Moregatta Road, Millaa Millaa, 18 Jul. 1977, *R. Griffiths* (BRI); Brisbane River, Sherwood, *I. R. Telford 8744* (BRI, CBG, NSW).

Trib. II. OPUNTIEAE

Trib. *Opuntieae* Britton & Rose, *Cact.* 1: 24 (1919).

Type: *Opuntia* Miller

Leaves reduced, terete or scale-like, mostly caducous. Areoles bearing glochids. Perianth lobes appearing more or less free. Stamens inserted on hypanthium. Ovary inferior, submerged in hypanthium.

A tribe of 5 genera; only *Opuntia* naturalised in Australia.

2. OPUNTIA

Opuntia Miller, *Gard. Dict.* abr. 4th edn (1754); supposedly after the Greek town Opus where plants may have been naturalised or cultivated.

Type: *O. humifusa* (Raf.) Raf.

Nopalea Salm-Dyck, *Cact. Hort. Dyck.* 2nd edn, 63 (1850). T: *N. cochenillifer* (L.) Salm-Dyck = *Opuntia cochinellifera* (L.) Miller.

Cylindropuntia (Engelm.) Knuth in Backeberg & Knuth, *Kaktus—ABC* 117, 410 (1935). T: *C. arborescens* (Engelm.) Knuth = *Opuntia imbricata* (Haw.) DC.

Austrocylindropuntia Backeb., *Blatt Kakteenf.* 1938: [21] (1938). T: *A. exaltata* (Berger) Backeb. = *Opuntia exaltata* Berger.

Shrubs or small trees, erect or spreading. Stems succulent, jointed, the segments cylindroidal or compressed. Leaves scale-like, conical to terete, mostly caducous, subtending glochidiate, often spinose, areoles. Flowers solitary on areoles, sessile. Hypanthium obovoid, truncate, depressed at apex. Perianth lobes inserted on hypanthium apex, appearing more or less free (short floral tube fused to hypanthium apex, shed after flowering). Stamens inserted on hypanthium apex. Style usually thick, shorter or longer than perianth; stigmas 5–10. Fruit indehiscent. Seeds discoid to irregular; hilum basal or appearing lateral.

About 90 species in tropical and temperate North and South America and the Galapagos Islands. Widely cultivated, many as ornamentals or hedges, *O. ficus-indica* (L.) Miller for its edible fruit. Several species widely naturalised in tropical and warm temperate regions. In Australia, at least 20 species have been recorded as more or less naturalised. Many *Opuntia* spp. have been declared noxious weeds — the entire genus (except *O. ficus-indica*) in Qld, N.S.W., N.T. and parts of W.A., and several species in Vic.

Specific delimitation has not been resolved satisfactorily. Apomixis is common and wild hybrids are not rare, complicating the taxonomy.

N. L. Britton & J. N. Rose, *Nopalea, Opuntia, The Cactaceae* 1: 33–215 (1919); N. D. Murray, Ecology and evolution of the *Opuntia-Cactoblastis* Ecosystem in Australia, in *Ecological Genetics and Evolution* (1982); L. Benson, *Opuntia*, in *The Cacti of the United States and Canada* 269–533 (1982).

KEY TO SUBGENERA

- | | |
|---|--------------------------------|
| Stem-segments more or less cylindroidal | subg. I. Cylindropuntia |
| Stems-segments compressed (sometimes only slightly so in <i>O. aurantiaca</i>) | subg. II. Opuntia |

KEY TO SPECIES

- | | |
|--|-------------------------|
| 1 Stem-segments more or less cylindroidal | |
| 2 Stems prominently ridged, grooved or tuberculate; petaloid lobes red, pink or purple | |
| 3 Leaves more than 5 cm long | † O. subulata |
| 3: Leaves less than 3 cm long | |
| 4 Spines with papery sheath; petaloid lobes spreading, purple | 1. O. imbricata |
| 4: Spines lacking sheath; petaloid lobes erect, pink or red | 2. O. cylindrica |
| 2: Stems not prominently ridged or grooved; petaloid lobes yellow | 3. O. aurantiaca |
| 1: Stem-segments compressed | |
| 5 Upper stem-segments less than 4 cm wide | |

- 6 Upright shrub to 2 m, sometimes with definite trunk; petaloid lobes red, shorter than stamens † *O. dejecta*
- 6: Spreading shrub to 40 cm; petaloid lobes yellow, longer than stamens 3. *O. aurantiaca*
- 5: Upper stem-segments more than 4 cm wide
- 7 Cladodes tomentose or pubescent between areoles
- 8 Cladodes tomentose; tree to 8 m; spines absent or 1 or 2 per areole 14. *O. tomentosa*
- 8: Cladodes pubescent or papillate; shrub less than 2 m; spines absent
- 9 Areoles less than 3 mm diam.; glochids red-brown † *O. rufida*
- 9: Areoles more than 4 mm diam.; glochids yellow-brown 15. *O. microdasys*
- 7: Stem-segments glabrous between areoles, rarely minutely papillate
- 10 Spines absent or mostly 1 per areole on upper stem-segments
- 11 Spines 1 (rarely 2) per areole on most areoles of upper stem-segments; upper stem-segments glossy green 5. *O. vulgaris*
- 11: Spines mostly absent, rarely 1 per areole on upper marginal areoles; stem-segments mostly dull green, blue-green or glaucous
- 12 Upper stem-segments mostly more than 25 cm long; upright shrub or tree to 5 m
- 13 Petaloid lobes red, shorter than stamens; spines absent † *O. cochenillifera*
- 13: Petaloid lobes yellow or orange, longer than stamens; spines absent or present 11. *O. ficus indica*
- 12: Upper stem-segments mostly less than 25 cm long; shrub less than 2 m
- 14 Stems decumbent; stem-segments mostly 5–15 cm long 7. *O. humifusa*
- 14: Stems erect to spreading, not decumbent; stem-segments mostly 10–30 cm long
- 15 Petaloid lobes less than 25 mm long, orange-apricot; spines red-brown with paler tips 4. *O. paraguayensis*
- 15: Petaloid lobes more than 25 mm long, yellow, sometimes with red markings; spines white, grey, yellow or brown
- 16 Outer petaloid lobes yellow; areoles more than 2 cm apart; spines erect or spreading 9. *O. stricta*
- 16: Outer petaloid lobes yellow with median red stripes; areoles less than 2 cm apart; spines deflexed 16. *O. sp.*
- 10: Spines mostly 2 or more per areole on upper stem-segments
- 17 Spines deflexed, at least the longer spines on upper areoles of stem-segments
- 18 Stem-segments mostly more than 15 cm long; longest spines more than 2 cm long 8. *O. lindheimeri*
- 18: Stem-segments mostly less than 15 cm long; longest spines less than 2 cm long 16. *O. sp.*
- 17: Spines erect or spreading
- 19 Stem-segments orbicular, glaucous 12. *O. robusta*
- 19: Stem-segments obovate, ovate or elliptic, rarely sub-orbicular, green, blue-green or grey-green
- 20 Stem-segments more than 3 times as long as wide; spreading shrub to 40 cm 10. *O. sulphurea*
- 20: Stem-segments mostly less than 3 times as long as wide; erect or spreading shrub over 40 cm tall, or tree

- 21 Spines mottled yellow and red-brown, ageing brown; filaments pink **6. *O. elatior***
- 21: Spines yellow or white, ageing white, grey or brown; filaments yellow
- 22 Fruit obovoid, often with narrowed stalk-like base
- 23 Seeds 3–4 mm diam. **8. *O. lindheimeri***
- 23: Seeds 4–5 mm diam. **9. *O. stricta***
- 22: Fruit barrel-shaped, lacking stalk-like base
- 24 Petaloid lobes yellow-orange to pink; fruit yellow-orange to red **11. *O. ficus-indica***
- 24: Petaloid lobes yellow; fruit pink to purple **13. *O. streptacantha***

The species marked with a dagger (†) are keyed out here but will not be described further in the text. Most are old records not supported by herbarium specimens. Several may have been eradicated. *Opuntia cochenillifera* (L.) Miller has been reported from central Qld (J. Mann, *Cacti naturalised in Australia and their control* 32 (1970), as *Nopalea cochenillifera* (L.) Salm-Dyck). *O. dejecta* Salm-Dyck has been recorded from near Rockhampton, Qld (J. Mann, *loc. cit.* as *Nopalea dejecta* (Salm-Dyck) Salm-Dyck. *O. rufida* Engelm. was recorded from Blinman, S.A. in 1946. *O. subulata* (Muehlenpf.) Engelm. was recorded (?naturalised) from Gayndah, Qld, in 1914; a recent collection has been made in the Barmera area, S.A. Other recent collections, mainly sterile unicates from the Barmera area, S.A., include *O. ?erinacea* Engelm. & Bigelow, *O. ?leptocaulis* DC. and *O. tunicata* (Lehm.) Link & Otto, and need further investigation.

Subg. I. *Cylindropuntia*

Opuntia* subg. *Cylindropuntia Engelm., *Proc. Amer. Acad. Arts* 3: 302 (1857).

Cylindropuntia (Engelm.) Knuth in Backeberg & Knuth, *Kaktus—ABC* 117, 410 (1935). T: *Opuntia arborescens* Engelm. = *O. imbricata* (Haw.) DC.

Stems cylindrical. Spines often more or less encased in a papery sheath.

1. **Opuntia imbricata* (Haw.) DC., *Prodr.* 3: 471 (1828)

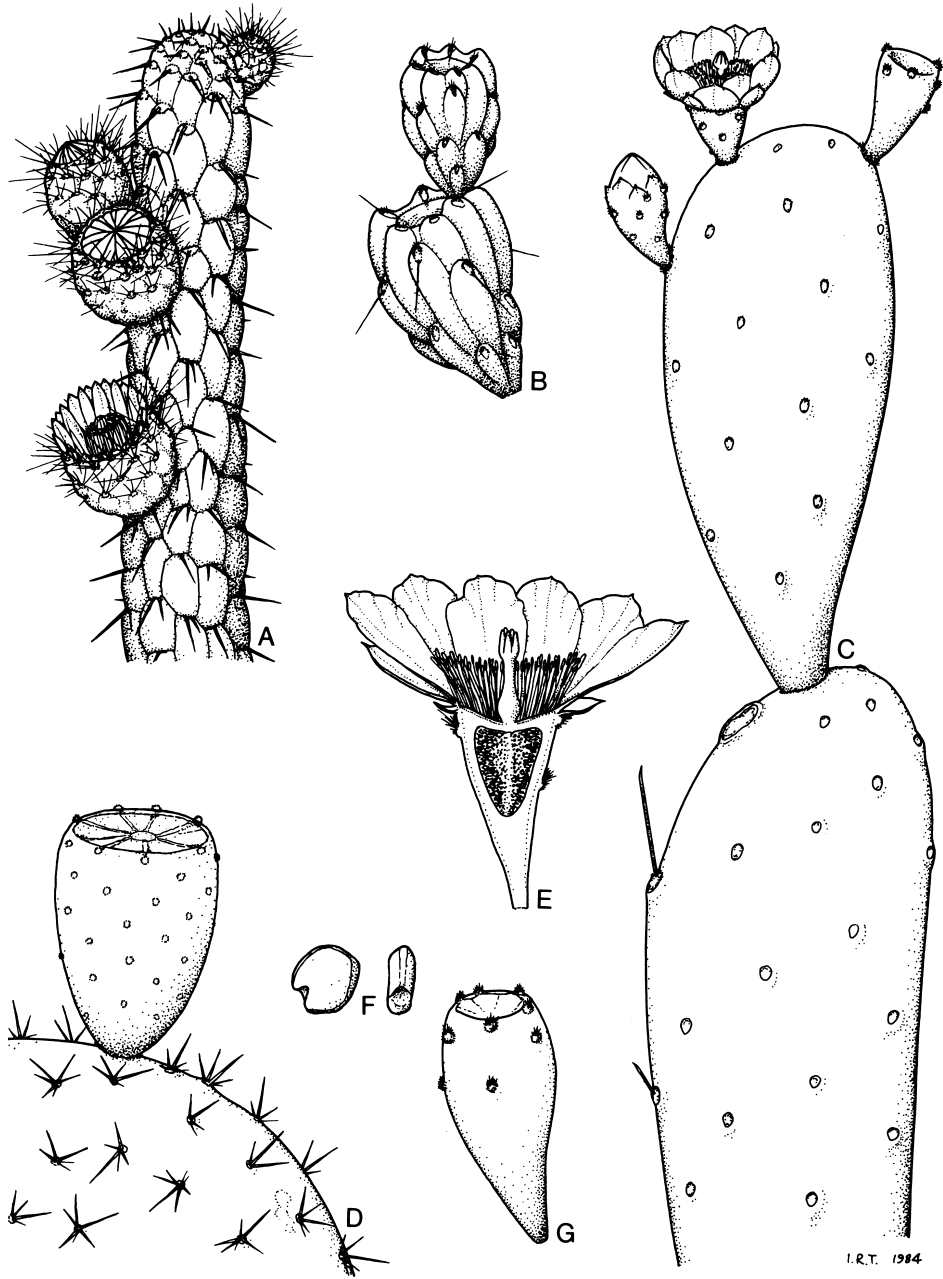
Cereus imbricatus Haw., *Rev. Pl. Succ.* 70 (1821); *Cylindropuntia imbricata* (Haw.) Knuth in Backeberg & Knuth, *Kaktus—ABC* 125 (1935). T: not known, *vide* Britton & Rose, *Cact.* 1: 64 (1919).

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 503 (1981).

Erect or spreading shrub or tree to 3 m. Stems much-jointed and branched; upper segments cylindrical, 5–35 cm long, 1.5–3.5 cm diam., with prominent discontinuous ridges, glabrous, pale grey-green. Leaves terete, 4–25 mm long. Spines 2–20 per areole, to 28 mm long, spreading, pale to yellow or brown, with papery sheaths; glochids yellow. Flowers 3–5 cm diam.; petaloid lobes spreading, purple. Fruit obovoid with deeply depressed apex, 2.5–7 cm long, 2.5–4 cm diam., tuberculate, green to yellow, often persisting and enlarging, sometimes proliferous. Seeds 3–4 mm diam., pale brown. *Devils-ropes Cactus*, *Chain-link Cactus*. Fig. 14B.

Native from southern central U.S.A. to central Mexico. Once cultivated in SE Australia especially in mining towns, now widely naturalised in south-eastern S.A., south-eastern Qld, N.S.W. and Vic. Map 83.

S.A.: Parachilna Gorge, 17 Aug. 1982, *N. D. Murray* (CBG). Qld: Gladfield, 22 km NE of Warwick, *I. R. Telford* 8872 (BRI, CBG, NSW). N.S.W.: Nymagee village, *G. M. Cunningham* 5365 & *P. L. Milthorpe* (NSW); Cobar Common, 1 Dec. 1982, *J. R. Hosking* (CBG). Vic.: Merbein South, *E. M. Canning* 5253 & *S. Corbett* (AD, CBG, MEL).



I.R.T. 1984

Figure 14. *Opuntia*. **A**, *O. cylindrica*, flowering stem $\times 0.5$ (I. Telford 8884, CBG). **B**, *O. imbricata*, proliferous fruit $\times 0.5$ (I. Telford 8750, CBG). **C**, *O. paraguayensis*, flowering stem $\times 0.5$ (E. Canning 5254, CBG). **D**, *O. streptacantha*, fruit $\times 0.5$ (I. Telford 8813, CBG). **E–G**, *O. stricta* var. *stricta*. **E**, section through flower $\times 0.75$; **F**, seeds $\times 3$; **G**, fruit $\times 0.5$ (E–G, I. Telford 8870, CBG).

2. *Opuntia cylindrica (Lam.) DC., *Prodr.* 3: 471 (1828)

Cactus cylindricus Lam., *Encycl.* 1: 539 (1783); *Austrocylindropuntia cylindrica* (Lam.) Backeb., *Cactaceae* 1: 12 (1942). T: not known.

Erect shrub to 2 m. Upper stem-segments cylindroidal, 10–70 cm long, 1.5–5 cm diam., with rounded protruberances, glabrous, green. Leaves terete, to 15 mm long, green. Spines 1–6 per areole, spreading to deflexed, to 20 mm long, lacking sheaths, pale yellow, brown or grey; glochids pale, mixed with long white caducous hairs. Flowers 2–3.5 cm diam.; petaloid lobes erect, pink to red. Fruit obovoid with deeply depressed apex, 3–4 cm long, 2–4 cm diam., tuberculate, spinose, green to orange, often persisting and proliferous. Seeds 4–6 mm diam. Fig. 14A.

Native to Peru and Equador. Naturalised occasionally in N.S.W. and Vic. as a garden escape. Map 84.

N.S.W.: 'Cunningham's Plains', Curringar, Sept. 1955, *S. Davison* (NSW). Vic.: Werribee R., Cobble Dick Ford, *I. R. Telford 8884* (CBG, MEL).

Subg. II. Opuntia**Opuntia** Miller subg. **Opuntia**

Stem-segments compressed; spines lacking sheaths.

3. *Opuntia aurantiaca Lindley, *Bot. Reg.* 19: t. 1606 (1833)

T: not designated.

[*Opuntia ferox auct. non* Haw.; F. M. Bailey, *Queensland Fl.* 2: 704 (1900)]

Spreading shrub to 40 cm. Stems easily breaking at joints; stem-segments compressed to sub-cylindroidal, 3.5–30 cm long, 2.5–4 cm wide, glabrous, green to purplish. Leaves conical, 3–4 mm long. Spines 3–7 per areole, to 4 cm long, red to red-brown, ageing white to pale brown; glochids brown. Flowers 2.5–5 cm diam.; petaloid lobes spreading, yellow. Fruit obovoid with depressed apex, 2.5–3.5 cm long, red to purple. Seeds not seen. *Tiger Pear*.

Native to Uruguay. Widely naturalised in eastern Australia from central Qld to northern Vic. Found in pasture, forest and woodland; common along stream banks where stem-segments are dispersed by floods. Map 85.

Qld: Di Di Stn, Proston, Feb. 1972, *J. P. Duff* (BRI). N.S.W.: Wiralong Stn, 58 km WSW of Nymagee, 1 Dec. 1982, *J. R. Hosking* (CBG); 'Camden Park', Camden, *K. L. Wilson 3173* (NSW). Vic.: near Rushworth, Mar. 1980, *A. M. Crosbie* (MEL).

4. *Opuntia paraguayensis K. Schum., *Monatsschr. Kakteenk.* 9: 149 (1899)

T: not known.

Opuntia bonaerensis Speg., *Contr. Fl. Tandil.* 18 (1904). T: not known.

Erect shrub to 2 m. Upper stem-segments obovate, 12–25 cm long, 4–9 cm wide, glabrous, green. Spines mostly lacking, rarely 1 per areole, to 4 cm long, slightly curved, dark red-brown, the apex yellow; glochids red-brown. Flowers 3–4 cm diam.; petaloid lobes erect to slightly spreading, orange-apricot. Fruit obovoid with depressed apex, 4–5 cm long, 2–2.5 cm diam., purple. Seeds yellow-brown, 2.5–3 cm long. Fig. 14C.

Native to Paraguay. Naturalised in south-western N.S.W. and adjacent S.A. and Vic., in woodland and bluebush shrubland. Map 86.

S.A.: Barmera area, Murray R., Aug. 1980, *C. Schrank* (AD, CBG). N.S.W.: W outskirts of Silverton, 2 Dec. 1982, *J. R. Hosking* (CBG, NSW); Wentworth, Lock 10, 2 Dec. 1982, *J. R. Hosking* (CBG, NSW). Vic.: Merbein South, *E. M. Canning 5254* & *S. Corbett* (CBG, MEL); Redcliffs, 14 Aug. 1982, *N. D. Murray* (CBG).

5. *Opuntia vulgaris Miller, *Gard. Dict.* 8th edn, no. 1 (1768)

T: not designated; 'based on Bauhin's figure, *Hist. Pl.* 1: 154 (1650), which was taken from Lobelius', *vide* Britton & Rose, *Cactaceae* 1: 156 (1919).

Opuntia monacantha (Willd.) Haw., *Syn. Pl. Succ.* 81 (1919); *Cactus monacanthos* Willd., *Enum. Hort. Berol. Suppl.* 33 (1814). T: not designated.

Illustrations: W. T. Parsons, *Noxious Weeds Victoria* figs 22–23 (1973).

Erect shrub or tree to 6 m, mostly 2–3 m. Lower stem-segments thickened forming trunk; upper segments drooping, obovate to narrowly obovate, 10–35 cm long, 6–12 cm wide, with sinuate margins, glabrous, shining green. Leaves conical, 2–3 mm long, red. Spines 1 or 2 per areole, to 5 cm long, (to 10 per areole, 10 cm long on trunk) white to brown with yellow or red markings; glochids yellow to reddish brown, caducous. Flowers 3–5.5 cm diam.; petaloid lobes spreading, yellow, the outer with red markings. Fruit obovoid with depressed apex, 5–7.5 cm long, 2–3 cm diam., reddish purple, long persistent, sometimes proliferous. Seeds 3.5–4 mm long, pale brown. *Drooping Prickly Pear*, *Drooping Tree Pear*, *Smooth Tree Pear*.

Native to subtropical eastern South America. Widely naturalised in coastal south-western W.A., south-eastern S.A., Qld, N.S.W. and Vic., in open forest, woodland and pasture. Map 87.

S.A.: Barmera area, Apr.–May 1980, *C. Schrank* (AD). Qld: Four Mile Beach, 1 km S of Port Douglas, *I. R. Telford 9464 & G. Butler* (BRI, CBG). N.S.W.: estuary of Tuross R., S bank, E of Bodalla, 2 Jan. 1983, *E. Mullins* (CBG, NSW). Vic.: c. 6 km from Castlemaine on road to Fryerstown, *I. R. Telford 8887* (CBG, MEL, NSW).

6. *Opuntia elatior Miller, *Gard. Dict.* 8th edn (1768)

T: not known.

Erect shrub or tree to 3 m. Upper stem-segments obovate, 12–28 cm long, 6–16 cm wide, glabrous, dull green. Spines 2–6, rarely 1, per areole, erect to spreading, to 4 cm long, mottled yellow and red-brown, ageing brown; glochids yellow-brown. Flowers 3–5 cm diam.; petaloid lobes slightly spreading, orange-pink. Filaments pink. Fruit obovoid with deeply depressed apex, 3.5–4.5 cm long, 2–3 cm diam. Seeds 4 mm diam.

Native of Panama and northern South America; sporadically naturalised through inland southern Australia; in N.T. near Alice Springs, in N.S.W. at Broken Hill and in the Hunter Valley, and in the Murray region of S.A. Also recorded from Yelarbon and Brisbane, Qld, and in 1887 from the Liverpool–Windsor area, N.S.W., *vide* J. Mann, *Cacti naturalised in Australia and their control* 31 (1970). Map 88.

N.T.: Old Telegraph Stn, Alice Springs, *R. Swinbourne 771* (BRI, NSW, NT). S.A.: Barmera area, 7 May 1980, *C. Schrank* (AD). N.S.W.: Broken Hill, 2 Dec. 1982, *J. R. Hosking* (CBG); Mt Dangar, Dec. 1983, *J. R. Hosking* (CBG).

7. *Opuntia humifusa (Raf.) Raf., *Med. Fl.* 2: 247 (1830)

Cactus humifusus Raf., *Ann. Nat.* 15 (1820). T: not designated.

Opuntia opuntia (L.) Coulter, *Contr. U.S. Natl. Herb.* 3: 432 (1896), *nom. illeg.*; *Cactus opuntia* L., *Sp. Pl.* 1: 468 (1753). T: not known; the lectotype chosen by L. Benson, *Cacti U.S. Canada* 923 (1982), is an error and may be *O. ficus-indica*.

Opuntia compressa (Salisb.) Macbride, *Contr. Gray Herb.* 65: 41 (1922); *Cactus compressus* Salisb., *Prodr.* 348 (1796), *nom. superfl.* for *C. opuntia* L. T: as for *C. opuntia* L.

Decumbent or spreading shrub to 40 cm tall. Stem-segments orbicular to broadly obovate, 4–17 cm long, 4–10 cm wide, often transversely wrinkled, glabrous, dull green. Leaves conical, 4–8 mm long. Spine 1 per areole, to 5 cm long, pale brown to red-brown, or spines absent; glochids yellow to brown. Flowers 5–9 cm diam.; petaloid lobes spreading, yellow, orange to red at base. Fruit obovoid with depressed apex, 3–5 cm long, 1–2 cm diam., red. Seeds 4–5 mm long, pale brown. *Creeping Pear*.

Native to eastern U.S.A. Naturalised in the middle Hunter Valley, N.S.W., in open forest and woodland. Map 89.

N.S.W.: 4 km from Singleton towards Muswellbrook, *I. R. Telford* 8882 (BRI, CBG, MEL, NSW).

Hybridises in south-eastern U.S.A. with *O. stricta*. Apparent hybrids occur in the Hunter Valley where both species occur.

8. **Opuntia lindheimeri* Engelm., *Boston J. Nat. Hist.* 6: 207 (1850)

T: New Braunfels, Texas, 1845, *F. Lindheimer*; lecto, MO n.v., *vide* L. Benson, *Cacti U.S. & Canada* 930 (1982).

Erect or spreading shrub to 3 m, mostly under 1.5 m. Stem-segments obovate to sub-orbicular, 12–30 cm long, 8–18 cm wide, glabrous. Spines 2–12, rarely 1, per areole, rarely almost absent, spreading to deflexed, to 4.5 cm long, yellow; glochids yellow to brown. Flowers 5–7 cm diam.; petaloid lobes widely spreading, yellow. Fruit obovoid with depressed apex, 3–7 cm long, 2.5–3.5 cm wide, purple. Seeds 3–4 mm diam., pale brown.

A species of 5 varieties. Most Australian material appears referable to the extremely variable var. *lindheimeri*. *O. lindheimeri* var. *linguiformis* (Griffiths) L. Benson, with elongate stem-segments, has recently been collected (?naturalised) from near Barmera, S.A.

Native to NE Mexico and adjacent U.S.A. Naturalised in S.A. in the Murray region and north-western Vic.; also collected from Parachilna, Flinders Ranges, in 1937. Map 90.

S.A.: Barmera area, Murray R., Aug. 1980, *C. Schrank* (AD, CBG); Riverland, 12 Nov. 1981, *C. Schrank* (AD, CBG). Vic.: 2 km W of Merbein, 5 Dec. 1978, *G. M. Cunningham & P. L. Milthorpe* (NSW).

9. **Opuntia stricta* (Haw.) Haw., *Syn. Pl. Succ.* 191 (1812)

Cactus strictus Haw., *Misc. Nat.* 188 (1803). T: illustration by Redouté in DC., *Pl. Hist. Succ.* t. 138 (1804), lecto, *vide* L. Benson, *Cacti U.S. Canada* 931 (1982).

[*Opuntia vulgaris* auct. non Miller: F. M. Bailey, *Queensland Fl.* 2: 704 (1900)]

Spreading to erect shrub to 2 m. Basal stem-segments sometimes thickened, trunk-forming; upper segments elliptic to obovate, 10–35 cm long, 7–20 cm wide, glabrous, dull green to grey-green. Leaves conical, 4.5–6 mm long. Spines up to 11 per areole, 1–6 cm long, yellow to brown; glochids yellow. Flowers 5–6.5 cm diam.; petaloid lobes spreading, yellow. Fruit obovoid with depressed apex, 4–6 cm long, 2.5–4 cm diam., purple. Seeds 4–5 mm long, pale brown.

Native to tropical and subtropical coast of eastern North America, Bermuda, West Indies and adjacent South America. Wild native populations show morphological intergradation in habit and spininess. Several genotypes appear to have been introduced into Australia (N.D. Murray in *Ecological Genetics and Evolution* 22, 1982) some of which have been interpreted as distinct species. Widely naturalised in all Australian mainland States. From garden escapes of the mid-1800s, by the mid-1920s *O. stricta* had infested c. 24 million hectares of central and southern Qld and northern N.S.W. Map 91.

The biological control of prickly pear, largely by the introduction of the Phycitid moth *Cactoblastis cactorum* Berg from Argentina, is one of the most spectacular successes of economic entomology and is documented by A. P. Dodd, *The biological campaign against prickly pear* (1940), J. Mann, *Cacti naturalised in Australia and their control* (1970) and C. B. Osmond & J. Munro in D. J. & S. G. M. Carr (eds), *Plants and Man in Australia* 194–222 (1981). A species of 2 varieties.

The varieties are mapped together in this account.

Spines absent, sometimes 1 per areole on margin of stem-segments

9a. var. stricta

Spines 1–11 per areole on most areoles

9b. var. dillenii

9a. *Opuntia stricta (Haw.) Haw. var. **stricta**

Opuntia inermis (DC.) DC., *Prodr.* 3: 473 (1828); *Cactus opuntia* var. *inermis* DC., *Plant. Hist. Succ.* 138 (1804). T: illustration by Redouté in DC., *Pl. Hist. Succ.* t. 138 (1804); lecto, *fide* L. Benson, *Cacti U.S. Canada* 931 (1982).

Opuntia bentonii Griff., *Annual Rep. Missouri Bot. Gard.* 22: 25 (1912). T: 'from a cultivated specimen ..., US 2607635–2607638'; type: US, *n.v.*, *fide* L. Benson, *op. cit.* 931 (1982).

Illustrations: W. T. Parsons, *Noxious Weeds Victoria* figs 20–21 (1973); H. E. Kleinschmidt & R. W. Johnson, *Weeds Queensland* 210 (1978).

Upper stem-segments narrowly elliptic to obovate, 15–25 cm long, 7–13 cm wide. Areoles lacking spines, sometimes 1 per areole on marginal areoles. *Common Prickly Pear*, *Smooth Pest Pear*. Fig. 14E–G.

Native to E coast of North America from the Gulf Coast of Mexico to SE Virginia, Florida, Cuba and Bahamas; widely naturalised in north-western W.A., south-eastern S.A., Qld, N.S.W. and Vic., in many habitats from open forest to coastal dune communities.

W.A.: West Lewis Is., Dampier Archipelago, *R. D. Royce 7405* (PERTH). N.T.: Hermannsburg, *B. G. Thomson 274* (NT). Qld: 7 km from Millmerran towards Western Ck, *I. R. Telford 8814* (BRI, CBG). N.S.W.: 3 km WSW of Araluen, *I. R. Telford 8893* & *M. Rafferty* (CBG, NSW). Vic.: 2.5 km from Rushworth along road to Stanhope, *I. R. Telford 8889* (CBG, MEL).

Natural hybrids with *O. humifusa* occur in south-eastern U.S.A. Putative hybrids have been observed in the Hunter Valley, N.S.W., where both species are naturalised.

9b. *Opuntia stricta var. **dillenii** (Ker Gawler) L. Benson, *Cact. Succ. J. (Los Angeles)* 41: 126 (1969)

Opuntia dillenii (Ker Gawler) Haw., *Suppl. Pl. Succ.* 79 (1819); *Cactus dillenii* Ker Gawler, *Bot. Reg.* 3: t. 255 (1818). T: t. 255 in *Bot. Reg.* 3 (1818), lecto *n.v.*, *fide* L. Benson, *loc. cit.*

Upper stem-segments obovate, 10–35 cm long, 12–20 cm wide. Spines 1–11 per areole on most areoles. *Spiny Pest Pear*.

Native to E coast of North America from Mexico to Florida, S. Carolina, Bermuda, West Indies and adjacent South America; sporadically naturalised in Qld and N.S.W.

Qld: 9 km from Raglan towards Rockhampton, *I. R. Telford 9143* & *G. Butler* (BRI, CBG).

Intermediates between var. *dillenii* and var. *stricta* have been collected in Qld and N.S.W., e.g.: 3 km WSW of Araluen, N.S.W., *I. R. Telford 8894* & *M. Rafferty* (CBG).

10. *Opuntia sulphurea G. Don ex Loudon, *Hort. Brit.* 196 (1830)

T: not designated.

Spreading or erect shrub to 40 cm. Stem-segments narrowly obovate, 8–30 cm long, 3–7 cm wide, glabrous, grey-green. Leaves conical, 2.5–3.5 mm long. Spines 1–8 per areole, to 4 cm long, white and pink, ageing white to grey; glochids brown. Flowers and fruit not seen.

Native to Argentina and Chile. Naturalised in localised areas of southern Qld, in disturbed woodland. Map 92.

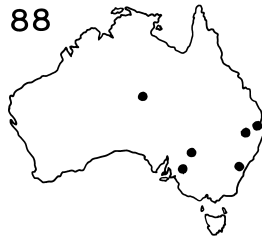
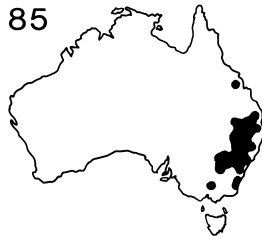
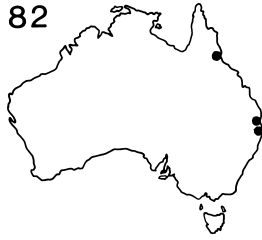
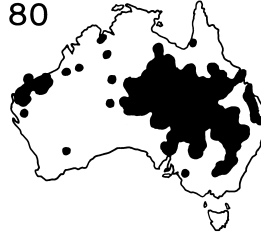
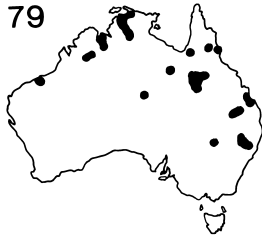
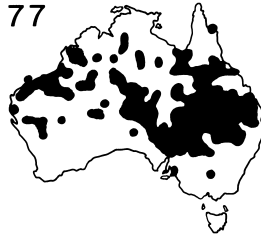
Qld: SE outskirts of Wallumbilla, *I. R. Telford 9509* & *G. Butler* (CBG); Crooked Ck, 5 km N of Goondiwindi, *I. R. Telford 9510* & *G. Butler* (BRI, CBG).

Tentatively placed here following earlier Australian authors. Fertile collections required to confirm identity.

11. *Opuntia ficus-indica (L.) Miller, *Gard. Dict.* 8th edn, no. 2 (1768)

Cactus ficus-indica L., *Sp. Pl.* 1: 468 (1753). T: ?S; the type cited for *Opuntia opuntia* by L. Benson, *Cacti U.S. Canada* 923 (1982) is probably referable to *O. ficus-indica*.

Opuntia megacantha Salm-Dyck, *Hort. Dyck.* 363 (1834). T: not preserved.



76. *Trianthema oxycalyptra*
var. *sessiliflora*

79. *Trianthema portulacastrum*

82. *Pereskia aculeata*

85. *Opuntia aurantiaca*

88. *Opuntia elatior*

77. *Trianthema triquetra*
var. *triquetra*

80. *Zaleya galericulata*

83. *Opuntia imbricata*

86. *Opuntia paraguayensis*

89. *Opuntia humifusa*

78. *Trianthema triquetra*
var. *clavata*

81. *Sesuvium portulacastrum*

84. *Opuntia cylindrica*

87. *Opuntia vulgaris*

90. *Opuntia lindheimeri*

Erect shrub to 5 m. Lower stem-segments thickened, sometimes trunk-forming; upper segments suborbicular to obovate, 25–50 cm long, 10–20 cm wide, glabrous, green, blue-green or glaucous. Leaves conical, 3 mm long. Spines lacking or 1–6 per areole, to 3 cm long, sometimes flattened or deflexed, white to pale yellow; glochids yellow, caducous. Flowers 7–10 cm diam.; petaloid lobes spreading, yellow to orange, pink-tinged. Fruit obovoid to ovoid with depressed apex, 5–9 cm long, the apex depressed, yellow orange or red. Seeds 4–5 mm long, grey or brown. *Indian Fig*.

Probably native to Mexico. Widely cultivated for edible fruit. Sporadically naturalised as a garden escape in S.A., Qld, N.S.W. and Vic. Map 93.

S.A.: Barmera area, Murray R., Aug. 1980, C. Schrank (AD). N.S.W.: off Cornish St, Broken Hill, 2 Dec. 1982, J. R. Hosking (CBG).

Cultivation and selection since prehistoric times in tropical America have resulted in many horticultural variants. Several genotypes have been introduced into Australia. Most commonly grown is a spineless cultivar. Some naturalised populations belong to the spiny variant previously known as *O. megacantha*. *Opuntia amyoclea* Tenore reported from 'Glenmore' near Rockhampton last century, and plants known as *Joconoxtle* also from central Qld, probably represent other spiny variants. Here also may belong *O. pachona* Griffiths, recorded from Pallamallawa, N.S.W. in 1923 (J. Mann, *Cacti naturalised in Australia and their control* 30, 1970).

12. **Opuntia robusta* Wendl. ex Pfeiffer, *Enum. Diagn. Cact.* 165 (1837)

T: not known.

Illustrations: W. T. Parsons, *Noxious Weeds Victoria* figs 18–19 (1973).

Erect shrub to 3.5 m; stem-segments orbicular, 18–35 cm diam., glabrous, glaucous. Spines 1–10 per areole, to 4 cm long, white to yellow; glochids yellow to brown. Flowers 5–9 cm diam.; petaloid lobes spreading, pale yellow. Fruit ovoid to obovoid, deeply depressed at apex, 6–8 cm long, pink to purple. Seeds 4–5 mm long, pale brown. *Wheel Cactus*, *Camuesa*. Fig. 16.

Native to central America. Naturalised in scattered areas of south-eastern S.A., south-western N.S.W. and central and western Vic., in woodland. Map 94.

S.A.: c. 22.6 km from Alford towards Port Broughton, E. M. Canning 5492 & S. Corbett (AD, CBG). N.S.W.: 1 km NE of Broken Hill drive-in theatre, 2 Dec. 1982, J. R. Hosking (CBG). Vic.: 2 km W of Merbein, 5 Dec. 1978, G. M. Cunningham & P. L. Milthorpe (NSW); 2.5 km from Maldon on road to Maryborough, I. R. Telford 8888 (CBG, MEL).

13. **Opuntia streptacantha* Lemaire, *Cact. Gen. Nov.* 62 (1839)

T: not known.

Erect shrub, rarely a tree, to 4 m. Basal stem-segments thickened, trunk-like; upper segments broadly obovate, 20–35 cm long, 14–30 cm wide, glabrous, dull green to grey-green. Spines 3–20 per areole, to 25 mm long, pale yellow to dark grey; glochids yellow. Flowers 5–7 cm diam.; petaloid lobes spreading, yellow. Fruit obovoid, 5.5–8 cm long, 3–5 cm diam., apex truncate to slightly depressed, pink to purple. Seeds 3–4 mm long, pale brown. *Gracemere Pear*, *Westwood Pear*. Fig. 14D.

Native to Mexico. Naturalised in central Qld from Rockhampton W to Blackwater and S along the Dawson R. Map 95.

Qld: 5 km SE of Gracemere, I. R. Telford 8753 (CBG); 2 km from Moura towards Dawson R. crossing, I. R. Telford 8813 (BRI, CBG, NSW).

14. *Opuntia tomentosa Salm-Dyck, *Obs. Bot.* 8 (1822)

T: Salm's specimens not preserved, *vide* L. Benson, *Cacti U.S. Canada* 933 (1982).

Erect shrub or tree to 8 m tall. Lower stem-segments thickened, trunk-forming; upper segments obovate, 15–30 cm long, 7–12 cm wide, tomentose, dull dark green. Spines mostly lacking, rarely 1 or 2 per areole, 3–25 mm long, grey; glochids yellow. Flowers 4–5 cm diam.; petaloid lobes spreading, orange. Fruit 3–4 cm long, 2.5–3 cm diam., the apex shallowly depressed, tomentose, red. Seeds 3–5 mm diam., pale brown. *Velvet Tree Pear.* Fig. 18.

Native to central Mexico; widely naturalised through central and southern Qld and north-eastern N.S.W., rarely in south-eastern S.A., often in clay soils associated with disturbed vine forest or brigalow (*Acacia harpophylla*) scrub. Map 96.

S.A.: Barmera area, Murray R., Aug. 1980, *C. Schrank* (AD). Qld: 5 km SE of Gracemere, *I. R. Telford* 8752 (BRI, CBG, NSW); 8 km S of Warwick, *I. R. Telford* 8871 (BRI, CBG). N.S.W.: Ottleys Ck, N of Coolatai, 1 Oct. 1983, *A. Glenn s.n.* (CBG, NSW).

15. *Opuntia microdasys (Lehm.) Pfeiffer, *Enum. Diagn. Cact.* 154 (1837)

Cactus microdasys Lehm., *Ind. Sem. Hort. Hamburg* 1827: 16 (1827). T: not designated.

Spreading shrub to 60 cm. Stem-segments broadly obovate, 8–15 cm long, 6–12 cm wide, pubescent, yellow-green. Spines absent; glochids yellow-brown. Flowers 4–5 cm diam.; petaloid lobes spreading, yellow to pink. Fruit subglobose, c. 3 cm diam., red. Seeds 2–3 mm diam.

Native to Mexico. Naturalised near Barmera, S.A., and near Cuttabri and Narrabri, N.S.W. Map 97.

S.A.: Barmera district, 28 Apr. 1980, *C. Schrank* (AD). N.S.W.: c. 25 km SW of Wee Waa, 14 Jan. 1924, *W. B. Gurney* (NSW).

16. *Opuntia sp.

Spreading to erect shrub to 50 cm. Stem-segments broadly elliptic to obovate, 9–18 cm long, 3.5–8 cm wide, more or less papillate. Spines 1 or 2 per upper areole, deflexed, 5–15 mm long, white, yellow or brown, rarely absent; glochids yellow-brown. Flowers 3–5 cm diam.; petaloid lobes widely spreading, yellow, the outer with median red stripes. Fruit not seen.

This may represent *O. lubrica* Griffiths. Spineless plants superficially resemble *O. rufida* and old records of that species may belong here.

Rarely naturalised in the Flinders Ranges, S.A., in western N.S.W. and in north-western Vic. Map 98.

S.A.: Mermerna Ruins, c. 50 km S of Parachilna, *J. Z. Weber* 736 (AD). N.S.W.: Cobar, 1 Dec. 1982, *J. R. Hosking* (CBG); 8 km from Broken Hill on Silverton road, 2 Dec. 1982, *J. R. Hosking* (CBG). Vic.: 2 km W of Merbein, 5 Dec. 1978, *G. M. Cunningham & P. L. Milthorpe* (NSW).

Trib. III. CACTEAE

Leaves absent or rudimentary, caducous. Areoles lacking glochids. Perianth tubular. Stamens inserted in tube. Ovary inferior, submerged in hypanthium.

A tribe of c. 80 genera; 4 genera naturalised in Australia.

Generic delimitation in this tribe remains uncertain. L. Benson in *Cactaceae of the United States and Canada* 539 (1982) regarded the earlier classifications as artificial and retained *Cereus* Miller *sens. lat.* pending further investigation. In this treatment the segregate genera *Hylocereus* (A. Berger) Britton & Rose, *Acanthocereus* (Engelm. ex A. Berger) Britton & Rose and *Eriocereus* (A. Berger) Riccob. are maintained.

3. HYLOCEREUS

Hylocereus (A. Berger) Britton & Rose, *Contr. U.S. Natl. Herb.* 12: 428 (1909); from the Greek *hyle* (forest) and *Cereus* (a genus of Cactaceae from which this genus was segregated); in reference to the forest habitat of the species.

Type: *Hylocereus triangularis* (L.) Haw.

Stems climbing by aerial roots, 3-angled, ridged or winged. Areoles bearing short spines. Flowers nocturnal. Perianth funnel-shaped; hypanthium and perianth tube bearing narrowly ovate scale leaves; petaloid lobes obovate, spreading. Fruit ellipsoidal or ovoid, fleshy.

A genus of 17 species in tropical America; one species naturalised in Australia.

****Hylocereus undatus* (Haw.) Britton & Rose in Britton, *Fl. Bermuda* 256 (1918)**

Cereus undatus Haw., *Philos. Mag. Ann. Chem.* 110 (1830). T: not designated

[*Cereus triangularis* auct. non Haw.; F. M. Bailey, *Queensland Fl.* 2: 703 (1900)]

Stems climbing to 15 m. Stem-segments to 1.5 m long, 3–8 cm diam.; margins of ridges coarsely crenate. Areoles with 2–5 spines 1–5 mm long. Flowers 15–25 cm diam., 15–30 cm long; petaloid lobes white to pink at base. Fruit 7–12 cm long, 5–8 cm diam., red; pulp white. Seeds obovate, 2 mm long, black. *Night-blooming Cereus*, *Queen of the Night*.

Native of tropical America. Persists in old gardens and has become established around refuse tips in coastal Qld and north-eastern N.S.W. Map 99.

Qld: Coringa, c. 25 km WSW of Biggenden, 23 Oct. 1967, G. W. C. Marlowe (BRI); Long Pocket, below Meiers Road, I. R. Telford 8739 (CBG). N.S.W.: Richmond Hill, near Lismore, 9 Jan. 1969, C. Faulkner (NSW).

4. ACANTHOCEREUS

Acanthocereus (Engelm. ex A. Berger) Britton & Rose, *Contr. U.S. Natl. Herb.* 12: 432 (1909); from the Greek *acanthos* (spine) and *Cereus* (a genus of Cactaceae from which this was segregated); in reference to the spiny nature of the plant.

Cereus subsect. *Acanthocereus* Engelm. ex A. Berger, *Annual Rep. Missouri Bot. Gard.* 16: 77 (1905); *Cereus* subg. *Acanthocereus* (Engelm. ex A. Berger) A. Berger, *Kakteen* 124 (1929). T: *Acanthocereus pentagonus* (L.) Britton & Rose

Stems erect to arching, 3–5-angled or ridged. Areoles with short or long spines. Flowers nocturnal. Perianth funnel-shaped; hypanthium and perianth tube bearing triangular scale leaves with small axillary spines; petaloid lobes narrowly obovate, spreading. Fruit ellipsoidal, fleshy, withered perianth persistent. Seeds small, minutely reticulate-papillate; hilum oblique.

A genus of 7 species of tropical and subtropical America; one species naturalised in Australia.

*** *Acanthocereus pentagonus* (L.) Britton & Rose, *Contr. U.S. Natl. Herb.* 12: 432 (1909)**

Cactus pentagonus L., *Sp. Pl.* 1: 467 (1753); *Cereus pentagonus* (L.) Haw., *Syn. Pl. Succ.* 180 (1812). T: not known.

Illustration: H. E. Kleinschmidt & R. W. Johnson, *Weeds Queensland* 211 (1978).

Stems to 5 m long, 6–8 cm diam., little-jointed, 3-angled (4–5-ridged on juvenile plants); margins coarsely crenate. Areoles with 4–7 radial spines 2–40 mm long and 1 or 2 central spines 15–50 mm long. Flowers 8–10 cm diam., 15–25 cm long; petaloid lobes white

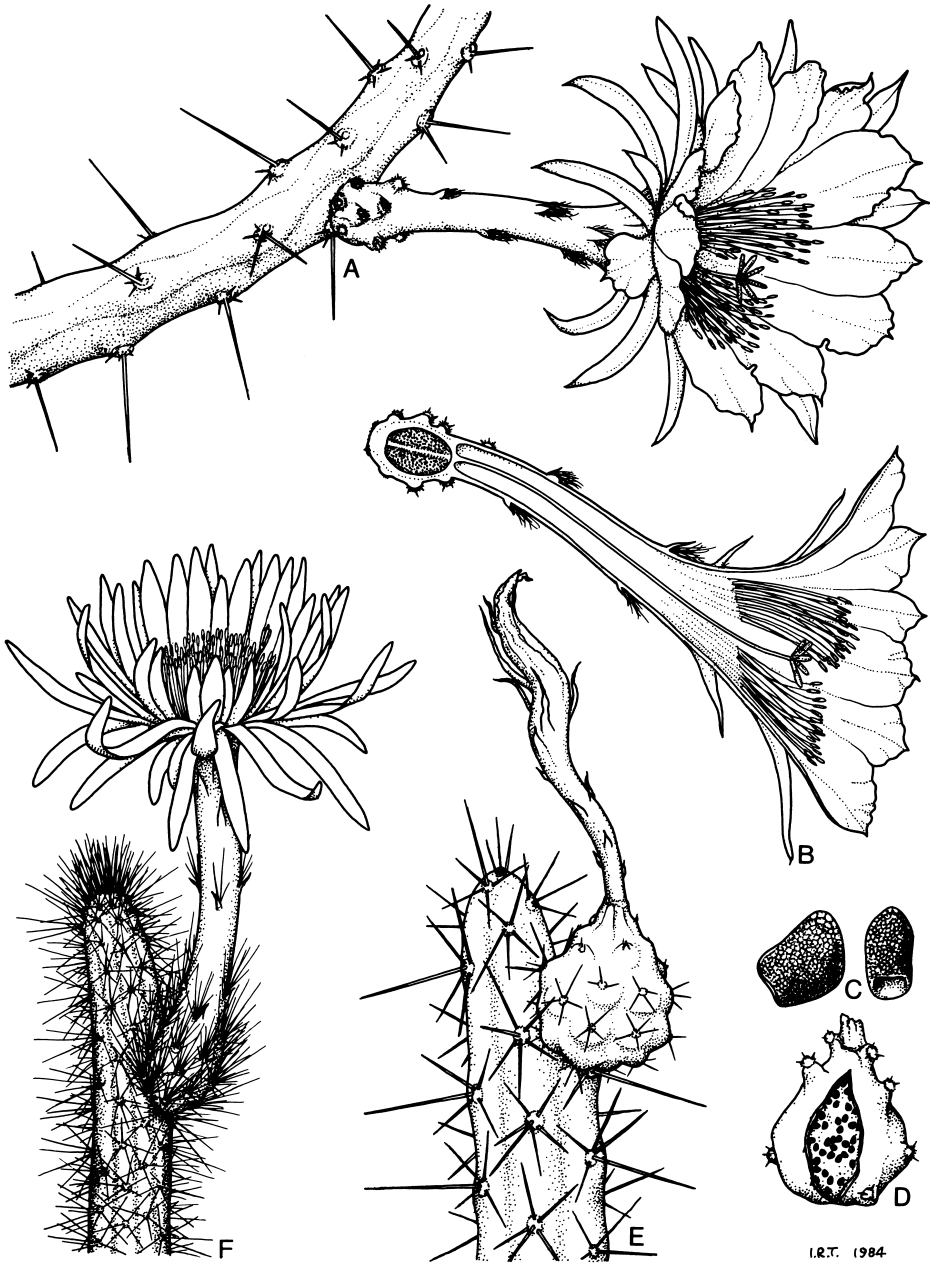


Figure 15. A-E, *Eriocereus*. A-D, *E. martinii*. A, flowering stem $\times 0.5$; B, section through flower $\times 0.5$ (A-B, I. Telford 8875, CBG). C, seed $\times 7$; D, fruit $\times 0.5$ (C-D, I. Telford 8749, CBG). E, *E. tortuosus*, fruiting stem $\times 0.5$ (W. of Parkville, N.S.W., J. Hosking, CBG). F, *Nyctocereus serpentinus*, flowering stem $\times 0.5$ (I. Telford 8873, CBG).

Fruit 3–8 cm long, 2.5–7 cm diam., red; pulp pink. Seeds 3–4 mm long, black. *Barbed-wire Cactus*.

Native to tropical and subtropical America from S Texas and S Florida to Brazil; naturalised in scattered areas of central Qld, where recorded from disturbed brigalow (*Acacia harpophylla*) forest on clay. Map 100.

Qld: 'Juanita', Fernlees, 23 July 1956, *P. P. Schwarz* (BRI); Gogango, *I. R. Telford 9144 & G. Butler* (CBG, NSW).

5. ERIOCEREUS

Eriocereus (A. Berger) Riccob., *Boll. Reale Orto Bot. Giardino Colon. Palermo* 8: 238 (1909); from the Greek *erios* (wool) and *Cereus* (a genus of Cactaceae from which this was segregated); in reference to the woolly axils of the floral tube.

Cereus subg. *Eriocereus* A. Berger, *Annual Rep. Missouri Bot. Gard.* 16: 74 (1905). T: *E. platygonus* (Otto) Riccob.

Harrisia Britton, *Bull. Torrey Bot. Club* 35: 561 (1909). T: *H. gracilis* (Miller) Britton.

Stems erect to trailing, more or less 4–8-ridged, ridges continuous or discontinuous. Areoles bearing long central spines; radial spines mostly shorter. Flowers nocturnal (often remaining open through following morning). Perianth funnel shaped; hypanthium bearing small triangular scale leaves, mostly with short axillary spines; perianth tube bearing subulate scale leaves with axillary woolly hair tufts. Fruit subglobose to ellipsoidal, fleshy, dehiscent; withered perianth persistent. Seeds small, minutely reticulate-papillate; hilum oblique.

A genus of 18 species of tropical and subtropical America; 3 or 4 species naturalised in Australia.

- | | | |
|----|--|-------------------------------|
| 1 | Stem ridges 6–8, continuous; radial spines mostly more than 1 cm long | 1. <i>E. tortuosus</i> |
| 1: | Stem ridges 4–5, often discontinuous; radial spines mostly less than 1 cm long | |
| 2 | Hairs of perianth tube white to grey; fruit mostly spinose | 2. <i>E. martinii</i> |
| 2: | Hairs of perianth tube brown; fruit lacking spines | † <i>E. sp.</i> |

The species marked with a dagger (†) as *Eriocereus* sp. is keyed out here but will not be treated in the text. It was recorded from Jandowae, Qld, as *Eriocereus regelii* (Weing.) Backeb. (*vide* J. Mann, *Cacti naturalised in Australia and their control* 32, 1970) but was apparently misplaced in that species.

1.Eriocereus tortuosus*** (James Forbes ex Otto & A. Dietr.) Riccob., *Boll. Reale Orto Bot. Giardino Colon. Palermo* 8: 245 (1909)

Cereus tortuosus James Forbes ex Otto & A. Dietr., *Allg. Gartenzeitung* 6: 35 (1838); *Harrisia tortuosa* (James Forbes ex Otto & A. Dietr.) Britton & Rose, *Cact.* 2: 154 (1920). T: not designated.

Stems to 4 m long, 4–6 cm diam., shallowly 6–8-ridged. Areoles with 6–9 radial spines 1–2 cm long, central spine 2.5–4 cm long. Flowers 8–14 cm diam., 10–15 cm long; petaloid lobes white. Fruit 3.5–5 cm diam., shortly spinose, red. *Harrisia Cactus*. Fig. 15E.

Native to Argentina; naturalised in the Darling Downs district, Qld, mainly W of Millmerran, and in the upper Hunter Valley, N.S.W. Map 101.

Qld: Western Ck, 20 km WNW of Millmerran, *I. R. Telford 8874* (BRI, CBG). N.S.W.: W of Parkville, Upper Hunter Valley, Mar. 1983, *J. R. Hosking* (CBG, NSW).



Figure 16. *Opuntia robusta*.
Photograph — I. R. Telford.



Figure 17. *Trianthesma turgidifolia*.
Photograph — A. S. George.



Figure 18. *Opuntia tomentosa*.
Photograph — D. Moffat.



Figure 19. *Atriplex spongiosa*.
Photograph — M. Fagg.

2. *Eriocereus martinii (Labouret) Riccob., *Boll. Reale Orto Bot. Giardino Colon. Palermo* 8: 241 (1909)

Cereus martinii Labouret, *Ann. Soc. Hort. Haute-Garonne* 1: (1854); *Harrisia martinii* (Labouret) Britton, *Addisonia* 2: 55 (1917). T: not designated.

Illustration: H. E. Kleinschmidt & R. W. Johnson, *Weeds Queensland* 212 (1978).

Stems to several m long, 2.5–4 cm diam., weakly 4- or 5-ridged, or ridges discontinuous. Areoles with 5–7 radial spines 1–6 mm long and 1 or 2 central spines 10–35 mm long. Flowers 15–18 cm diam., 15–20 cm long; petaloid lobes white. Fruit 3–4 cm diam., usually spinose, red; pulp white. Seeds 2–2.5 mm long, black. *Harrisia Cactus*. Fig. 15A–D.

Native to Argentina. Naturalised in E Australia from Collinsville, Qld, W to Charleville and S to near North Star, N.S.W. Grows in clay soils usually associated with disturbed brigalow (*Acacia harpophylla*) forest. Map 102.

Qld: Deep Gully, 8 km SSW of Gatton, *I. R. Telford* 8749 (CBG, NSW); 5 km from Goondiwindi towards Inglewood, *I. R. Telford* 8875 (BRI, CBG, NSW). N.S.W.: MacIntyre River, 5 km from Boggabilla, *I. R. Telford* 8876 (CBG, NSW).

A recent collection from Springton parish, near Duaringa, Qld (*R. E. McFadyen*, CBG) resembling *E. martinii* but with strongly angled stems and spineless fruit, may represent *C. bonplandii* Parm. ex Pfeiffer.

6. NYCTOCEREUS

Nyctocereus (A. Berger) Britton & Rose, *Contr. U.S. Natl Herb.* 12: 423 (1909); from the Greek *nyctos* (night) and *Cereus* (a genus of Cactaceae from which this genus was segregated); in reference to its nocturnal blooming.

Cereus sect. *Nyctocereus* A. Berger, *Annual Rep. Missouri Bot. Gard.* 16: 75 (1905). T: *N. serpentinus* (Lagasca & Rodrigues) Britton & Rose.

Stems erect to spreading, with few articulations, 5–13-ridged. Areoles spinose. Flowers nocturnal. Perianth funnel-shaped; tube spinose; petaloid lobes narrowly lanceolate, spreading, white to pink. Hypanthium spinose. Fruit subglobose, fleshy. Seeds large, smooth.

A genus of 6 species native to Mexico and Central America; one species in Australia as an occasional garden escape.

***Nyctocereus serpentinus** (Lagasca & Rodrigues) Britton & Rose, *Contr. U.S. Natl Herb.* 12: 423 (1909)

Cereus serpentinus Lagasca & Rodrigues, *Anales Ci. Nat.* 4: 261 (1801). T: not designated.

Stems to 3 m long, 2.5–5 cm diam., 10–12-ridged. Areoles with 10–12 radial spines, needle- or bristle-like, to 15 mm long, central spine absent or 1, stouter, to 30 mm long. Flowers 8–10 cm diam., 12–18 cm long; petaloid lobes pink to white. Fruit 5 cm long, red. Seeds 5 mm long, black. *Snake Cactus*, *Night-blooming Cereus*. Fig. 15F.

Native to Mexico. Cultivated for its showy flowers. Occasionally naturalised as a garden escape around several central and SE Qld towns. Map 103.

Qld: Jericho, 28 Jan. 1960, *Jericho Shire Council* (BRI); 3 km NE of Warwick, *I. R. Telford* 8873 (BRI, CBG, MEL, NSW).

Description of fruit based on Britton & Rose, *Cact.* 2: 118 (1920).

CHENOPODIACEAE

Paul G. Wilson

Herbs, shrubs, or (not in Australia) small trees, glabrous or pubescent, sometimes glandular. Leaves usually alternate, simple, often succulent, exstipulate, in the *Salicornieae* opposite and reduced to small lobes at the apex of jointed internodes (articles). Inflorescence of compact or open cymes or panicles, or reduced to solitary axillary flowers. Flowers small, monochlamydeous, bisexual or unisexual. Perianth of 1–5 tepals, often united, rarely absent, sometimes enlarged and developing wings, spines or tubercles in fruit. Stamens opposite and equal in number to perianth lobes or fewer, hypogynous or attached to wall of perianth; staminal disc present or absent; anthers exerted, bilocular, dehiscent by longitudinal slits. Ovary superior (half inferior in *Beta*) 2 or 3-carpellate, unilocular; stigmas usually 2 or 3. Ovule solitary, basal, campylotropous to amphitropous. Fruit a nut or berry with membranous, crustaceous, or succulent pericarp. Seed often lenticular; testa membranous to crustaceous; embryo straight, curved, horseshoe-shaped, annular, or spiral; albumen (perisperm) absent to abundant.

A cosmopolitan family of over 100 genera and 1500 species, particularly common in semi-arid environments and in saline habitats. Represented in Australia by 302 species in 28 native and 4 introduced genera. A few species have given rise to cultivars of agriculture; a number of the endemic species were important food plants of Australian Aborigines.

G. Bentham, *Chenopodiaceae*, *Fl. Austral.* 5: 150–208 (1870); F. Mueller, *Iconography of Australian Salsolaceous Plants*, Decades 1–9 (1889–91); E. Ulbrich, *Chenopodiaceae*, *Nat. Pflanzenfam.* 2nd edn, 16c: 379–584 (1934); P. Aellen, *Chenopodiaceae*, in Hegi, *Ill. Fl. Mitt.-Eur.* 2nd edn, 3: 534–747 (1960–61); R. C. Carolin *et al.*, Leaf structure in *Chenopodiaceae*, *Bot. Jahrb. Syst.* 95: 226–255 (1975); A. J. Scott, Reinstatement and revision of *Salicorniaceae* J. Agardh (Caryophyllales), *Bot. J. Linn. Soc.* 75: 357–374 (1978); A. J. Scott, A revision of the *Camphorosmioideae* (Chenopodiaceae), *Feddes Repert.* 89: 101–119 (1978).

In this treatment the text for 8 species of *Atriplex* has been contributed by G. Parr-Smith.

KEY TO TRIBES

- 1 Embryo curved to annular; albumen usually present
 - 2 Plant with well-developed leaves; flowers not immersed in succulent spikes
 - 3 Fruits not operculate; stigma papillose all over; ovary superior
 - 4 Flowers usually in glomerules, axillary or paniculate; perianth not or little enlarged in fruit
 - 4: Flowers usually solitary and axillary; perianth usually enlarged, hardened, and bearing appendages at fruiting stage
 - 3: Fruits operculate; stigma papillose within; ovary semi-inferior
 - 2: Plant leafless; stems jointed and succulent; flowers usually surrounded by succulent bracts
 - 1: Embryo spiral; albumen absent or scanty
- Trib. I. CHENOPODIEAE**
Trib. II. CAMPHOROSMEAE
Trib. III. BETEAE
Trib. IV. SALICORNIEAE

- 5 Perianth herbaceous or membranous; bracteoles small, scale-like Trib. V. SUAEDEAE
- 5: Perianth glumaceous; bracteoles larger than flower, often rigid and spinescent Trib. VI. SALSOLEAE

KEY TO GENERA

- 1 Plant with obvious leaves; branches not articulate
- 2 Leaves flat, often broad, if terete then with mealy hairs when young
- 3 Plant glabrous; fruiting perianths hard, united in clusters; ovary semi-inferior 24. BETA
- 3: Plant glabrous, mealy, pilose, or glandular; ovary superior
- 4 Plant mealy when young; flowers unisexual; male flowers with 5-lobed perianth and 5 stamens; female flowers lacking perianth but surrounded by a pair of bracteoles that may be free or fused, often inflated or spongy 1. ATRIPLEX
- 4: Plant variously hairy to glabrous; flowers unisexual or bisexual, all with a perianth, not surrounded by bracteoles
- 5 Plants shrubby, predominantly dioecious, if monoecious or with bisexual flowers then stamens 5 5. RHAGODIA
- 5: Plants herbaceous or weakly woody; flowers polygamous or bisexual
- 6 Herb with basal rosette of leaves; tepals 4, cartilaginous in fruit 6. SCLEROBLITUM
- 6: Plants without a basal rosette
- 7 Fruiting perianth encircled by a single horizontal hyaline wing 8. CYCLOLOMA
- 7: Fruiting perianth without appendages
- 8 Plant glandular-pubescent; tepals 1-4; stamens 1 or 2; embryo lateral, horizontal, or basal 3. DYSPHANIA
- 8: Plant glabrous, pubescent, or mealy, if glandular-pubescent then with other characters not combined as above
- 9 Tepals 5; stamens 1-3; seed horizontal; perennial herbs or weak shrubs with mealy early indumentum 4. EINADIA
- 9: Tepals 1-5; stamens 1-5; seed horizontal or vertical; mostly annual herbs, rarely perennials, glabrous or with mealy or glandular indumentum
- 10 Tepals (in lateral flowers) 1; stamen 1; sparsely mealy herb 7. MONOLEPIS
- 10: Tepals 3-5; stamens 1-5; herb or rarely perennial with mealy or glandular indumentum, or glabrous 2. CHENOPODIUM
- 2: Leaves narrow, usually sub-terete; hairs (if present) simple, bifurcate, or stellate, neither glandular nor mealy
- 11 Flowers and fruits fused in axillary clusters of 2 or more
- 12 Indumentum of dendritic or stellate hairs 17. EREMOPHEA
- 12: Indumentum of simple hairs
- 13 Flowers in pairs; fruiting perianth cylindrical with 5 horizontal wings 13. DIDYMANTHUS
- 13: Flowers in clusters of 2 or more; fruiting perianth without wings 18. DISSOCARPUS
- 11: Flowers and fruits solitary or if in pairs then not fused
- 14 Fruiting perianth without obvious appendages
- 15 Flowers bibracteolate; embryo spirally coiled 31. SUAEDA
- 15: Flowers without bracteoles; embryo curved or annular

CHENOPODIACEAE

Key to Genera

- 16 Fruit a subglobular nut subtended by the small deeply 5-lobed perianth **12. ROYCEA**
- 16: Fruit totally enclosed within the enlarged perianth
- 17 Fruiting perianth succulent, berry-like, split longitudinally to base **11. ENCHYLAENA**
- 17: Fruiting perianth dry or, if succulent, not berry-like and not split to base
- 18 Fruiting perianth dry, subglobular **20. OSTEOCARPUM**
- 18: Fruiting perianth dry or slightly succulent, ovoid to urceolate **19. THRELKELDIA**
- 14: Fruiting perianth with one or more wings, spines, or tubercles, not succulent
- 19 Fruiting perianth with erect wing or wings
- 20 Both horizontal and vertical wings present **10. MAIREANA**
- 20: Only vertical wing or wings present **20. OSTEOCARPUM**
- 19: Fruiting perianth without erect wings
- 21 Horizontal wing or wings (but not spines) present on fruiting perianth
- 22 Annual; leaves herbaceous; flowers in axillary clusters; fruiting perianth with 5 horizontal wings **9. BASSIA**
- 22: Annual or perennial herb or shrub; leaves usually succulent
- 23 Flowers subtended by a pair of prominent spinescent bracteoles; embryo spirally coiled **32. SALSOLA**
- 23: Bracteoles, if present, minute; embryo annular
- 24 Fruiting perianth hemispherical, glabrous; apex truncate extending into a hard, narrow, 5-angled wing **23. SCLEROCHLAMYS**
- 24: Fruiting perianth lenticular to turbinate or globose with 5 horizontal wings or a simple annular horizontal wing **10. MAIREANA**
- 21: Spines or tubercles (but not wings) present on fruiting perianth
- 25 Plant densely stellate- or dendritic- tomentose; leaves flattened; perianth spines epitepalous in origin **17. EREMOPHEA**
- 25: Plant with simple or bifurcate hairs (if dendritic then leaves terete), or glabrous
- 26 Perianth appendages oblong, in two series, 5 erect and 5 horizontal, all arising from base of tepals **16. ERIOCHITON**
- 26: Perianth appendages in one series, either beneath or between tepals
- 27 Fruiting perianth hard, globoid, with c. 11 very short radiating spines arising from a narrow horizontal wing **22. STELLIGERA**
- 27: Fruiting perianth with 1-6 spines, tubercles, or other processes
- 28 Perianth appendages 3-5, subcylindrical, soft, woolly, arising from base of perianth lobes **14. MALACOCERA**
- 28: Perianth appendages of spines or tubercles
- 29 Annual; leaves linear to oblanceolate, fruiting perianth papery; seed horizontal **9. BASSIA**
- 29: Perennial herb or shrub; leaves subterete or, if flat, then fleshy; fruiting perianth hard; seed horizontal to vertical

- 30 Fruiting perianth cylindrical with 5 spines arising from base of perianth lobes, the spines sometimes united into an apical cup-shaped structure 15. NEOBASSIA
- 30: Fruiting perianth variously shaped; spines or tubercles 1-6 arising between perianth lobes 21. SCLEROLAENA
- 1: Plant apparently leafless, or with opposite very reduced leaves; branches made up of succulent articles (internodes)
- 31 Perianth truncate or rounded at apex with an upper (adaxial) lobe overlapping the 2 lateral lobes; stamens 2; embryo horseshoe-shaped; albumen absent 25. SARCOCORNIA
- 31: Perianth lacking upper lobe; stamen 1; seed with abundant albumen
- 32 Flowers solitary in axils along branches 27. TEGICORNIA
- 32: Flowers in clusters of 3 (rarely 5 or 7) in axils of opposite bracts usually forming a spike-like inflorescence
- 33 Lateral flowers of triads male, central flower bisexual
- 34 Leaf lobes prominent, fleshy, divaricate; embryo annular 30. PACHYCORNIA
- 34: Leaf lobes insignificant, scariosus; embryo straight or curved 29. SCLEROSTEGIA
- 33: Flowers all bisexual or all female
- 35 Opposite bracts of inflorescence united 26. HALOSARCIA
- 35: Opposite bracts of inflorescence free
- 36 Plants woody perennial or shrubs; perianth gamotepalous 26. HALOSARCIA
- 36: Plants annuals or short-lived perennials; perianth of two succulent (eventually free) laterally placed tepals 28. TECTICORNIA

Trib. I. CHENOPODIEAE

Flowers in glomerules, axillary or paniculate. Perianth scarcely enlarged in fruit. Ovary superior; stigmas papillose all over. Fruit not operculate. Testa crustaceous; embryo curved, horseshoe-shaped or annular; perisperm copious.

A world-wide tribe of c. 24 genera. Seven genera in Australia, of which six contain some indigenous species.

1. ATRIPLEX

Atriplex L., *Sp. Pl.* 2: 1052 (1753); *Gen. Pl.* 5th edn, 472 (1754); from the Latin *atriplexum*, orache, a plant sometimes used as a substitute for spinach.

Type: *A. hortensis* L., *fide* J. McNeill *et al.*, *Taxon* 32: 551 (1983).

Theleophyton Moq. in DC., *Prodr.* 13(2): 44, 115 (1849); *Atriplex* ser. (or sect.) *Theleophyton* (Moq.) Benth., *Fl. Austral.* 5: 168, 179 (1870); *Atriplex* subg. *Theleophyton* (Moq.) Volkens, *Nat. Pflanzenfam.* 3(1a): 66 (1893). T: *T. billardierei* (Moq.) Moq.

Haloxanthium Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 521 (1934). T: *H. quadrivalvatum* (Diels) Ulbr.

Neopreissia Ulbr., *op. cit.* 519 T: *N. isatidea* (Moq.) Ulbr.

Blackiella Aellen, *Bot. Jahrb. Syst.* 68: 423 (1938); *Atriplex* subg. *Blackiella* (Aellen) Maire, *Fl. Afrique Nord* 8: 91 (1962), '*Blakiella*'. T: not designated.

Pachypharynx Aellen, *op. cit.* 429. T: not designated.

Senniella Aellen, *op. cit.* 416. T: *S. spongiosa* (F. Muell.) Aellen

Annual or perennial herbs or shrubs, monoecious or dioecious. Indumentum of bladder-like hairs which may collapse to form a scurfy or scaly covering and then fuse to a silvery sheen. Leaves mostly alternate, flat to semiterete, entire, dentate or lobed. Flowers small, clustered, the clusters axillary, spicate or paniculate. Male flowers without bracts or

bracteoles; perianth deeply 5-lobed; stamens 5, filaments linear; pistillode minute or absent. Female flowers: perianth absent (present in some flowers of *A. hortensis*) and replaced by a pair of bracteoles which enlarge and cover the fruit; bracteoles sessile or pedicellate, free or fused, in fruit herbaceous, woody, or spongy, sometimes with tubercular, foliaceous, winged, inflated, or spongy appendages which may exceed the bracteoles; staminodes absent; stigmas 2, slender. Pericarp membranous. Seed erect (also horizontal in *A. hortensis*), lenticular, sometimes dimorphic; testa crustaceous, coriaceous or membranous; embryo annular; perisperm central.

A cosmopolitan genus of over 250 species, mainly subtropical and temperate, often halophytic. About 61 species in Australia of which 3 or 4 are introduced; one of the native species is also found in New Zealand, the rest are endemic.

P. Aellen, Revision der australischen und neuseeländischen Chenopodiaceen I: *Theleophyton, Atriplex, Morrisiella, Blackiella, Senniella, Pachypharynx*, *Bot. Jahrb. Syst.* 68: 345–434 (1937–1938); I. J. Bassett *et al.*, *The genus Atriplex (Chenopodiaceae) in Canada* (1983); G. A. Parr-Smith, Biogeography and evolution in the shrubby Australian species of *Atriplex* (Chenopodiaceae) in W. R. Barker and P. J. M. Greenslade, *Evolution of the fauna and flora of arid Australia* 291–299 (1982).

Atriplex exhibits considerable polymorphism in leaf and bracteole shape, both on the same plant and in different populations of the one species, while hybridization within the genus is common. These and other factors combine to make the circumscription of some taxa arbitrary and identification difficult. Certain areas of taxonomic uncertainty are noted under the species concerned.

Note: The term 'bracteole' as used in the keys refers to the fruiting bracteoles; the term 'valve' to the free portion of these bracteoles.

The text for species 46, 48–53 and 57 has been contributed by G. Parr-Smith.

KEY TO SUBGENERA AND SECTIONS

- 1 Prostrate to erect herbs or shrubs, scurfy or scaly pubescent; seed aligned parallel to bracteoles **Subg. I. ATRIPLEX (page 86)**
- 2 Annuals or short-lived perennials, monoecious; fruiting bracteoles almost totally united, spongy or (in one species) dorsiventrally flattened and with broad vertical wings; appendages (other than wings) absent **Sect. III. SPONGIOPUS (page 86)**
- 2: Annuals, perennials, or shrubs; fruiting bracteoles free or united, not spongy though sometimes with spongy appendages; wings absent
- 3 Annuals with slender, ribbed stems; leaves herbaceous, flat, with open venation
 - 4 Fruiting bracteoles sub-orbicular, c. 10 mm long, thin, reticulate, or bracteoles absent and perianth present; erect plant with triangular leaves **Sect. I. ATRIPLEX (page 86)**
 - 4: Fruiting bracteoles deltoid to rhomboid, 3–6 mm long, thickened with age and sometimes tuberculate **Sect. II. TEUTLIOPSIS (page 86)**
- 3: Perennial herbs or shrubs; leaves with closed dark green reticulate venation
 - 5 Perennial herbs, monoecious; glomerules of male flowers axillary or spicate **Sect. IV. SEMIBACCATAE (page 86)**
 - 5: Perennial herbs or shrubs, predominantly dioecious; glomerules of male flowers spicate or paniculate **Sect. V. DIALYSEX (page 89)**
- 1: Prostrate herbs, monoecious, covered with watery bladder-hairs; seed aligned at right angles to the urceolate bracteoles **Subg. II. THELEOPHYTON (page 90)**

Subg. I. Atriplex**Sect. I. Atriplex**

Only species

1. A. hortensis**Sect. II. Teutliopsis**

Lower leaves triangular or hastate with spreading or slightly backwardly directed basal lobes

2. A. prostrata

Lower leaves lanceolate, entire to deeply serrate, if hastate then with forwardly directed basal lobes

3. A. australasica**Sect. III. Spongiocarpus****1** Bracteoles globular, ellipsoidal, or obovoid; wing-like appendages absent**2** Leaves sessile or shortly petiolate; bracteoles broadly ellipsoidal to globular, 4–6 mm long, rarely to 8 mm**4. A. spongiosa****2:** Leaves conspicuously petiolate; bracteoles globular to obovoid, 8–12 mm long**5. A. holocarpa****1:** Bracteoles variously shaped bearing one or two horizontal to vertical wing-like appendages (sometimes very narrow)**3** Tube small, obconical, 1–3 mm high, somewhat compressed**4** Valves fan-shaped, appressed; appendages inflated, attached to apex of tube on each side**10. A. kochiana****4:** Valves minute or triangular and 1–2 mm long; appendages wing-like, horizontal, somewhat undulate**5** Bracteoles scurfy pubescent**7. A. obconica****5:** Bracteoles glabrous, glossy**9. A. macropterocarpa****3:** Tube prominent, 5–12 mm high, either compressed and bordered by decurrent wings or turbinate to globular without decurrent wings**6** Bracteoles broadly turbinate, cup-shaped, or subglobular; wing more or less horizontal**7** Bracteoles subglobular; upper surface curved; wing narrow, almost horizontal; leaves narrowly elliptic to narrowly obovate, acute**8. A. lindleyi****7:** Bracteoles turbinate to cup-shaped; upper surface flat; wing prominent, horizontal, thin; leaves rhombic to orbicular**6. A. codonocarpa****6:** Bracteoles compressed; wings erect or spreading, decurrent down tube**8. A. lindleyi****Sect. IV. Semibaccatae****1** Bracteoles from half to nearly entirely united**2** Bracteoles cylindrical or with a cylindrical tube**3** Bracteoles 4–6-lobed at apex, the lobes horn-like, fan-shaped, or reduced to small teeth**24. A. limbata****3:** Bracteoles acute to rounded or truncate**4** Bracteoles with free broadly fan-shaped to reniform valves, often with recurved lobes**16. A. angulata****4:** Bracteoles fused to apex; distal portion flattened to cylindrical, oblong or narrowly cuneate

CHENOPODIACEAE

Atriplex

- 5 Bracteole apex flattened, rhomboid or cuneate, dentate, glossy when mature **21. A. intermedia**
- 5: Bracteole apex compressed or cylindrical, insignificant, scurfy
- 6 Bracteoles smooth, 3–5 mm long, the basal portion being the spongy straw-coloured stipe (central Australia) **23. A. sturtii**
- 6: Bracteoles smooth or tuberculate, 4–6 mm long including the slender or spongy stipe **22. A. leptocarpa**
- 2: Bracteoles flattened to biconvex, without a cylindrical tube
- 7 Bracteoles without dorsal appendages
- 8 Bracteoles sessile or appearing so
- 9 Bracteoles ± deltoid, prominently reticulate, often red and succulent when fresh; plant prostrate or decumbent **26. A. semibaccata**
- 9: Bracteoles variously shaped, not succulent
- 10 Erect divaricately branched plant with deeply concave clasping leaves (Nullarbor Plain) **14. A. cryptocarpa**
- 10: Prostrate to erect; leaves not clasping
- 11 Plant prostrate; leaves 2–6 mm long; bracteoles 1–1.5 mm long **11. A. pumilio**
- 11: Plant decumbent to erect; leaves and bracteoles longer than above
- 12 Bracteoles oblong with somewhat swollen tube **12. A. acutibractea**
- 12: Bracteoles compressed and rhomboid to deltoid or swollen and rounded at apex
- 13 Bracteoles swollen, rounded at apex **31. A. muelleri**
- 13: Bracteoles compressed, rhomboid to deltoid
- 14 Leaves coarsely serrate, sparsely scurfy above and below; bracteoles scurfy-pubescent **32. A. suberecta**
- 14: Leaves sinuate-dentate to entire, scurfy below, glabrescent above
- 15 Leaves narrowly elliptic, c. 10 mm long, entire; bracteoles c. 2 mm long and wide, scurfy-pubescent **25. A. infrequens**
- 15: Leaves oblong-elliptic, 10–20 mm long, entire or sinuate-dentate; bracteoles 2–5 mm long and wide, glabrous or sparsely scurfy **26. A. semibaccata**
- 8: Bracteoles stipitate
- 16 Leaves sessile or subsessile, 5–20 mm long, rarely to 30 mm
- 17 Bracteoles deltoid to rhomboid, flattened, reticulate; leaves glabrescent above **26. A. semibaccata**
- 17: Bracteoles swollen at least in part
- 18 Bracteoles acute **12. A. acutibractea**
- 18: Bracteoles obtuse to truncate, entire or toothed
- 19 Bracteoles turbinate or narrowly turbinate, c. 5 mm long **20. A. turbinata**
- 19: Bracteoles rhomboid to deltoid or broadly deltoid
- 20 Bracteoles with a short, thick stipe and deltoid 3-toothed valves, in all 2–3 mm long **15. A. crassipes**
- 20: Bracteoles shortly and narrowly stipitate, broadly deltoid, 2–3 mm long, denticulate or entire **17. A. pseudocampanulata**
- 16: Leaves prominently petiolate, 20–40 mm long; bracteoles with fan-shaped or reniform valves **16. A. angulata**

- 7: Bracteoles with dorsal appendages
- 21 Bracteole appendages numerous, verrucose, papillose or spiny
- 22 Appendages needle-like (W.A.) **39. A. spinulosa**
- 22: Appendages blunt, verrucose or papillose
- 23 Leaves thick, linear to narrowly oblong, acute **38. A. papillata**
- 23: Leaves thin, elliptic to broadly obovate
- 24 Leaves broadly obovate, sinuate-dentate, rounded **37. A. morrisii**
- 24: Leaves elliptic, acute **35. A. flabelliformis**
- 21: Bracteole appendages 1–4, or few and flattened or inflated
- 25 Appendages distinct, tuberculate, papapillose, or slender
- 26 Bracteoles with a short, thick stipe; valves flattened, deltoid, c. 2 mm long **15. A. crassipes**
- 26: Bracteoles sessile or, if stipitate, with spinose appendages
- 27 Bracteoles U-shaped, swollen, c. 1.5 mm long **33. A. elachophylla**
- 27: Bracteoles deltoid to fan-shaped, flattened, 3–4 mm long, sessile or shortly stipitate, with 2–4 spines each side **34. A. cornigera**
- 25: Appendages inflated, foliaceous, or spiny (and usually united towards base)
- 28 Bracteoles with swollen base and narrow, beak-like valves; appendages inflated **44. A. nessorhina**
- 28: Bracteoles without a swollen base
- 29 Flower-clusters arranged in spikes; bracteoles equal; appendages spiny and arranged in a semicircle on both valves **36. A. semilunaris**
- 29: Flowers axillary; appendages foliaceous or inflated on both margins of only one side of bracteoles
- 30 Bracteoles equal, leaves sinuate on margin **17. A. pseudocampanulata**
- 30: Bracteoles unequal
- 31 Appendages leaf-like **18. A. eardleyae**
- 31: Appendages inflated, attached along each margin on one side of tube **19. A. eichleri**
- 1: Fruiting bracteoles free to near base
- 32 Bracteoles fan-shaped to reniform, unequal **18. A. eardleyae**
- 32: Bracteoles not as above
- 33 Bracteoles prominently lobed
- 34 Leaves congested, sessile, cordate **30. A. quadrivalvata**
- 34: Leaves not congested, petiolate or narrowed at base
- 35 Bracteoles with flat or inflated acutely lobed appendages **29. A. fissivalvis**
- 35: Bracteoles without appendages **40. A. lobativalvis**
- 33: Bracteoles entire or the margin sinuate or toothed
- 36 Bracteoles sessile or shortly stipitate
- 37 Bracteole appendages inflated, entire, more or less equal in size to bracteoles **10. A. kochiana**
- 37: Bracteole appendages small or absent
- 38 Leaves narrowly triangular, cordate at base **41. A. cordifolia**
- 38: Leaves narrowly oblong to broadly obovate, narrowed at base
- 39 Leaves 3–6 mm long; bracteoles 2–3 mm long **13. A. exilifolia**
- 39: Leaves 5–40 mm long; bracteoles in all c. 5 mm long

- 40 Bracteoles with tubercular or spine-like appendages on each valve
- 41 Bracteoles narrowed at base to form a deltoid tube; valves sinuate or bluntly toothed **34. *A. cornigera***
- 41: Bracteoles not narrowed into a tube
- 42 Bracteoles truncate at base, sharply toothed; appendages spine-like **28. *A. spinibractea***
- 42: Bracteoles truncate or deltoid at base, entire or weakly toothed; appendages of 1 or 2 tubercles or absent **26. *A. semibaccata***
- 40: Bracteoles without appendages or with inflated appendages
- 43 Bracteoles sessile, cordate, rounded, without appendages **27. *A. humifusa***
- 43: Bracteoles sessile or subsessile, acute or obtuse
- 44 Bracteoles prominently dentate, scurfy-tomentose; appendages basal, small and inflated **43. *A. acutiloba***
- 44: Bracteoles entire or with basal teeth, scurfy-tomentose to subglabrous; appendages basal or absent **42. *A. velutinella***
- 36: Bracteoles with a stout or narrow stipe
- 45 Stipe thick, c. 1 mm long; bracteoles deltoid, smooth or with 1 or 2 short spiny appendages on each valve (Gulf of Carpentaria) **45. *A. humilis***
- 45: Stipe slender, to 2 mm long, or absent; bracteoles deltoid to fan-shaped with 2–4 spiny appendages c. 1 mm long on each valve (central Qld) **34. *A. cornigera***

Sect. V. *Dialysex*

- 1 Bracteoles with slender stipe, reniform or semicircular, entire
- 2 Bracteole appendages absent; leaves elliptic to broadly elliptic, 0.5–1 cm long, entire **46. *A. stipitata***
- 2: Bracteole appendages reniform, inflated, c. half width of valve; leaves oblanceolate, c. 2 cm long, distantly toothed **47. *A. quinii***
- 1: Bracteoles with a thick stipe or sessile to subsessile
- 3 Leaves large; lamina c. 5 cm or more long, thick; bracteoles sessile or with a short hard turbinate stipe; tubercular or verrucose processes often present on bracteoles
- 4 Female flowers paniculate, terminal **54. *A. isatidea***
- 4: Female flowers in axillary clusters **55. *A. cinerea***
- 3: Leaves mostly 0.5–3 cm long; bracteoles not as above
- 5 Bracteoles with bladder-like appendages, occasionally absent in *A. vesicaria*
- 6 Decumbent or spreading shrub; leaves narrowly elliptic, c. 1 cm long; bracteoles thin, orbicular, each with an inflated appendage (W.A.) **49. *A. hymenotheca***
- 6: Erect shrub; leaves narrowly to broadly elliptic to obovate, sometimes broadly so
- 7 Small, dense, rounded shrub c. 30 cm high; leaves narrowly elliptic, boat-shaped, thick, c. 8 mm long; bracteoles deltoid-cordate, c. 5 mm long on a short thick stipe; appendages inflated, sometimes verrucose or divided in two (W.A.) **51. *A. nana***
- 7: Erect or decumbent shrub; leaves flat, elliptic to obovate; bracteoles sessile or shortly stipitate **50. *A. vesicaria***
- 5: Bracteoles without appendages, or with two slender antler-like appendages

- 8** Leaves entire
- 9** Leaves cordate to deltoid; bracteoles broadly rhomboid to orbicular, c. 3 mm wide, biconvex, hard with little or no papery margin (Murray River area) **58. A. rhagodioides**
- 9:** Leaves elliptic
- 10** Female flowers in terminal panicles
- 11** Leaves bluish; bracteoles cordate, apex obtuse or rounded; valves thin, sometimes with 2 antler-like appendages at base **48. A. bunburyana**
- 11:** Leaves greenish grey; bracteoles cordate to deltoid, acute, without antler-like appendages **52. A. paludosa**
- 10:** Female flowers axillary (coastal species)
- 12** Plant monoecious, decumbent; leaves glabrous above (coastal SW W.A.) **53. A. hypoleuca**
- 12:** Plant dioecious; leaves scurfy or scaly on both surfaces (coastal Southern Australia) **55. A. cinerea**
- 8:** Leaves dentate or denticulate
- 13** Leaves elliptic to oblong, often shortly hastate, remotely denticulate, often glabrescent above; bracteoles somewhat rhomboid, biconvex, hard all over or with short papery valves **56. A. amnicola**
- 13:** Leaves deltoid to cordate, broadly elliptic or orbicular
- 14** Leaves rhomboid to orbicular, sinuate-dentate; bracteoles sessile, rhomboidal to orbicular, papery all over or with thickened base; valves appressed or reflexed with entire or denticulate margins; shrub 1.5–3 m high with ascending branches (inland Australia) **57. A. nummularia**
- 14:** Leaves cordate to deltoid, dentate; branches sessile, thickened all over or only at base; divaricately branched shrubs
- 15** Bracteoles sub-orbicular, 6–10 mm wide; valves papery, slightly recurved, dentate, thickened in centre or towards base (central S.A.) **59. A. incrassata**
- 15:** Bracteoles broadly rhomboid to orbicular, c. 3 mm wide, biconvex, hard with little or no papery margin (Murray River area) **58. A. rhagodioides**

Subg. II. Theleophyton

Only species

60. A. billardi

Subg. I. Atriplex

Atriplex L. subg. **Atriplex**

Herbs or shrubs, monoecious or dioecious, covered, at least when young, with bladder hairs which collapse to form a scurfy or scale covering. Fruiting bracteoles free or united. Seed parallel to bracteoles.

Sect. I. Atriplex**Atriplex L. sect. Atriplex**

Atriplex sect. *Dichospermum* Dumort., *Fl. Belg.* 21 (1827). T: *A. hortensis* L.

Atriplex ser. *Oleraceae* Benth., *Fl. Austral.* 5: 167, 173 (1870) p.p. T: not designated.

Annual monoecious plants, stems erect, striate. Female flowers dimorphic: some with a pair of bracteoles and vertical seeds; others without bracteoles but with a 5-lobed perianth and vertical or horizontal seeds.

One species naturalised in Australia.

1. *Atriplex hortensis L., Sp. Pl. 2: 1053 (1753)

T: described from cultivated material; lecto: Hort. Sicc. Cliff., BM, *n.v.* fide J. McNeill *et al.*, *Taxon* 32: 552 (1983).

Illustration: W. H. Fitch & W. G. Smith, *Ill. Brit. Fl.* 5th edn, fig. 855 (1931).

Erect annual herb to 2.5 m high, monoecious. Branches angular. Leaves petiolate; lamina 5–10 cm long, thin, almost glabrous, the lower ones triangular, cordate or hastate at base, entire to dentate. Flowers mixed in a terminal spike or panicle. Female flowers dimorphic, some lacking bracteoles but with 5-lobed perianth and horizontal or vertical seeds, others with bracteoles and no perianth and with vertical seeds; bracteoles orbicular to very broadly ovate, flattened, free except at base, entire, papery, reticulate-veined, c. 10 mm long. Seed circular; radicle horizontal, basal. *Garden Orache*.

Found in southern States as an escape from cultivation. Map 104.

W.A.: Albany, Feb. 1965, *Baile* (PERTH). Vic.: Swan Hill, Feb. 1909, *E. Prescott* (MEL). Tas.: Kingston, 28 Mar. 1951, *W. M. Curtis* (HO).

Evidently a native of Asia where it possibly arose by selection from *A. nitens* Schkuhr. Various colour forms are cultivated for either food or ornament.

Sect. II. Teutliopsis**Atriplex sect. Teutliopsis Dumort., Fl. Belg. 20 (1827).**

Type: *A. hastata* L.

Atriplex sect. *Schizotheca* C. Meyer in Ledeb., *Fl. Altaic.* 4: 306 (1833). T: *A. hastata* L.

Atriplex ser. *Oleraceae* Benth., *Fl. Austral.* 5: 167, 173 (1870) p.p. T: not designated.

Annual monoecious plants; stems striate. Leaves with an open venation (in Australian species). Female flowers all with a pair of bracteoles and vertical seeds.

Two or three species in Australia one of which may be native.

2. *Atriplex prostrata Boucher ex DC. in Lam. & DC., Fl. Franc. 3: 387 (1805)

T: from France; *n.v.*

A. hastata var. *salina* Wallr. ex Gren. in Gren. & Godron, *Fl. France* 3: 12 (1855). T: from Europe; *n.v.*

[*A. hastata* auct. pl. non L. s. str.: J. H. Willis, *Handb. Pl. Victoria* 2: 91 (1973).]

[*A. patula* var. *hastata* auct. non (L.) A. Gray: A. J. Ewart, *Fl. Victoria* 443 (1931).]

Illustration: S. Ross-Craig, *Draw. Brit. Pl.* pt. 25, t. 25 (1968).

Prostrate to erect annual herb c. 50 cm high, monoecious. Branches angular. Leaves petiolate, opposite below, alternate above, scurfy to glabrous. Lower leaves triangular to hastate, lamina 1.5–5 cm long, rarely to 8 cm, basal lobes (if present) spreading or slightly backwards pointing, margin entire or sparsely dentate, apex obtuse to acute. Upper leaves triangular to narrowly ovate, decreasing in size upwards. Flowers mixed, clustered,

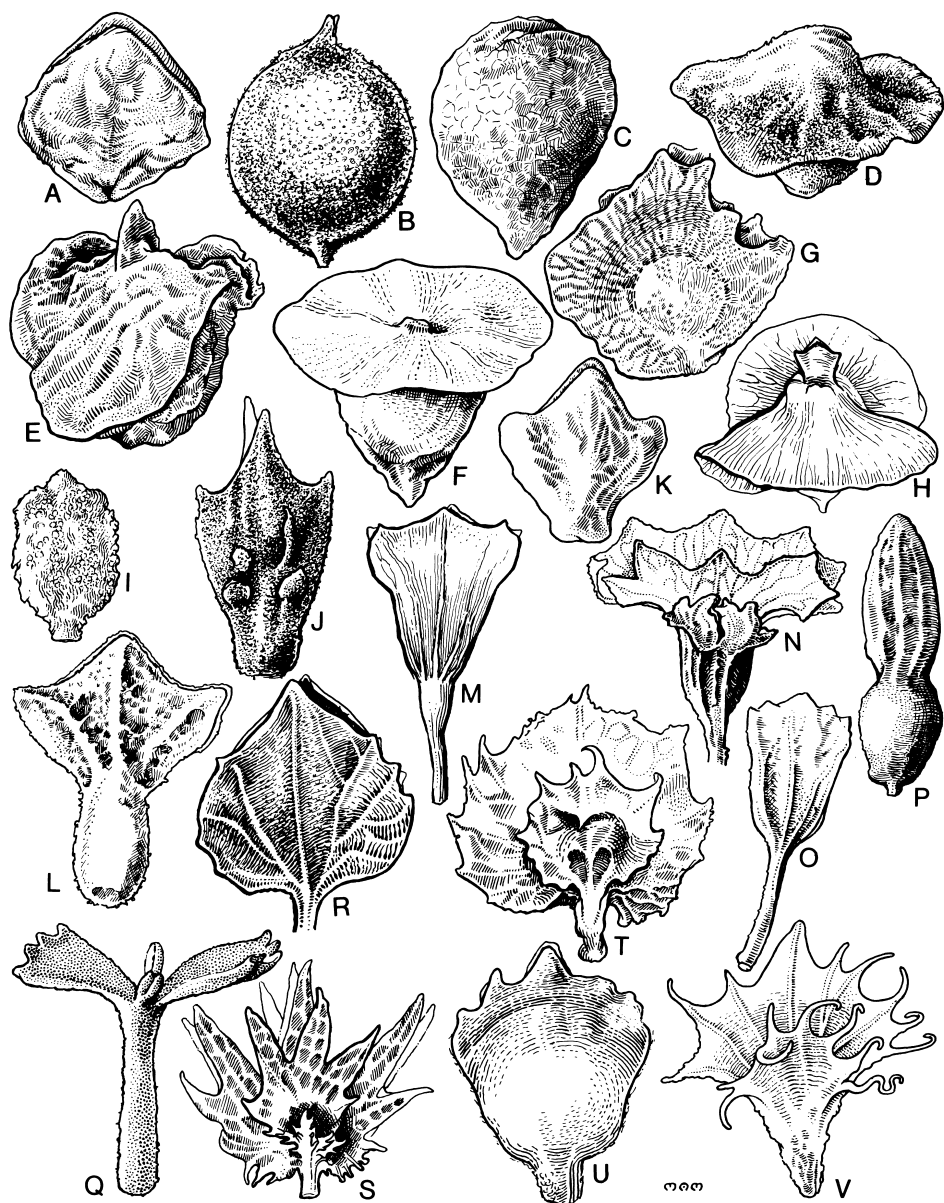


Figure 20. *Atriplex* fruits. A, *A. australasica* $\times 5$ (Lake Albacutya, Vic., D. Cheal, MEL). B, *A. spongiosa* $\times 6$. C, *A. holocarpa* $\times 3.5$. D, *A. obconica* $\times 6.5$ (B. Lay 512, AD). E–G, *A. lindleyi*; E, subsp. *lindleyi*; $\times 5$; F, subsp. *inflata* $\times 4$; G, subsp. *conduplicata* $\times 3.5$. H, *A. macropterocarpa* $\times 3.5$. I, *A. pumilio* $\times 16.5$ (P. Wilson 6422, PERTH). J, *A. acutibractea* $\times 6.5$. K, *A. exilifolia* $\times 10$ (K. Newbey 3064, PERTH). L, *A. crassipes* $\times 15$. M, *A. angulata* $\times 5$. N, *A. eardleyae* $\times 6.5$. O, *A. turbinata* $\times 11.5$. P, *A. leptocarpa* $\times 12.5$. Q, *A. limbata* $\times 5$. R, *A. humifusa* $\times 5$. S, *A. fissivalvis* $\times 7.5$. T, *A. quadrivalvata* $\times 10$. U, *A. muelleri* $\times 9$. V, *A. semilunaris* $\times 6.5$. A, D, I, K drawn by M. Menadue. Others reproduced by permission from J. Jessop (ed.), *Fl. Centr. Australia* Fig 82 (1981). Some vouchers not recorded.

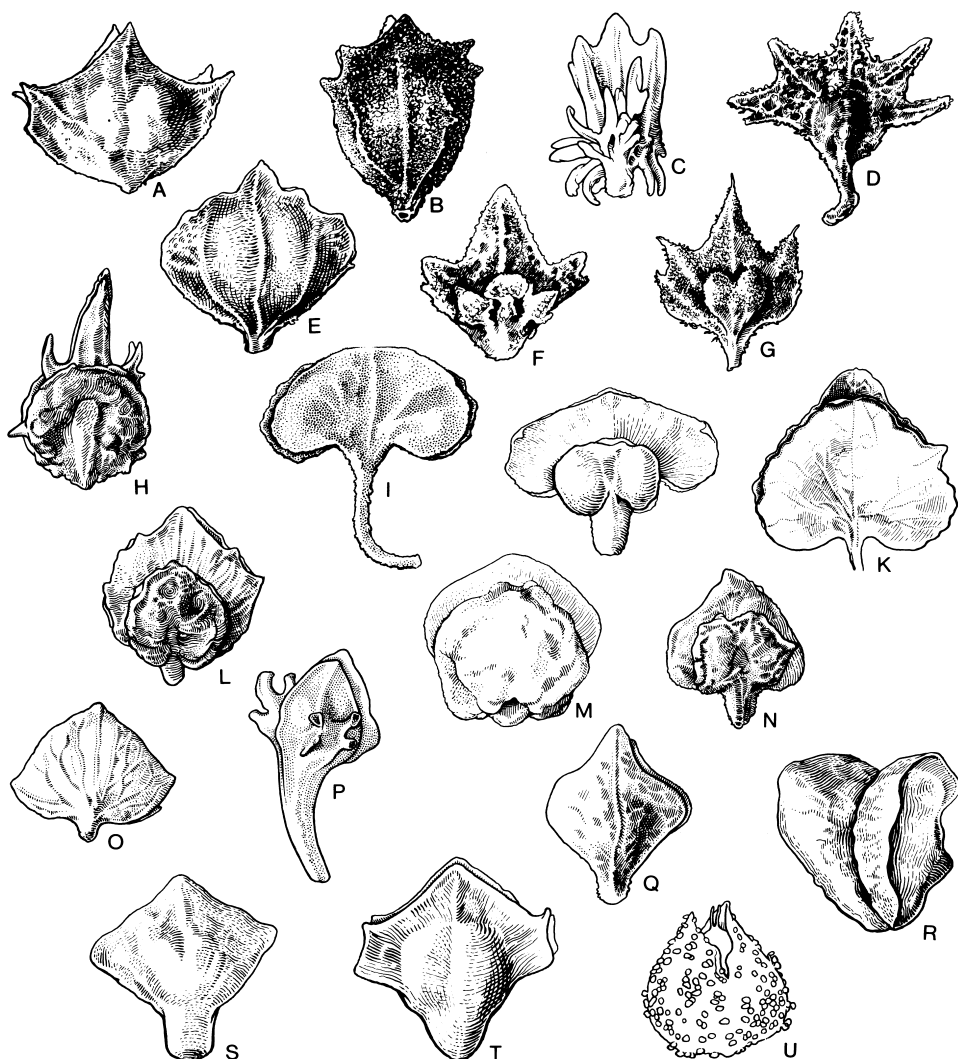


Figure 21. *Atriplex* fruits. **A**, *A. suberecta* $\times 10.5$. **B**, *A. elachophylla* $\times 7.5$. **C**, *A. papillata* $\times 8$ (Yamba, S.A., J. Browne, AD). **D**, *A. lobativalvis* $\times 7$. **E**, *A. cordifolia* $\times 9$. **F**, *A. velutinella* $\times 4$. **G**, *A. acutiloba* $\times 4$ (A. Morris 2732, NSW). **H**, *A. nessorhina* $\times 4$ (J. Pickard 2394, NSW). **I**, *A. stipitata* $\times 4$. **J**, *A. quinii* $\times 3$. **K**, *A. bunburyana* $\times 3$. **L**, *A. hymenotheca* $\times 3$ (P. Wilson 11842, PERTH). **M**, *A. vesicaria* $\times 3$. **N**, *A. nana* $\times 4$ (R. Saffrey 1577, PERTH). **O**, *A. paludosa* subsp. *cordata* $\times 3$ (A. Orchard 2062, AD). **P**, *A. isatidea* $\times 3$ (Lancelin, W.A., R. Lightfoot, PERTH). **Q**, *A. cinerea* $\times 3$ (H. Aston 266, MEL). **R**, *A. nummularia* $\times 4$. **S**, *A. rhagodioides* $\times 5$. **T**, *A. incrassata* $\times 4$. **U**, *A. billardierei* $\times 5.5$ (Marion Bay, Tas., W. Curtis, HO). **C**, **G**, **H**, **L**, **N**, **O**, **P**, **Q**, **U** drawn by M. Menadue. Others reproduced by permission from J. Jessop (ed.), *Fl. Centr. Australia* Fig. 82 (1981). Some vouchers not recorded.

forming paniculate inflorescences. Fruiting bracteoles sessile, ovate to triangular or rhombic, free to base, 3–6 mm long, entire to dentate, not thickened, smooth or tuberculate on back, often turning black with age. Seed circular; radicle basal, horizontal.

Native of Europe, Asia and North America; in coastal and estuarine situations and along saline creeks, also elsewhere in wet somewhat saline situations. Map 105.

W.A.: South Perth, *G. Perry 1287* (PERTH). S.A.: Brown Lake, Mt Gambier, *D. E. Symon 1180* (ADW). N.S.W.: Port Jackson, May 1897, *J. H. Maiden* (PERTH). Vic.: Lake Cope Cope, *A. C. Beaglehole 68749* (PERTH). Tas.: Stewarts Bay, *A. Brown 274* (HO).

A polymorphic species. Some of the material referred here may belong to other closely related taxa.

3. *Atriplex australasica* Moq., *Chenop. Monogr. Enum.* 59 (1840)

T: south coast of Australia, 1821; holo: P.

A. patula var. *gunnii* Aellen, *Bot. Jahrb. Syst.* 68: 385 (1938). T: Launceston, Tasmania, 1833, *R. C. Gunn 389*; holo: K.

A. patula var. *serratifolia* Aellen, *loc. cit.* T: Launceston, Tasmania, *Gunn 389*; holo: K.

[*A. patula* auct. non L.: *G. Bentham, Fl. Austral.* 5: 172 (1870) p.p.]

[*Chenopodium bonus-henricus* auct. non L.: anon., *Victorian Naturalist* 22: 79 (1905); *A. J. Ewart, Fl. Victoria* 452 (1931)].

Spreading to erect annual c. 1 m high, monoecious. Branches quadrangular, almost glabrous. Lower leaves lanceolate, base cuneate, margin entire to deeply serrate, often hastate with forwardly directed lobes, 5–10 mm long, including petiole of c. 10 mm. Flowers mixed, spiciform, paniculate, the flower clusters at first continuous, later disjunct. Fruiting bracteoles deltoid, acute, 3–4 mm long and wide, united in lower half or free to base, entire or with 1 or 2 teeth, smooth or with warty protuberances, becoming black and thickened with age. Seeds of two types, brown and black, orbicular; radicle basal, horizontal. *Native Orache*. Fig. 20A.

Native to south-eastern Australia and Tasmania in wet brackish situations, often coastal. Map 106.

S.A.: near Meningie, *D. E. Symon 6889* (ADW). N.S.W.: Nowra, 5 Mar. 1957, *E. Gauba* (PERTH). Vic.: Lake Corangamite, 11 Mar. 1962, *J. H. Willis* (MEL). Tas.: Launceston, *R. C. Gunn 389* (K).

A variable species that is difficult to circumscribe with precision. Some material referred here may belong to *A. patula* L. but the presence of this and other closely related species has not been confirmed. Usually considered endemic but possibly an introduction from Asia.

Sect. III. Spongiocarpus

Atriplex sect. *Spongiocarpus* F. Buxb., *Verh.-Zool. Bot. Ges. Wien* 76: 44 (1927).

Type: *A. spongiosa* F. Muell.; lecto: *vide* P. G. Wilson, *Fl. Australia* 4: 322 (1984).

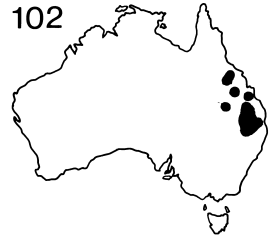
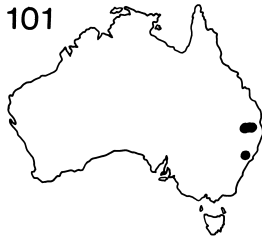
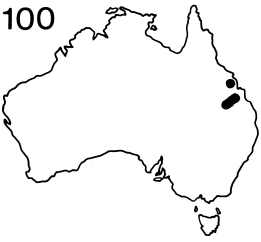
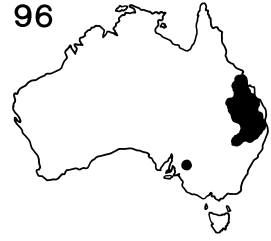
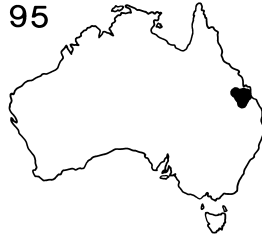
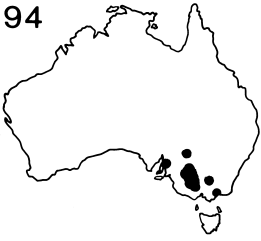
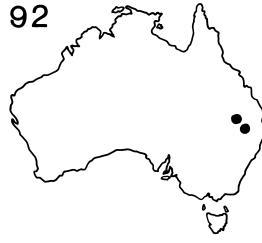
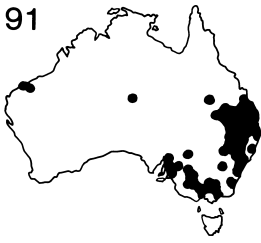
Atriplex ser. *Parvilobae* Benth., *Fl. Austral.* 5: 168, 177 (1870), p.p. T: not designated.

Atriplex sect. *Halimoides* Ulbr., *Nat. Pflanzenfam. 2nd edn, 16c: 515* (1934). T: *A. lindleyi* Moq. (*A. halimoides* Lindley)

Atriplex sect. *Spongiosa* Ulbr., *loc. cit.*, *nom. illeg.* T: *A. spongiosa* F. Muell.

Blackiella Aellen, *Bot. Jahrb. Syst.* 68: 423 (1938); *Atriplex* subg. *Blackiella* (Aellen) Maire, *Fl. Afrique Nord* 8: 91 (1962). T: not designated.

Annuals or short-lived perennials, monoecious. Stems smooth. Leaves with a closed dense reticulate venation. Female flowers bi-bracteolate. Fruiting bracteoles almost totally united (except in *A. kochiana*), spongy or if otherwise with wing-like appendages, these otherwise absent. Seeds vertical.



- 91. *Opuntia stricta*
- 94. *Opuntia robusta*
- 97. *Opuntia microdasys*
- 100. *Acanthocereus pentagonus*
- 103. *Nyctocereus serpentinus*

- 92. *Opuntia sulphurea*
- 95. *Opuntia streptacantha*
- 98. *Opuntia* sp.
- 101. *Eriocereus tortuosus*
- 104. *Atriplex hortensis*

- 93. *Opuntia ficus-indica*
- 96. *Opuntia tomentosa*
- 99. *Hylocereus undatus*
- 102. *Eriocereus martinii*
- 105. *Atriplex prostrata*

Six species endemic in Australia.

4. *Atriplex spongiosa* F. Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 74 (1858)

A. holocarpa var. *spongiosa* (F. Muell.) Maiden & E. Betche, *Census New South Wales Pl.* 68 (1916); *Senniella spongiosa* (F. Muell.) Aellen, *Bot. Jahrb. Syst.* 68: 416 (1938). T: Sturts Creek, F. Mueller; lecto: MEL 607132, *vide* P. G. Wilson, *Fl. Australia* 4: 325 (1984).

Senniella spongiosa var. *amoena* Aellen, *Bot. Jahrb. Syst.* 68: 420 (1938). T: Mt Lyndhurst, S.A., 1900, M. Koch s.n.; n.v.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* fig. 44(27) (1982).

Rounded annual or short-lived perennial to 30 cm high, monoecious. Leaves elliptic, broadly elliptic or ovate, 1–2 cm long, acute to obtuse, entire to sinuate dentate (or rarely deeply serrate), narrowed at base into a short petiole or sessile, scurfy on both surfaces. Flowers of mixed sexes in axillary glomerules. Fruiting bracteoles sessile, fused, broadly ellipsoidal, to globular 4–6 mm long, rarely to 8 mm, shortly apiculate, inflated; epidermal covering thin, loosely scurfy, supported on a network of fibrous veins; utricle in centre of bracteoles, cavity compressed elliptic, with a thin woody wall. Seed erect, broadly elliptic; radicle lateral, erect. *Pop Saltbush*. Fig. 20B.

Found from southern N.T. south-east to western N.S.W., on margins of salt lakes and in dry, somewhat saline areas. Map 107.

N.T.: Arltunga National Park, T. S. Henshall 1299 (NT). S.A.: Barton, E. H. Ising 1360 (ADW). Qld: Pulchera waterhole, P. K. Latz 522 (PERTH). N.S.W.: 19 km SSW of Milparinka, J. De Nardi 796 (NSW).

Atriplex spongiosa, if treated in the broad sense, includes *A. holocarpa* and then contains many variants, some of which are very plastic in their morphology. In eastern and central Australia these variants can be segregated into two groups centred around the types of *A. spongiosa* and *A. holocarpa*. In WA the distinction between the two groups is less obvious and most collections cannot readily be placed with one or the other; in this account the W.A. plants with an intermediate aspect have been included under *A. holocarpa*. In spite of this difficulty the two groups are here recognised as representing distinct species for where they grow together in the eastern States they retain their distinctive features.

The name *Senniella spongiosa* var. *amoena* was given to a variant in which the bracteoles are spindle-shaped and translucent. It is found in north-eastern S.A.

5. *Atriplex holocarpa* F. Muell., *Rep. Pl. Babbage's Exped.* 19 (1859)

Senniella spongiosa var. *holocarpa* (F. Muell.) Aellen, *Bot. Jahrb. Syst.* 68: 418 (1938); *A. spongiosa* var. *holocarpa* (F. Muell.) J. Black, *Fl. S. Australia* 2nd edn, 300 (1948). T: Eyre's Depot Creek, *Babbage's Expedition*; holo: MEL.

A. pterocarpa Ewart & Rees, *Proc. Roy. Soc. Victoria* n. ser. 23: 110 (1910). T: near Silverton, N.S.W., 1886, E. N. Charsley; holo: MEL.

Senniella spongiosa f. *microcarpa* Aellen, *op. cit.* 419 p.p. T: Swan River, W.A., J. Drummond 247; isosyn: MEL.

S. spongiosa var. *xylocarpa* Aellen, *op. cit.* 422. T: Mt Lyndhurst, S.A., 1899, M. Koch 145; holo: K.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 239, fig. 44(9) (1982).

Rounded annual or short-lived perennial to 30 cm high, monoecious. Leaves thin, rarely leathery, scurfy both sides; lamina deltoid to narrowly rhomboid, acute, 15–30 mm long, base obtuse, margin sinuate to serrate; petiole $\pm\frac{1}{2}$ length of lamina. Flowers in axillary glomerules. Fruiting bracteoles sessile, fused, globular to obovoid, 8–12 mm long, shortly apiculate, inflated; epidermal covering thin, scurfy or eventually glabrous, on a network of fibrous veins; utricle cavity compressed elliptic in centre of bracteoles with a thin woody wall. Seed erect, broadly elliptic; radicle lateral, erect. *Pop Saltbush*. Fig. 20C.

Found in SW Qld, western N.S.W. and north-western Vic. to southern W.A., often on floodplains or sandy flats. Map 108.

W.A.: c. 26 km E of Haig, *T. E. H. Aplin 5798* (PERTH). N.T.: Palmer Valley Stn, *T. S. Henshall 2082* (NT). Qld: Birdsville, *S. T. Blake 12253* (BRI). N.S.W.: 5 km S of Mossgiel, *W. Mulham 561* (NSW). Vic.: Hattah Lakes National Park, *A. C. Beaglehole 39240* (PERTH).

Very similar to, and often found growing with, *A. spongiosa*.

6. *Atriplex codonocarpa* Paul G. Wilson, *Fl. Australia* 4: 322 (1984)

T: Lake Barlee, W.A., *P. G. Wilson 8861*; holo: PERTH; iso: MEL.

A. halimoides var. *deplanata* F. Muell., *Pl. N.W. Australia* 7 (1881). T: Yule River near the coast, W.A., 1878, *J. Forrest*; lecto: MEL 607644, *fide* P. G. Wilson, *loc. cit.*

Illustration: J. M. Black, *Fl. S. Australia* 2nd edn, fig. 385 (1948) as *A. inflata*.

Rounded annual or short-lived perennial c. 30 cm high, monoecious. Leaves thin, with scaly sheen on both sides, rhomboid orbicular, contracted at base into petiole from as long as to half as long as lamina, in all 2–4 cm long; margin sinuate-dentate. Male flowers few and mixed with female in small sub-terminal clusters. Female flowers in scattered axillary clusters. Fruiting bracteoles soft and spongy, completely united, turbinate to cup-shaped with a flat top that is bordered by a continuous, horizontal, circular, entire or sinuate wing, in all 7–15 mm high and wide, sessile or rarely with a stipe up to 10 mm long. Seed with basal, horizontal radicle. *Flat-topped saltbush*.

Found in the western half of W.A. S of Roebourne, generally in somewhat saline areas particularly on outer margin of salt lakes. Map 109.

W.A.: Hamelin Pool, *A. S. George 1479* (PERTH); 16 km S of Leonora, *T. E. H. Aplin 2314* (PERTH).

The lower half of the turbinate structure consists of a pedicel enveloped in the spongy covering while the upper half contains the tube. When the spongy covering at the base is scanty the pedicel has a stipe-like appearance.

7. *Atriplex obconica* Paul G. Wilson, *Fl. Australia* 4: 324 (1984)

T: S end of Wilkinson Lake East, S.A., *B. Lay 512*; holo: AD.

Rounded annual or short-lived perennial c. 30 cm high, monoecious. Leaves petiolate, thin with a thin scurfy indumentum (or developing a silvery sheen); lamina broadly obovate to rhomboid, 10–15 mm long, rounded at apex, sinuate on margin; petiole c. half length of and grading into lamina. Flowers in mixed axillary clusters. Fruiting bracteoles fused, subcampanulate, seemingly sessile, scurfy pubescent; tube compressed obconical, c. 3 mm long, slightly inflated, fibrous, the upper half with a compressed spherical cavity enclosing the utricle; wing \pm horizontal to undulate, reticulate, almost circular and sinuate on margin or divided into semi-circular halves, in all 5–8 mm diam.; apex flat and continuous with wings or produced in centre into a narrowly triangular 2-lobed tip to 2 mm long. Seed circular; radicle basal, horizontal. Fig. 20D.

Found in northern and central S.A.; often along drainage channels in subsaline soils. Map 110.

S.A.: Hermit Hill Springs, *D. E. Symon 11223* (ADW); 25 km W of William Creek, *J. Z. Weber 804* (AD).

Similar to *A. codonocarpa* but the fruiting bracteoles are smaller and have a compressed tube. Possibly of hybrid origin involving *A. macropterocarpa* or *A. lindleyi* subsp. *quadripartita* and another species, but now evidently stabilised.

8. Atriplex lindleyi Moq. in DC., *Prodr.* 13(2): 100 (1849), based on *A. halimoides* Lindley

A. halimoides Lindley in T. Mitch., *Three Exped. Australia* 1: 282 (1838) *nom. illeg.* non Tineo (1827). T: Interior of New Holland (probably c. 20 km N of Greenoughs Hill, N.S.W.), 1835, *T. L. Mitchell*; holo: CGE.

Annual or short-lived perennial c. 30 cm high, monoecious. Leaves thin, narrow obovate to rhomboid-orbicular, acute or obtuse to rounded, cuneate at base, in all c. 20 mm long, margin coarsely sinuate-dentate to entire. Male flowers in small glomerules towards the branch apices. Female flowers in scattered axillary clusters. Fruiting bracteoles seemingly sessile, united except near apex, strongly dorsiventrally flattened to spongy turbinate or subglobose, variously winged around apex or with opposite erect circular wing-like appendages, in all 5–18 mm long and wide, prominently or minutely apiculate due to the free triangular bracteole apices, 1–2 mm high. Seed circular; radicle basal, horizontal.

This species is extremely variable in the shape of its leaves and of its fruiting bracteoles. The type variant approaches subsp. *conduplicata* in having a pair of dorsal and ventral wings: at the other extreme (represented by the type of subsp. *inflata*) the bracteoles are sub-globose and have almost no wing. Hybridisation probably occurs between the subspecies. This treatment does not account for all the variability observed.

- | | |
|---|---------------------------------|
| <p>1 Fruiting bracteoles ± turbinate to strongly dorsiventrally compressed; upper surface or lateral margins produced into spreading or ascending wings</p> | |
| <p>2 Fruiting bracteoles dorsiventrally flattened, broadly elliptic to orbicular in outline due to the opposite wing-like appendages that unite to form a winged tube; leaves rounded</p> | 8d. subsp. conduplicata |
| <p>2: Fruiting bracteoles spongy; wing-like appendages not passing to base</p> | |
| <p>3 Upper-surface of bracteoles produced into a dorsal and a ventral wing, leaves acute to obtuse</p> | 8a. subsp. lindleyi |
| <p>3: Upper-surface of bracteoles produced into an erect dorsal and ventral wing and a pair of smaller spreading lateral lobes; leaves obtuse to rounded</p> | 8b. subsp. quadripartita |
| <p>1: Fruiting bracteoles subglobose, wingless or almost so; leaves narrow, acute</p> | 8c. subsp. inflata |

8a. Atriplex lindleyi Moq. subsp. **lindleyi**

Illustration: G. M. Cunningham *et al.*, *Pl. W New South Wales* 242 fig. 44(4) (1982) as *A. conduplicata*.

Leaves oblanceolate to narrowly obovate, acute, entire to dentate. Fruiting bracteoles turbinate, somewhat dorsiventrally compressed; upper surface curved; wing variable, surrounding apex of tube as a pair of lobes, dorsal and ventral, which are somewhat decurrent down tube when this is compressed. Fig. 20E.

Widespread in eastern S.A., central and south-western Qld, western N.S.W. and far north-western Vic. Map 111.

S.A.: 5 km E of Burra, *E. N. S. Jackson 381* (AD). Qld: Winton, *S. T. Blake 6525* (BRI). N.S.W.: Fowlers Gap, *S. Jacobs 2079* (NSW). Vic.: Lake Cullulleraine, *A. C. Beaglehole 39491* (PERTH).

A taxon that is difficult to circumscribe; it passes on the one hand into the sub-globose fruited subsp. *inflata* and on the other into the plant with dorsiventrally flattened fruit, subsp. *conduplicata*.

8b. *Atriplex lindleyi* subsp. *quadripartita* Paul G. Wilson, *Fl. Australia* 4: 324 (1984)

T: 1 km SW of Kalabitty Homestead, S.A., 26 July 1976, *L. D. Williams 8393*; holotype: AD.

[*A. lindleyi* var. *quadripartita* J. Black, *Fl. S. Australia* 2nd edn, 300 (1948) *nom. inval.*]

Leaves broadly obovate to rhomboid, coarsely dentate; apex obtuse to rounded. Fruiting bracteoles with obconical slightly compressed spongy tube c. 5 mm long; wing deeply 4-lobed, dorsal and ventral lobes c. 5 mm long, erect and rounded, lateral lobes smaller, spreading.

Found from west of the northern Flinders Ranges in S.A. to western N.S.W. Map 112.

S.A.: Murnpeowie Ck, 19 July 1920, *H. W. Andrew* (AD); between Leigh Ck and Copley, *Hj. Eichler 12986* (AD). N.S.W.: c. 26 km E of Old Corunna Well, *S. Jacobs 161* (NSW).

8c. *Atriplex lindleyi* subsp. *inflata* (F. Muell.) Paul G. Wilson, *Fl. Australia* 4: 323 (1984)

Atriplex inflata F. Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 75 (1858); *Blackiella inflata* (F. Muell.) Aellen, *Bot. Jahrb. Syst.* 68: 426 (1938). T: in the Murray Desert, S.A., collector unknown; lectotype: MEL 607091, *fide* P. G. Wilson, *Fl. Australia* 4: 323 (1984).

A. lampifer F. Buxb., *Verh.-Zool. Bot. Ges. Wien* 1926, 76: 44 (1927). T: from near Stax, Tunisia, *F. Buxbaum and E. & H. Janchen*; *syn. n.v.*

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(13) (1982) as *A. lindleyi*.

Leaves elliptic to narrowly elliptic, acute, remotely sinuate-dentate. Fruiting perianth spongy, sub-globose, c. 8 mm long and wide; base rounded to obtuse; upper surface flat but curved laterally, with the margins sometimes produced into a narrow, slightly inflated wing; free apex of bracteoles narrow triangular, c. 1 mm high. Fig. 20F.

Found in south-western W.A., southern N.T., eastern S.A., western N.S.W. and northern Vic., often in somewhat saline denuded areas. Map 113.

W.A.: Waeel, *T. E. H. Aplin 747* (PERTH). N.T.: Erldunda Stn, *T. S. Henshall 60* (NT). S.A.: Port Germain, *G. H. Clarke* (ADW 3151). N.S.W.: Broken Hill, *A. Morris 124* (ADW). Vic.: 5 km E of Red Cliffs, *J. Cullimore 36* (MEL).

8d. *Atriplex lindleyi* subsp. *conduplicata* (F. Muell.) Paul G. Wilson, *Fl. Australia* 4: 323 (1984)

Atriplex conduplicata F. Muell., *Austral. J. Pharm.* 1: 429 (1886); *A. halimoides* var. *conduplicata* (F. Muell.) F. Muell. & Tate, *Trans. Roy. Soc. S. Austral.* 16: 345 (1892); *Blackiella conduplicata* (F. Muell.) Aellen, *Bot. Jahrb. Syst.* 68: 424 (1938). T: 'In the vicinity of the Darling-River and some of its tributaries; *C. King, L. Singleton*,'; *n.v.*

?*Blackiella conduplicata* var. *phyllocarpa* Aellen, *op. cit.* 425. T: Mt Lyndhurst, S.A., 1890, *M. Koch s.n.*; *n.v.*

Illustrations: J. P. Jessop, *Fl. Central Australia* fig. 82(5) (1981); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 238 (1982) as *A. conduplicata*

Leaves obovate to rhomboid-orbicular, in all 20–40 mm long, apex obtuse to rounded. Fruiting bracteoles slightly spongy, covered with a scaly sheen, united almost to apex, broadly elliptic to orbicular in outline due to the opposite erect circular appendages that unite in middle to form a winged tube and stipe, in all 5–18 mm long and wide; upper surface of bracteoles rounded and surrounded by the prominent free oblong-triangular apexes which do not exceed the winged appendages. Fig. 20G.

Found in south-eastern N.T., eastern S.A., central and SW Qld, central and western N.S.W. and far north-western Vic. An invader of slightly saline denuded areas. Map 114.

N.T.: c. 35 km N of Andado Homestead, *G. Chippendale* (NT 2826). S.A.: 72 km SE of Bluff Homestead, *T. R. N. Lothian and D. E. Francis 564* (AD). Qld: c. 5 km N of Coorabulka Stn, *P. K. Latz 496* (NT). N.S.W.: Fowlers Gap, *S. Jacobs 2259* (NSW). Vic.: W of Merbein, *G. Parr-Smith 1101* (PERTH).

The fruiting bracteoles of this species are compressed, flat on their dorsal and ventral surfaces and often almost circular in outline due to the erect decurrent wings; the leaves are rhomboid-orbicular. In typical *A. lindleyi* subsp. *lindleyi* the bracteoles are similar but thicker, with shorter wings; the leaves are narrow obovate. It is probable that subsp. *conduplicata* hybridises with subsp. *lindleyi*.

9. *Atriplex macropterocarpa* (Aellen) H. Eichler, *Suppl. J.M.Black's Fl. S. Australia 2nd edn*, 113 (1965)

Blackiella macropterocarpa Aellen, *Bot. Jahrb. Syst.* 68: 427 (1938). T: Kootanoorinna, 1891, *R. Helms*; Mt Lyndhurst, S.A., 1898, *M. Koch s.n.*, ? isosyn: AD.

Illustrations: J. P. Jessop, *Fl. Central Australia* fig. 82(6) (1981); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(15) (1982).

Annual herb to 30 cm. Leaves obovate to orbicular-rhomboid c. 15–25 mm long, scaly on both surfaces, apex rounded, base cuneate and narrowed to a petiole, $\pm\frac{1}{2}$ length of lamina, margin sinuate-dentate. Male flowers glabrous or almost so, in glomerules c. 3 mm diam., terminal or forming disjunct spikes or panicles. Female flowers in scattered axillary glomerules. Fruiting bracteoles sessile, united to near apex, glabrous, glossy; tube turbinate with rounded base, 2–4 mm long, spongy, upwards into a pair of horizontal, wing-like, entire, slightly spongy, auriculate appendages, 5–8 mm wide, the margins of which are decurrent down tube; apex of tube rounded, its centre apiculate with the minute narrowly triangular terminal lobes. Seed with basal, horizontal radicle. Fig. 20H.

Found in disjunct areas along the Gascoyne R. in NW Australia, central S.A., north-western N.S.W. and south-western Qld. Map 115.

W.A.: Gascoyne R., 1900, *W. V. Fitzgerald* (PERTH). S.A.: Oakden Hills, 19 Aug. 1968, *S. A. Pastoral Board* (AD). Qld: Marion Downs, *S. T. Blake 12350* (BRI). N.S.W.: Kayrunnera, *J. C. De Nardi 867* (NSW).

10. *Atriplex kochiana* Maiden, *Trans. & Proc. Roy. Soc. S. Australia* 21: 87 (1897)

T: Mt Distance, S.A., July 1897, *M. Koch*; holo: NSW; iso: AD, MEL.

Illustration: J. M. Black, *Fl. S. Australia* 2nd edn, fig. 365 (1948).

Erect rounded annual or short-lived perennial to 40 cm high, monoecious. Leaves thin with scaly sheen on both surfaces; lamina very broadly obovate to rhomboidal, 15–35 mm long, coarsely sinuate, apex rounded, base cuneate; petiole slightly winged, $\pm\frac{1}{2}$ length of lamina. Male flowers in glomerules forming continuous or disjunct slender spikes. Female flowers in axillary clusters. Fruiting bracteoles sessile or minutely stipitate, united towards base into a compressed broadly turbinate tube 0.5–1.5 mm high and 1.5–2.5 mm wide at apex, expanding above into thin adpressed prominently veined fan-shaped valves with sinuate margins, 5–8 mm wide and 2.5 mm high; appendages inflated, compressed, ovate to orbicular, cordate at base, equal to or exceeding valves, attached at apex of tube of each bracteole by a short stipe. Seed depressed orbicular; radicle lateral, erect.

A rare species of north-eastern S.A. Map 116.

S.A.: 32 km W of Oodnadatta, 5 Aug. 1933, *J. B. Cleland* (AD); 3 km NW of Andamooka, *R. Swinbourne 174* (AD).

Sect. IV. Semibaccatae

Atriplex sect. **Semibaccatae** (Standley) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 515 (1934) as '*Semibaccata*'.

Atriplex XIII. *Semibaccatae* Standley, *N. Amer. Fl.* 21: 52 (1916). T: *A. semibaccata* R. Br.

Atriplex ser. *Glomeratae* Benth., *Fl. Austral.* 5: 167, 174 (1870). T: not designated.

Atriplex sect. *Austrobione* Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 515 (1934). T: not designated.

Atriplex sect. *Podiceps* Ulbr., *op. cit.* 516, *p.p.* as to ser. *Velutinella* Ulbr., ser. *Leptocarpa* Ulbr. and ser. *Morrisia* Ulbr.

Atriplex ser. *Velutinella* Ulbr., *op. cit.* 517. T: *A. velutinella* F. Muell.

Atriplex ser. *Leptocarpa* Ulbr., *op. cit.* 517. T: *A. leptocarpa* F. Muell.

Atriplex ser. *Morrisia* Ulbr., *op. cit.* 517; *Morrisiella* Aellen, *Bot. Jahrb. Syst.* 68: 422 (1938). T: *A. morrisii* R. Anderson

Atriplex sect. *Elachophylla* Ulbr., *op. cit.* 517. T: *A. elachophylla* F. Muell.

Atriplex sect. *Lobataivalvis* Ulbr., *op. cit.* 517. T: *A. lobataivalvis* F. Muell.

Perennial herbs or weak shrubs, monoecious; stems smooth. Leaves with a closed reticulate venation. Female flowers with a pair of bracteoles. Fruiting bracteoles free or united, thin or variously thickened but not spongy; appendages tuberculate, foliaceous, inflated, spinose, or absent, not spongy. Seeds vertical.

36 species endemic in Australia.

11. *Atriplex pumilio* R. Br., *Prodr.* 406 (1810)

T: St Peter Is., [S.A.], *R. Brown*; holo BM, *n.v.*

A. prostrata R. Br., *loc. cit.*, *nom. illeg.*, non Boucher ex DC. (1805); *A. decumbens* R. Br. ex Schultes in Roemer & Schultes, *Syst. Veg.* 6: 289 (1820). T: Kangaroo Is., S.A., *R. Brown*; holo: BM, *n.v.*; iso: PERTH.

Illustration: J. M. Black, *Fl. S. Australia* 2nd edn, fig. 373 (1948).

Prostrate to decumbent perennial, monoecious. Leaves very shortly petiolate, elliptic to circular, 2–6 mm long with a scaly sheen on both surfaces. Flowers in glomerules; male glomerules terminal or in distal leaf axils on principal branchlets; female glomerules scattered along branches or on dwarf lateral shoots, sometimes reduced to one flower. Fruiting bracteoles broadly oblong-elliptic, convex, obtuse or rounded at apex, 1–1.5 mm long, sessile or minutely stipitate, the valves united except at apex. Fig. 20 I.

Coastal and inland areas of southern W.A., S.A., inland N.S.W., southern Qld, and far NW Vic., in somewhat saline soil. Map 117.

W.A.: Kalgoorlie, *R. J. Holloway* 215 (PERTH). S.A.: Cook, *P. G. Wilson* 10261 (PERTH). Qld: Hungerford, 6 Aug. 1948, *J. Riches* (BRI). N.S.W.: Deniliquin, *E. Gauba* (CBG 013179). Vic.: Mildura, *A. C. Beaglehole* 19982 (PERTH).

12. *Atriplex acutibractea* R. Anderson, *Proc. Linn. Soc. New South Wales* 55: 500 (1930) as *acutibractum*

T: Murray Flats W of Blanchetown, S.A., May 1911, *J. B. Cleland*; holo: NSW 151138.

Intricately branched rounded shrub c. 50 cm high, monoecious. Leaves sessile to shortly petiolate; lamina broadly obovate to orbicular, flat or folded, 5–30 mm long, shallowly sinuate-dentate, scaly tomentose on both surfaces or glabrescent above. Flowers in clusters, axillary or forming short interrupted spikes; male glomerules inconspicuous. Fruiting bracteoles oblong, swollen towards base, fused except for the acute to acuminate apex, sessile or the lower third forming a slender or stout stipe, in all 2–8 mm long; appendages conical, usually paired on one or both valves, sometimes lacking. Seed circular; radicle lateral, erect. Fig. 20J.

Leaves \pm flat, c. 10 mm long or more; fruiting bracteoles 4–8 mm long, acuminate

12a. subsp. acutibractea

Leaves folded, c. 5 mm long; fruiting bracteoles 2–4 mm long, acute or 3-toothed

12b. subsp. karoniensis

12a. Atriplex acutibractea R. Anderson subsp. **acutibractea**

A. leptocarpa var. *acuminata* J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 46: 568 (1922). T: Tarcoola, S.A., 22 Sept. 1920, *E.H. Ising*; lecto: AD, *fide* P. G. Wilson, *Fl. Australia* 4: 323 (1984).

A. acutibractea subsp. *whyallensis* Aellen, *Bot. Jahrb. Syst.* 68: 359 (1937) *nom. illeg.*, based on *A. acutibractea*.

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 237, 242 fig. 44(1) (1982).

Leaves usually \pm flat, 10–30 mm long. Fruiting bracteoles 4–8 mm long with narrow to stout pedicel, acuminate.

Found in south-eastern W.A., southern S.A., south-western N.S.W. and north-western Vic., usually on slightly saline soils. Map 118.

W.A.: 15 km N of Cocklebiddy, *A. S. George 11873* (PERTH). S.A.: Ooldea, *P. G. Wilson 1823* (AD). N.S.W.: 64 km SW of Menindee, *J. C. De Nardi 1069* (NSW). Vic.: Hattah Lakes National Park, *G. W. Anderson* (MEL).

12b. Atriplex acutibractea subsp. **karoniensis** Aellen, *Bot. Jahrb. Syst.* 68: 360 (1937)

T: Port Augusta, S.A., *A. Meebold 6867a, 7585b*; Coolgardie, W.A., *Hochreutiner 2924*; Zanthus, W.A., *A. Meebold 6872*; Karonie, W.A., *A. Meebold 8048*; all *n.v.*

A. fasciculiflora Aellen, *op. cit.* 71: 229 (1940). T: Hughes, S.A., 1931, *C. E. Hubbard 8383*; holo: K.

A. spongiivalvis Aellen, *Trans. Roy. Soc. S. Australia* 78: 155 (1955). T: Cowell and Kimba districts, S.A., June 1937, *J. C. Gross*; iso: ADW 6847.

Illustration: P. Aellen, *Trans. Roy. Soc. S. Australia* 78: 155 (1955).

Leaves \pm folded, 5–10 mm long. Fruiting bracteoles subsessile, swollen, oblong to narrowly deltoid, 2–4 mm long, truncate with short central triangular lobe or minutely 3-toothed; appendages absent or represented by a pair of small tubercles of each bracteole.

Found in southern W.A., south-western S.A. and north-western Vic. on calcareous soil. Map 119.

W.A.: 1 km S of Salmon Gums, *K. Newbey 6709* (PERTH). S.A.: Gilles Downs, 7 Mar. 1955, *S.A. Pastoral Board* (AD). Vic.: c. 3 km SE of Annuello, *A. C. Beauglehole 40508* (MEL).

All intermediates between the extremes of both subspecies may be found; it is unclear how much of the variation is due to environment and how much to genetic factors. Plants intermediate between subsp. *karoniensis* and *A. pumilio* are found where the distribution of the two species overlap.

13. Atriplex exilifolia F. Muell., *Fragm.* 7: 9 (1869)

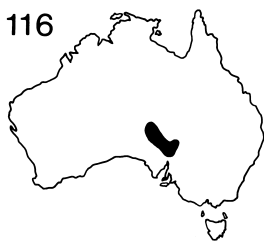
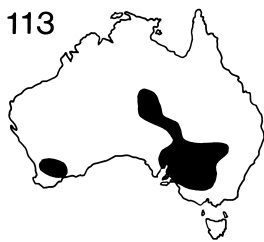
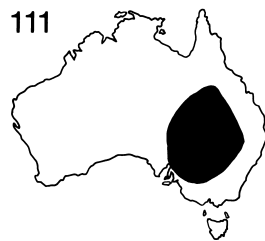
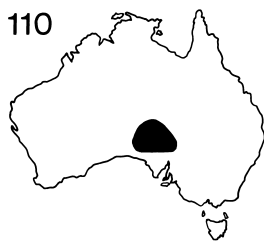
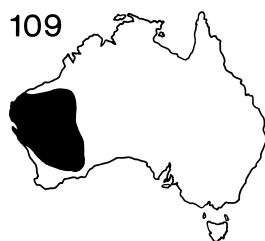
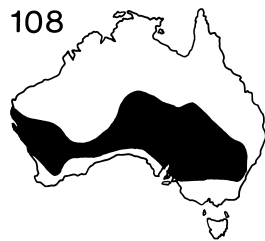
T: Western Australia, *J. Drummond 4: 249*; holo: MEL; iso: K, PERTH.

Decumbent perennial, monoecious. Leaves ovate or elliptic, shortly petiolate; lamina 3–6 mm long, entire with scaly sheen on both surfaces. Flowers in axillary glomerules; male glomerules in distal leaf axils or forming slender spikes; female glomerules scattered along branches. Fruiting bracteoles minutely pedicellate, rhomboid, 2–3 mm long and wide, smooth or each with a pair of small tubercles, united towards base. Fig. 20K.

Found in southern W.A. on margin of salt lakes. Map 120.

W.A.: c. 1.6 km N of Ongerup, *K. Newbey 3064* (PERTH); 3 km SW of Pingrup, *P. G. Wilson 8289* (PERTH).

Very similar to, and probably intergrading with, *A. pumilio*.



106. *Atriplex australasica*

109. *Atriplex codonocarpa*

112. *Atriplex lindleyi*
subsp. *quadripartita*

115. *Atriplex macropterocarpa*

118. *Atriplex acutibractea*
subsp. *acutibractea*

107. *Atriplex spongiosa*

110. *Atriplex obconica*

113. *Atriplex lindleyi*
subsp. *inflata*

116. *Atriplex kochiana*

119. *Atriplex acutibractea*
subsp. *karoniensis*

108. *Atriplex holocarpa*

111. *Atriplex lindleyi*
subsp. *lindleyi*

114. *Atriplex lindleyi*
subsp. *conduplicata*

117. *Atriplex pumilio*

120. *Atriplex exilifolia*

14. Atriplex cryptocarpa Aellen, *Bot. Jahrb. Syst.* 71: 228 (1940)

T: Hughes, S.A., 1931, *C. E. Hubbard* 8398; iso: BRI.

Illustration: P. Aellen, *op. cit.* 229, fig. A1–A2.

Divaricately branched shrub, c. 50 cm high, monoecious. Leaves sessile, erect, deeply concave and partially clasping the branch; frequently congested on dwarf lateral shoots; lamina broadly ovate, 4–8 mm long, apex acute and often recurved, base rounded or cordate, margin entire or with 2–4 teeth, scaly or with a grey sheen, sometimes glabrous with age. Male flowers in axillary glomerules, c. 0.6 mm diam., towards apex of branches. Female flowers axillary, solitary, obscured by the subtending leaf. Fruiting bracteoles sessile, united except at apex, oblong; apex 3-toothed; base rounded; in all c. 2.5 mm long, 1.5 mm wide.

Known only from far north-western Eyre Peninsula in S.A. to the central Nullarbor Plain in extreme south-eastern W.A., growing in shallow depressions on limestone plains. Map 121.

W.A.: 5 km S of Reid, *T. E. H. Aplin* 1678 (PERTH). S.A.: 15 km N of Cook, *N. N. Donner* 7211 (AD).

15. Atriplex crassipes J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 42: 171 (1918)

T: Hergott, S.A., 12 Oct. 1917, *J. M. Black*; holo: AD; iso: NSW.

Decumbent to erect rounded herb to 30 cm high, monoecious. Leaves sessile or shortly petiolate, scurfy tomentose on both surfaces, ovate to elliptic, 7–15 mm long, thin, obtuse, entire, cuneate to truncate at base. Flowers in axillary glomerules. Fruiting bracteoles like a duck's foot; stipe thick, 1–1.5 mm long; tube deltoid, flattened, united in lower half, shortly 3-toothed at apex, c. 2 mm long, prominently nerved and reticulate, smooth or with tubercles on one bracteole towards base. Seed circular; radicle lateral. Fig. 20L.

This species is closely related to *A. pseudocampanulata* with which it intergrades.

Bracteoles without appendages

15a. var. crassipes

Bracteoles with a pair of appendages on one face

15b. var. appendiculata

15a. Atriplex crassipes J. Black var. **crassipes**

A. crassipes var. *inappendiculata* Aellen, *Bot. Jahrb. Syst.* 71: 232 (1940) *nom. illeg.* (based on type of *A. crassipes*).

A. rosea var. *stipitata* F. Muell., *Rep. Pl. Babbage's Exped.* 20 (1859); *A. muelleri* var. *stipitata* (F. Muell.) Aellen, *Bot. Jahrb. Syst.* 68: 370 (1937). T: Emu Springs, S.A., *D. Herrgott*; holo: MEL 607128.

Illustrations: J. P. Jessop, *Fl. Central Australia* fig. 82(16) (1981); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(5) (1982).

Bracteoles without appendages.

Found in south-eastern N.T., central and north-eastern S.A., south-western Qld, and extreme north-western N.S.W., generally in heavy soil. Map 122.

N.T.: Ringwood Stn, *P. K. Latz* 4444 (NT). S.A.: Evelyn Downs, 14 Sept. 1953, *E. H. Ising* (AD). Qld: Glengyle Stn, *S. L. Everist* and *L. S. Smith* 101 (BRI). N.S.W.: 12 Mile Creek, *S. Jacobs* 3110 (NSW).

15b. Atriplex crassipes var. **appendiculata** Aellen, *Bot. Jahrb. Syst.* 71: 232 (1940)

T: Curragh Stn, near Cunnamulla, Qld, 4 Jan. 1931, *C. E. Hubbard* & *C. W. Winders* 6197; iso: BRI.

Bracteoles with pair of small toothed or antler-like appendages at base of tube on outer bracteole.

Found from central Qld to north-central N.S.W. in loam or clay soil. Map 123.

Qld: Thylungra, *S. L. Everist 7475* (BRI). N.S.W.: c. 34 km N of Bourke, *D. H. Benson & J. Pickard 1811* (NSW).

16. *Atriplex angulata* Benth., *Fl. Austral.* 5: 174 (1870)

T: Cudnaka, S.A., *F. Mueller; n.v.*; Murray River, *W. Ross*; syn: MEL.

A. angulata var. *campanulatiformis* Aellen, *Bot. Jahrb. Syst.* 68: 364 (1937). T: Port Augusta, S.A., *A. Meebold 1831b, 6816b, c; n.v.*; Mt Victor Stn, 1935, S.A., *C. M. Eardley; n.v.*

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(3) (1982).

Rounded annual or short-lived perennial, to 30 cm high, monoecious. Leaves thin, or leathery, scurfy on both surfaces, broadly obovate to rhomboid, narrowed at base into a petiole c. half length of lamina, in all 2–4 cm long; apex rounded; margin entire to sinuate-dentate. Male flowers in compact glomerules forming short interrupted spikes. Female flowers in axillary clusters. Fruiting bracteoles stipitate; lower half fused, campanulate to cylindrical; sometimes thickened; upper half free, fan-shaped to reniform, herbaceous, nerved, pedicel slender or thickened and continuous with tube, in all to 10 mm long and wide at apex. Seed circular; radicle erect, prominently projecting. *Fan Saltbush*. Fig. 20M.

Found in far NW Vic., western N.S.W., south-western Qld, south-eastern N.T. and north-eastern S.A. Map 124.

N.T.: Tobermoray Stn, *P. K. Latz 2596* (PERTH). S.A.: Koonamore, *J. Carrick 1691* (AD). Qld: Mt Howitt, *S. T. Blake 11909* (BRI). N.S.W.: Yanco Glen, *J. C. De Nardi 709* (NSW). Vic.: Boundary Bend, 5 May 1955, *L. A. S. Johnson* (NSW).

This species varies greatly in the shape and texture of the bracteole and leaf. It evidently in some areas intergrades with *A. pseudocampanulata*, *A. intermedia*, *A. turbinata* and *A. crassipes*. The circumscription of these species, and of the related *A. eardleyae*, is somewhat arbitrarily drawn.

17. *Atriplex pseudocampanulata* Aellen, *Bot. Jahrb. Syst.* 68: 365 (1937)

T: Mildura, Vic., Oct. 1928, *H. B. Williamson*; isolecto: MEL 607121, *fide* P. G. Wilson, *Fl. Australia* 4: 324 (1984).

A. pseudocampanulata var. *appendiculata* Aellen, *op. cit.* 366. T: Mildura, 1928, *H. B. Williamson*; isolecto: MEL 607121, *fide* P. G. Wilson, *op. cit.* 325.

A. campanulata var. *inappendiculata* R. Anderson, *Proc. Linn. Soc. New South Wales* 55: 497 (1930); *A. pseudocampanulata* var. *inappendiculata* (R. Anderson) Aellen, *op. cit.* 366. T: Murrumburrah, N.S.W., May 1911, *Town Clerk*; lecto: NSW 151164, *fide* P. G. Wilson, *loc. cit.*

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(23), 243 (1982).

Spreading to rounded herb to 30 cm high, monoecious. Leaves sessile, elliptic, c. 10 mm long, entire or sinuate, cuneate to rounded or truncate at base, scurfy tomentose on both surfaces. Flowers in axillary clusters. Fruiting bracteoles stipitate, compressed, broadly rhomboid to broadly deltoid, united in lower half, reticulate and herbaceous towards apex, 2–3 mm long, 3–4 mm wide, often with small inflated or foliaceous tubercles on one face near base; valves equal or almost so, slightly dentate to entire; pedicel c. 1 mm long, often thickened at maturity. Seed circular; radicle lateral.

Found in north-western Vic. western N.S.W., central and south-eastern Qld, and eastern S.A. Map 125.

S.A.: Muloorina Stn, *R. H. Kuchel 2858* (AD). Qld: Sandringham Stn, *B. J. Marlow* (NSW). N.S.W.: N end of Lake Popitta, *M. Fox 7910053* (NSW). Vic.: Mystic Park, *E. J. Semmens 453* (MEL).

This species varies considerably in the shape of its fruiting bracteoles which at one extreme grade into those of *A. crassipes* and, at the other, into those of *A. angulata*. Its delineation is arbitrary and could be so drawn as to include the latter two species.

18. *Atriplex eardleyae* Aellen, *Candollea* 12: 153 (1949)

A. campanulata Benth., *Fl. Austral.* 5: 177 (1870) *nom. illeg.* non J. Woods, *Tourists Fl.* 317 (1850). T: near Darling R., Bambamers [Lake Pamamaroo], N.S.W., 21 Nov. 1860, *Victorian Expedition*; syn: MEL 607071.

A. campanulata var. *multiappendiculata* Aellen, *Bot. Jahrb. Syst.* 68: 356 (1937); [*A. eardleyae* var. *multiappendiculata* (Aellen) Aellen in Hegi, *Ill. Fl. Mitt.-Eur.* 2nd edn, 3(2): 686 (1960) *nom. inval.*] T: Darling R., N.S.W., *F. Mueller*; *n.v.*

?*A. campanulata* var. *inappendiculata* Aellen, *Bot. Jahrb. Syst.* 68: 356 (1937) *nom. illeg.* non R. Anderson (1930); [*A. eardleyae* var. *inappendiculata* Aellen in Hegi, *loc. cit.*, *nom. inval.*] T: Broken Hill, N.S.W., 1919, *A. Morris* 2; ?iso: NSW.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(6) (1982).

Decumbent to erect perennial herb to 30 cm high, monoecious. Leaves elliptic to orbicular, c. 10 mm long, entire; base cuneate and passing into a short petiole or sessile. Male flowers in small glomerules in distal leaf axils usually with a few female flowers. Female flowers in scattered glomerules along branches. Fruiting bracteoles with a compressed narrow campanulate to deltoid tube, c. 1–2 mm long which expands into appressed fan-shaped to reniform reticulate sinuate valves \pm equal in length to tube, the adaxial valve slightly shorter than the abaxial; tube with a pair of small leaf-like appendages on adaxial surface near base or these sometimes lacking; stipe slender or stout, shorter than to slightly exceeding length of tube. Fig. 20N.

Found in southern W.A. eastwards to southern Qld, western N.S.W. and far north-western Vic. Map 126.

W.A.: Southern Cross, *P. G. Wilson* 6427 (PERTH). N.T.: Simpson Desert, *P. K. Latz* 4638 (NT). S.A.: Oraparinna National Park, *D. E. Symon* 7492 (ADW). Qld: 64 km N of Bungunya, *R. W. Johnson* 1225 (BRI). N.S.W.: between Wakool and Deniliquin, *M. E. Phillips* 794 (CBG). Vic.: 10 km NW of Lake Cullulleraine, *A. C. Beauglehole* 40639 (PERTH).

A very variable species evidently grading into *A. pseudocampanulata* and *A. crassipes* var. *appendiculata*. In the Simpson desert area of N.T., S.A. and Qld is found a plant intermediate in leaf and bracteole morphology between *A. eardleyae* and *A. angulata*. Hybrids between these species have been observed.

19. *Atriplex eichleri* Aellen in H. Eichler, *Suppl. J. M. Black's Fl. S. Australia* 2nd edn, 111 (1965)

T: Koonamore, S.A., 13 Aug. 1956, *Hj. Eichler* 12428; iso: AD.

A. campanulata var. *adnata* J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 42: 172 (1918). T: Lyndhurst, S.A., 15 Oct. 1917, *J. M. Black*; lecto: AD, *vide* P. Aellen, *Bot. Jahrb. Syst.* 68: 356 (1937).

Illustration: P. Aellen in H. Eichler, *op. cit.* Fig. 387A.

Decumbent to erect annual or short lived perennial to 20 cm high, monoecious. Leaves elliptic to broadly elliptic, 10–15 mm long, sessile, entire to faintly sinuate-dentate, scaly tomentose on both surfaces. Male flowers in small glomerules in distal leaf axils usually mixed with some female flowers. Female flowers in scattered axillary glomerules. Fruiting bracteoles adpressed, flat, c. 5 mm long, prominently reticulate with age, fused in lower 2/3 into a campanulate tube, broadly triangular above; the adaxial limb considerably shorter than the abaxial; appendages paired, inflated, attached along margins of adaxial bracteole; stipe 0.5–1 mm long.

Found in the Flinders Ranges and eastern regions of S.A. Map 127.

S.A.: Flinders Ranges National Park, *S. Jacobs* 3647 (PERTH).

20. *Atriplex turbinata* (R. Anderson) Aellen, *Bot. Jahrb. Syst.* 68: 356 (1937)

A. leptocarpa f. *turbinata* R. Anderson, *Proc. Linn. Soc. New South Wales* 55: 499 (1930); *A. leptocarpa* var. *turbinata* (R. Anderson) J. Black, *Fl. S. Australia* 2nd edn, 299 (1948). T: Hergott, S.A., 11 Oct. 1917, *J. M. Black*; syn: AD; Mt Lyndhurst, S.A., 1897, *M. Koch* 153; syn: NSW.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(30) (1982).

Rounded annual or short-lived perennial to 30 cm high, monoecious. Leaves thin scurfy on both surfaces, sessile, elliptic to obovate, 10 mm long, rarely to 30 mm, obtuse, entire or weakly sinuate-dentate, cuneate at base. Male flowers in glomerules in terminal axils. Female flowers in axillary clusters. Fruiting bracteoles stipitate, turbinate to narrowly turbinate, lower two-thirds united into a flattened narrowly deltoid tube 2–3 mm long, upper one-third of free appressed semicircular herbaceous reticulate lobes shortly 3-toothed; stipe slender or thickened, \pm equal in length to tube. Seed circular; radicle erect, prominently projecting. Fig. 20 O.

Found in south-eastern N.T., central and north-eastern S.A., and north-western N.S.W.; in heavy soil on plains and along creeks. Map 128.

N.T.: c. 20.5 km E of Finke, *G. Chippendale & L. Johnson* (NT 3934). S.A.: 1 km W of Millars Creek woolshed, *R.J. Chinnock* 2607 (AD). N.S.W.: Yantara Creek, *S. Jacobs* 3035 (NSW).

The typical variant of this species is found only in S.A.; elsewhere there is strong suggestion of introgression with other species, e.g. *A. angulata*, *A. crassipes* or *A. intermedia*.

21. *Atriplex intermedia* R. Anderson, *Proc. Linn. Soc. New South Wales* 55: 498 (1930)

T: Paroo River, Sept. 1900, *E. Betche*; syn: NSW; Stephen's Creek, N.S.W., *A. Morris* 170, 710; Corona, *M. Collins* 33; syn: NSW.

Illustrations: J. M. Black, *Fl. S. Australia* 2nd edn, fig. 384 (1948); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(10) (1982).

Sprawling annual or short-lived perennial to 30 cm high, monoecious. Leaves thin sessile or shortly petiolate, elliptic to obovate, 10–20 mm long, obtuse, entire to slightly sinuate-dentate, scurfy on both surfaces. Male flowers in glomerules in terminal axils. Female flowers in axillary clusters. Fruiting bracteole with a spongy cylindrical stipe c. 3 mm long continuous with the short thickened tube from which arise the appressed coarsely reticulate rhomboid lobes c. 3–4 mm long with toothed margin, the whole glossy when mature. Seed circular; radicle erect, prominently projecting.

Typical variant found in western N.S.W. and south-western Qld; plants resembling those of N.S.W are also found in south-eastern N.T. and central and north-eastern S.A. Map 129.

N.T.: c. 30 km NNE of Old Andado Homestead, *A. C. Beauglehole* 27920 (NSW). S.A.: Mt Dutton, *B. G. Briggs* 1286 (NSW). Qld: 13 km W of Hungerford, *J. Pickard* 3315 (NSW). N.S.W: Corella Stn, *J. C. De Nardi* 313 (NSW).

The fruiting bracteoles have a slender stipe when young and in this stage they resemble those of *A. turbinata* to which this species is evidently closely related. It grades into the latter species and into *A. crassipes*.

22. *Atriplex leptocarpa* F. Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 74 (1858)

T: Murray-flats, *F. Mueller*; syn: MEL 607095, 607096.

A. leptocarpa var. *armata* Aellen, *Bot. Jahrb. Syst.* 68: 362 (1937) *nom. illeg.*, based on *A. leptocarpa*.

A. leptocarpa var. *inermis* Aellen, *op. cit.* 361. T: near Lake Eyre, S.A., *Andrews* 126; Mildura, Vic., 1928, *Williamson*; Moree, N.S.W., 1907, *A. E. Darvall*; Yelarbon, Qld, 1919, *C. T. White*; all *n.v.*

A. leptocarpa f. *gracilis* Aellen, *op. cit.* 362. T: South Australia and Murray [R.], *F. Mueller*; syn: *n.v.*

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl. t. 3* (1889); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 240, 242 fig. 44(11) (1982).

Decumbent annual or short-lived perennial with slender branches, monoecious. Leaves narrowly elliptic to narrowly oblanceolate or rhomboid, remotely dentate to entire, 10–30 mm long, scaly on both surfaces. Male flowers in axillary glomerules or in short terminal spikes; perianth glabrous. Female flowers clustered in leaf axils. Fruiting bracteoles fused to apex, cylindrical to urceolate (sometimes compressed when young) flattened distally, seemingly sessile or with a short slender stipe (this often developing a spongy cylindrical sheath with age continuous with the bracteoles), in all 4–6 mm long; basal portion often thickened and sometimes tuberculate; distal portion herbaceous and ± flattened, strongly nerved; apex truncate to acute, often shortly 3-toothed. Seed circular to ovate; radicle lateral, slightly exserted. *Slender-fruit Saltbush*. Fig. 20P.

Found in eastern S.A., southern Qld, N.S.W., and north-western Vic.; introduced into W.A. Grows along river flats, margins of lakes, and other periodically water-logged sites. Map 130.

W.A.: Kellerberrin, Apr. 1968, *R. Forsyth* (PERTH). S.A.: Renmark, 25 Mar. 1958, *S.A. Pastoral Board* (AD). Qld: Cunnamulla, *S. T. Blake 5569* (NSW). N.S.W.: Cunninyeuk, *D. L. W. Henderson 200* (NSW). Vic.: c. 6 km NE of Kooloonong, *N. Macfarlane 770* (MEL).

A very variable species which possibly intergrades with both *A. intermedia* and *A. sturtii*.

23. *Atriplex sturtii* S. Jacobs, *Telopea* 2: 453 (1983)

A. leptocarpa f. *minor* R. Anderson, *Proc. Linn. Soc. New South Wales* 55: 499 (1930); *A. leptocarpa* var. *minor* (R. Anderson) J. Black, *Fl. S. Austral.* 2nd edn, 299 (1948). T: Tibooburra, N.S.W., May 1913, *O. E. Couch 110*; lecto: NSW 149928 *vide* S. Jacobs, *loc. cit.*

Spreading annual or short-lived perennial to 30 cm high, monoecious. Branches slender. Leaves thin, obovate, sinuate-dentate, scaly on both surfaces, apex rounded, base cuneate; lamina 10–20 mm long; petiole slender. Male flowers in distal axils, perianth glabrescent. Female flowers numerous in scattered glomerules. Fruiting bracteoles: when immature oblong and shortly stipitate, the stipe eventually becoming spongy; when mature narrowly cylindrical, 3–5 mm long, of two distinct portions, lower third to half a cylindrical firm spongy straw-coloured stipe; upper portion a somewhat compressed green to straw-coloured thin walled, longitudinally nerved tube, obtuse. Seed obovate, radicle lateral and slightly exserted.

Found in central Australia from south-eastern N.T. to far north-western N.S.W., principally in white sand. Map 131.

N.T.: Rainbow Valley, *T. S. Henshall 1191* (PERTH). S.A.: Murta Well, *W. S. Reid* (ADW 26356). Qld: near the Mulligan R., 1885, *W. H. Cornish* (MEL). N.S.W.: Tibooburra, *A. Morris 709* (ADW).

This species differs from *A. leptocarpa* in leaf shape and in the morphology of the fruiting bracteoles; in *A. sturtii* the basal portion is eventually spongy and the tube thin-walled while in *A. leptocarpa* the basal portion is hard and the tube woody.

A. sturtii appears to grade into *A. turbinata* and *A. leptocarpa*.

24. *Atriplex limbata* Benth., *Fl. Austral.* 5: 178 (1870)

T: Darling River, N.S.W., 12 Oct. 1860, *Victoria Expedition*; holo: MEL 607100.

A. limbata var. *sexifida* J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 38: 462 (1914). T: between Crown Point and Horseshoe Bend, Finke R., N.T., Aug. 1913, *S. A. White*; holo: AD.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl. t. 4* (1889); J. M. Black, *Fl. S. Australia* 2nd edn, fig. 379 (1948).

Erect perennial branching near base, c. 30 cm high, monoecious. Leaves rhomboid or circular and c. 10 mm long to narrowly elliptic or narrowly obovate and c. 40 mm long, sinuate to entire, scaly tomentose on both surfaces; petiole 1/3 length of lamina. Male

flowers in glomerules c. 5 mm diam., in the upper leaf axils or forming slender interrupted spikes. Female flowers in axillary glomerules. Fruiting bracteoles united (except at apex where closely appressed) to form a hard cylindrical tube 1.5–3 mm long, passing into a slender or thick stipe from half as long to as long as tube; apex rounded, apiculate, with a pair of lateral erect or spreading horn-like lobes or these reduced to small teeth; appendages terminal, flat, spreading, fan-shaped, 1–3 mm long, crenulate or lobed or divided into two. Seed ellipsoid, erect with erect radicle. Fig. 20Q.

Found in north-eastern W.A., southern N.T., northern and eastern S.A., extreme south-western Qld, western N.S.W., and far north-western Vic. Also in southern W.A. where probably introduced. Map 132.

W.A.: Rudall R., *A. S. George 10724* (PERTH). N.T.: Petermann Range, *A. S. George 4966* (MEL). S.A.: Kenmore Park, *A. C. Beaglehole 10191* (PERTH). Qld: Currawilla, *S. L. Everist 4104* (BRI). Vic.: 10 km NW of Lake Cullulleraine, *A. C. Beaglehole 40638* (MEL).

25. *Atriplex infrequens* Paul G. Wilson, *Fl. Australia* 4: 323 (1984)

Atriplex microcarpa Benth., *Fl. Austral.* 5: 176 (1870) *nom. illeg.*, non Moq. ex D. Dietr. (1852); *A. prostrata* var. *microcarpa* F. Muell. ex Maiden & Betche, *Census New South Wales Pl.* 68 (1916); *A. semibaccata* var. *microcarpa* (Maiden & Betche) Aellen, *Bot. Jahrb. Syst.* 68: 412 (1938). T: Bamaneroo [Lake Pamamaroo], N.S.W., 28 Oct. 1860, [*H. Beckler*]; holo: MEL 607130; iso: NSW.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(16) (1982).

Small procumbent to erect perennial, to 30 cm high, monoecious. Leaves shortly petiolate, narrowly elliptic, c. 10 mm long, entire, scurfy below, sparsely so above. Flowers clustered in distal leaf axils. Fruiting bracteoles minutely pedicellate, compressed, papery, rhomboid, c. 2 mm long and wide, smooth or rarely with 1 or 2 minute tubercular appendages, united in lower half, scurfy pubescent. Seed circular; radicle lateral, erect.

Found in western N.S.W.; evidently a rare species. Map 133.

N.S.W.: Delalah Downs, *P. L. Milthorpe 5038* (NSW).

Some specimens of *A. semibaccata* from northern N.S.W. are similar to *A. infrequens*, for this reason an infraspecific rank as indicated by Aellen may be appropriate for this taxon. Unfortunately collections are too few to provide a sound basis on which to form an opinion.

26. *Atriplex semibaccata* R. Br., *Prodr.* 406 (1810)

T: Port Jackson, N.S.W., *R. Brown*; holo: BM, *n.v.*

A. denticulata Moq. in DC., *Prodr.* 13(2): 97 (1849). T: Port Jackson, N.S.W., *F. Bauer*; Swan River, W.A., *J. Drummond 80*, 228; syn: *n.v.*

A. neurivalvis Domin, *Biblioth. Bot.* 89: 65 (1921). T: Hughenden, Qld, Feb. 1910, *K. Domin 3719*; holo: PR.

A. semibaccata var. *gracilis* Aellen, *Bot. Jahrb. Syst.* 68: 411 (1938). T: near Melbourne, Vic., *F. Mueller*; Port Adelaide, S.A., *F. Mueller*; between Port Adelaide and Adelaide, S.A., *F. Mueller*; syn: all *n.v.*

A. semibaccata var. *appendiculata* Aellen, *op. cit.* 412. T: South Australia, *F. Mueller*; syn: *n.v.*; Swan River, W.A., *J. Drummond 222*; syn: MEL.

?*A. semibaccata* var. *biformis* Aellen, *op. cit.* 412. T: Cooranga, Qld, 1925, *C. T. White 2493*; iso: BRI.

A. flagellaris Wootton & Standley, *Contr. U.S. Natl. Herb.* 16: 119 (1913), *fide* Reed in Lundell, *Fl. Texas* 2: 59 (1969). T: Mesilla Valley, New Mexico, U.S.A., *P. C. Standley 490*; *n.v.*

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 8 (1889); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(25) (1982).

Prostrate or decumbent perennial herb with slender spreading branches arising from a woody taproot, monoecious. Leaves thin, oblong-elliptic, obtuse, shortly petiolate, 1–2 cm long, almost glabrous above, scaly beneath, margin sinuate, dentate to entire. Male

flowers in small glomerules in distal axils; female flowers in scattered axillary clusters. Fruiting bracteoles minutely pedicellate, rhomboid, 2–5 mm long and wide, acute, red and succulent (in southern variation) or thin, dry and deltoid, coarsely reticulate when dry, united in lower half, or only at base, glabrous; margin entire or with 1–4 small teeth; appendages absent or rarely 1 or 2 present. Seed with ascending radicle. *Creeping Saltbush*, *Berry Saltbush*.

Widespread in southern Australia. Introduced for grazing in Tasmania and in many parts of the mainland; usually found in heavy soil (sometimes slightly saline), in woodland, near salt lakes, and as an invader of disturbed areas. Map 134.

W.A.: Fremantle, *P. G. Wilson 8691* (PERTH). S.A.: Kapunda, *D. E. Symon* (ADW 23609). Qld: Biloela, *L. S. Smith 3495* (BRI). N.S.W.: Willandra, *A. J. A. Sikkes* (CBG 046252). Vic.: Bendigo, 5 May 1947, *F. Robbins* (PERTH).

Intergrades with *A. spinibractea* in N.S.W. In Qld and northern N.S.W. the bracteoles are predominantly thin, dry, tending to deltoid in shape, whereas in the south and in W.A. they are rhomboid and succulent. The variant with dry bracteoles found in northern Qld was described by Domin as *A. neurivalvis*.

27. *Atriplex humifusa* Paul G. Wilson, *Fl. Australia* 4: 323 (1984)

A. sp. (nr. *semibaccata* R. Br.), Paul G. Wilson in J. P. Jessop, *Fl. Central Australia* 55 (1981). T: 2.5 miles (4 km) NW of Kunoth Well, N.T., *D. J. Nelson 2272*; holo: PERTH; iso: NT.

Illustration: J.P. Jessop, *op. cit.* Fig. 82(11) (1981).

Spreading prostrate to erect perennial herb to 0.3 m high, 1 m wide, monoecious. Leaves thin, sessile, elliptic to broadly elliptic or obovate, 8–30 mm long, apex obtuse to rounded, margin entire to repand dentate, upper surface glabrescent, lower surface densely scurfy. Male flowers in small glomerules 2–3 mm diam., in distal axils or forming short spikes. Female flowers in axillary clusters. Fruiting bracteoles sessile, thin, flat, deltoid to cordate, acute or obtuse 4–6 mm long and wide, free to base, entire or sparsely denticulate, reticulate, scurfy. Seed transversely elliptic; radicle ascending. Fig. 20R.

Found in south-eastern N.T. and central-western Qld; usually in heavy soil. Map 135.

N.T.: Mt Riddock Stn, *T. S. Henshall 964* (NT). Qld: 16 km N of Urandangie, *R. A. Perry 839* (NT).

Possibly grading south-eastwards into *A. semibaccata*.

28. *Atriplex spinibractea* R. Anderson, *Proc. Linn. Soc. New South Wales* 55: 496 (1930) as *spinibractum*.

T: Minore, N.S.W., Feb. 1899, *J. L. Boorman*; holo: NSW.

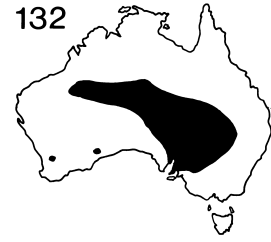
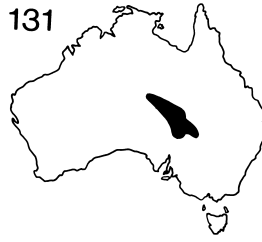
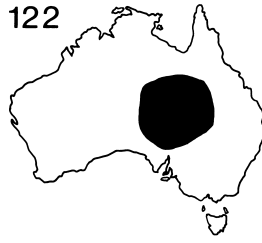
Illustrations: R. Anderson, *op. cit.* t. 18, fig. 4; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(26) (1982).

Prostrate herb with wiry branches, monoecious. Leaves shortly petiolate, narrowly elliptic to narrowly obovate, 5–20 mm long, entire to remotely denticulate, scurfy lepidote below, sparsely scurfy above. Male flowers in small glomerules in terminal axils. Female flowers solitary or paired in leaf axils. Fruiting bracteoles scurfy, shortly stipitate (c. 1 mm), free to base, flat, deltoid, 3–6 mm long, acute, toothed, several short spine-like appendages present on each face (these sometimes united at their base to form a spiny semicircular rim). Seed semicircular; radicle lateral, erect.

Found in central and eastern N.S.W. and south-eastern Qld. Map 136.

Qld: Meandarra—Glenmorgan road, *R. W. Jackson 1604* (BRI). N.S.W.: Narromine, *C. W. E. Moore 357* (CANB); Coonamble, Feb. 1923, *Haviland* (MEL).

Plants intermediate in morphology between this species and *A. semibaccata* have been collected; some of these may represent a distinct species.



121. *Atriplex cryptocarpa*

124. *Atriplex angulata*

127. *Atriplex eichleri*

130. *Atriplex leptocarpa*

133. *Atriplex infrequens*

122. *Atriplex crassipes*
var. *crassipes*

125. *Atriplex pseudocampanulata*

128. *Atriplex turbinata*

131. *Atriplex sturtii*

134. *Atriplex semibaccata*

123. *Atriplex crassipes*
var. *appendiculata*

126. *Atriplex eardleyae*

129. *Atriplex intermedia*

132. *Atriplex limbata*

135. *Atriplex humifusa*

29. Atriplex fissivalvis F. Muell., *Fragm.* 9: 123 (1875)

Haloxanthium fissivalve (F. Muell.) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 521 (1934). T: between Youldeh and the Elizabeth River, S.A., 1875, *Young*; holotype: MEL.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 1 (1889); J. M. Black, *Fl. S. Australia* 2nd edn, fig. 369 (1948); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 239, 242 fig. 44(8) (1982).

Open annual herb 10–30 cm high, branching from base, monoecious. Leaves thin, ovate to sub-orbicular, obtuse, entire or sinuate, scaly tomentose, lamina 10–20 mm long, petiole 5–10 mm long. Flowers in axillary glomerules including those of basal leaves. Fruiting bracteoles sessile, flat, broadly deltoid, c. 4 mm high and wide, glossy, prominently nerved, deeply divided into 3–5 major narrow lanceolate lobes and smaller basal teeth, appendages basally attached, either flat or somewhat inflated and similar in shape to the bracteoles but somewhat smaller. Seed broadly elliptic, transversely positioned; radicle directed tangentially from the vertical. Fig. 20S.

Found in central, north and north-eastern S.A., far south-western Qld, and north-western N.S.W., on stony tablelands. Map 137.

S.A.: Mt Alexander, *D. E. Symon* 9122 (ADW). Qld: Birdsville, *D. E. Boyland* 193 (BRI). N.S.W.: Koorningbirry [c. 200 km NNW of Broken Hill] Sept. 1887, *W. Baeuerlen* 202 (MEL).

30. Atriplex quadrivalvata Diels, *Bot. Jahrb. Syst.* 35: 182 (1904)

Haloxanthium quadrivalvatum (Diels) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 521 (1934). T: near Bullabulling, W.A., *L. Diels* 5212; *n.v.*

Illustration: J. P. Jessop, *Fl. Central Australia* fig. 82(23) (1981).

Annual or short-lived perennial c. 20 cm high, branching from near base, monoecious. Leaves, inflorescence, and young branches covered with white globular to tubular vesicular hairs. Leaves broadly ovate, 5–10 mm long, entire, rounded to cordate at base, sessile or very shortly petiolate, crowded towards branch apices. Flowers in axillary glomerules, containing one male and several female. Fruiting bracteoles cordate to orbicular, c. 4 mm long and wide, spinulose on margin, sessile or almost so; appendages attached near base of each bracteole, similar in shape to valves but half as wide, or absent. Seed with lateral erect radicle. Fig. 20T.

Found in south central W.A., north central S.A., and south central N.T., usually in heavy soil.

Fruiting bracteoles with a flat orbicular appendage.

30a. var. quadrivalvata

Fruiting bracteoles without appendages

30b. var. sessilifolia

30a. Atriplex quadrivalvata Diels var. **quadrivalvata**

A. hochreutineri R. Anderson & Aellen ex Aellen, *Candollea* 4: 505 (1931). T: Coolgardie, W.A., 1905, *B. P. G. Hochreutiner* 2925; syn: NSW, Kalgoorlie, W.A., 1929, *A. Meebold* 6819; syn: NSW.

Fruiting bracteoles with an appendage near base similar in shape but about half as wide as the valves.

Found over the entire range of the species. Map 138.

W.A.: Comet Vale, *W. E. Blackall* 1403 (PERTH). N.T.: Mt Beddome, *P. K. Latz* 5228 (NT). S.A.: 1.6 km N of Wintinna Stn, *D. E. Symon* 2729 (ADW).

30b. Atriplex quadrivalvata var. **sessilifolia** (Ising) Ising, *Trans. Roy. Soc. S. Australia* 81: 166 (1958)

A. sessilifolia Ising, *Trans. Roy. Soc. S. Australia* 78: 111 (1955). T: Mt Willoughby Stn, S.A., 12 Aug. 1952, *E. H. Ising* 3570; holotype: AD; isotype: NSW.

Fruiting bracteoles without appendages.

Found in northern S.A. Map 139.

S.A.: Evelyn Downs, *E. H. Ising 3831* (AD); Mt Willoughby, *P. L. Milthorpe 3112* (NSW).

This variety appears to hybridise or intergrade with the typical one.

31. *Atriplex muelleri* Benth., *Fl. Austral.* 5: 175 (1870)

T: Peak Downs, Qld, *F. Mueller*; lecto: K, *fide* P. Aellen, *Bot. Jahrb. Syst.* 68: 370 (1937).

[*A. rosea auct. non* L.: *F. Mueller, Fragm.* 7: 9 (1869)]

Illustrations: *F. Mueller, Iconogr. Austral. Salsolac. Pl.* t. 7 (1889); *G. M. Cunningham et al., Pl. W. New South Wales* 242 fig. 44(18) (1982).

Spreading to erect herb branching from base, to 30 cm high. Leaves thin, broadly obovoid, apex rounded, base cuneate and passing into petiole $\frac{1}{2}$ length of lamina, in all 15–30 mm long, margin undulate to sinuately lobed, upper surface glabrescent, lower surface scaly. Male flowers clustered in terminal axils. Female flowers in scattered axillary clusters. Fruiting bracteoles sessile or almost so, bluntly deltoid to circular, swollen, hard, smooth, c. 3 mm long and wide at apex, connate except at the rounded apex, valves herbaceous, forming a narrow denticulate margin around apex of bracteole; appendages absent. Seed circular, radicle lateral, erect. *Mueller's Saltbush.* Fig. 20U.

Found in Qld, far eastern N.T., northern N.S.W., and far north-eastern S.A. Map 140.

N.T.: Tobermory Stn, *P. K. Latz 2531* (NT). S.A.: Innamincka, 29 May 1957, *S.A. Pastoral Board* (AD). Qld: c. 10 km E of Hughenden, *R. A. Perry 3607* (PERTH). N.S.W.: c. 16 km N of Bourke, *C. W. E. Moore 7460* (CANB).

32. *Atriplex suberecta* I. Verd., *Bothalia* 6: 418 (1954)

T: from South Africa; *n.v.*

Illustrations: *I. C. Verdoorn, op. cit.* 419, fig. 2; *G. M. Cunningham et al., Pl. W. New South Wales* 242 fig. 44(29), 245 (1982).

Spreading herb branching from base, to 60 cm high, monoecious. Leaves thin, narrow to broadly rhomboid, 15–30 mm long, coarsely serrate, shortly petiolate; upper surface glabrescent, lower surface somewhat scurfy. Male flowers in subterminal clusters. Female flowers in axillary clusters. Fruiting bracteoles shortly stipitate the stipe sometimes thickening with age; bracteoles rhomboid, acute, c. 2–5 mm long, \pm flat or convex, connate in lower half, thin or somewhat thickened with age, scurfy pubescent; margin entire in lower half, 2–4 toothed in upper half. Seed circular; radicle lateral, erect. Fig. 21A.

Found in southern Australia, around lakes or dams, also coastal; considered naturalised in S Africa. Map. 141.

W.A.: Carnamah, *T. E. H. Aplin 444* (PERTH). S.A.: Edithburg, *D. E. Symon 2032* (ADW). N.S.W.: Menindee, 3 July 1948, *D. L. W. Henderson* (NSW). Vic.: Birchip, *R. V. Smith 67/60* (MEL). Tas.: Little Chalky Is., *J. S. Whinray 1342* (MEL).

33. *Atriplex elachophylla* F. Muell., *Fragm.* 7: 8 (1869)

T: Sturts Creek, [?W.A.], *F. Mueller*; holo: K.

A. semibaccata f. *tenuis* Bailey, *Queensland Agric. J.* 25(4): 164 (1910); *A. elachophylla* var. *tenuis* (Bailey) R. Anderson ex Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 517 (1934). T: Windorah, Qld, *W.H. Rose*; *n.v.*

A. varia Ewart & O. Davies, *Fl. Northern Territory* 94, t. 11 (1917). T: Henbury Stn, N.T., 9 Mar. 1911, *G. F. Hill 42*; syn: MEL; c. 96 km NE of Camp II, N.T., 7 June 1911, *G. F. Hill 284a*; syn: MEL.

Illustrations: *G. M. Cunningham et al., Pl. W. New South Wales* 238, 242 fig. 44(7) (1982).

Erect perennial to 50 cm high. Leaves varying from narrowly-elliptic to elliptic, subsessile, 2.5–5 mm long in the north, up to obovate, 10–40 mm long in the south, entire to strongly sinuate-dentate; upper surface glabrescent, lower surface scurfy to scaly. Male flowers in small glomerules 2–3 mm diam. in terminal axils. Female flowers in

scattered axillary clusters. Fruiting bracteoles sessile, united into a swollen campanulate tube 1.5–2.5 mm long, or rarely tube narrowly deltoid and passing into a short stipe; apex truncate to rounded, entire or 3-toothed; appendages small and tooth-like, 1–4 on each face, or absent. Fig. 21B.

Found in northern and east-central W.A. eastwards into central and south-western Qld and north-western N.S.W. Map 142.

W.A.: 64 km S of Broome, *A. C. Beauglehole 11280* (PERTH). N.T.: Mt Wedge Stn, *A. O. Nicholls 898* (NT). S.A.: Mt Illbillee area, *A. C. Beauglehole 25629* (PERTH). Qld: Emerald, *S. L. Everist 2504* (BRI). N.S.W.: 75 km W of Wanaaring, *S. Jacobs 3128* (NSW).

The northern and southern variants of this species differ greatly in leaf shape and size, but somewhat less in bracteole dimensions; these variants grade evenly into each other. *A. cornigera*, a species of central Qld, is closely related and plants intermediate in form between the two may be found in south-eastern Qld, far northern N.S.W., and southern N.T.

34. *Atriplex cornigera* Domin, *Biblioth. Bot.* 89: 66 (1921)

T: Jericho, Qld, Mar. 1910, *K. Domin, n.v.*

Illustration: *K. Domin, op. cit.* t. 20, fig. 13–15.

Prostrate to ascending perennial to 30 cm high, monoecious. Branches slender. Leaves subsessile, narrow to broadly-elliptic or oblanceolate, 10–25 mm long, acute to obtuse, entire or sinuate, scurfy beneath, glabrescent to sparsely scurfy above. Male flowers in small glomerules in axils of terminal leaves. Female flowers in axillary clusters. Fruiting bracteoles sessile or with a slender stipe to 2 mm long, obtriangular to fan-shaped, flat, 3–10 mm long, 3–5 mm wide, basal portion united into a deltoid tube, upper portion free, herbaceous, sinuate-dentate or acutely toothed; tube bearing on both sides 2–4 spreading spine-like appendages c. 1 mm long. Seed circular; radicle lateral, erect.

Found in central Qld. Map 143.

Qld: 22 km N of Brighton Downs, *R. W. Purdie 1221* (BRI); S of Winton, *P. Bell* (NSW 151128).

This species possibly represents an eastern variant of *A. elachophylla*.

35. *Atriplex flabelliformis* Paul G. Wilson, *Fl. Australia* 4: 322 (1984)

T: Well 39, Canning Stock Route, W.A., 5 May 1979, *A. S. George 15612*; holotype: PERTH.

Erect rounded perennial herb to 35 cm high, monoecious. Leaves thin, narrowly elliptic to elliptic, flat, c. 10 mm long, entire or slightly sinuate, narrowed at base into a short petiole or sessile, with a scaly pitted indumentum on both surfaces. Flowers in small axillary glomerules in upper axils or forming short interrupted spikes. Fruiting bracteoles sessile or shortly stipitate, campanulate to fan-shaped; tube shortly cylindrical, c. 1 mm long, tuberculate or covered with slender papillae; lobes free, flattened, broadly deltoid to fan-shaped, reticulate, with sinuate margin, to 1.5 mm high and 3.5 mm wide (or reduced to a narrow denticulate rim to the tube); pedicel to 1 mm long, thickened. Seed circular, radicle erect.

Found in the Great Sandy Desert of north-eastern W.A. and the neighbouring Tanami Desert of central-western N.T. Map 144.

W.A.: Lake Auld, *A. S. Mitchell 1057* (AD). N.T.: Lake Mackay, *G. M. Chippendale* (NT 3400).

This species possibly intergrades with *A. elachophylla*.



Figure 22. *Atriplex semilunaris*. **A**, habit $\times 0.7$; **B**, male flower $\times 15$; **C**, hairs from perianth $\times 30$; **D**, female flower $\times 15$; **E**, fruiting bracteoles $\times 7.5$; **F**, seeds $\times 13.5$; **G**, L.S. fruiting bracteoles to show fruit $\times 7.5$ (P. Wilson 10603, PERTH).

36. *Atriplex semilunaris* Aellen, *Bot. Jahrb. Syst.* 68: 382 (1937)

T: banks of Ashburton River, Munderoo, W.A., 11 Oct. 1905, *A. Morrison 15119*; lecto: K, *n.v.*; iso: PERTH, *fide* P. G. Wilson, *Fl. Australia* 4: 325 (1984).

A. semilunaris var. *gracilis* Aellen, *Bot. Jahrb. Syst.* 68: 383 (1937). T: Onslow, mouth of Ashburton River, W.A., 15 Oct. 1905, *A. Morrison 15120*; holo: K.

Weak decumbent to erect perennial c. 25 cm high, monoecious. Leaves thin, narrow to broadly obovate, obtuse, lamina 15–40 mm long, coarsely and bluntly toothed, both surfaces with a scaly sheen or the upper almost glabrous, narrowed at base into a petiole 5–10 mm long. Flowers in mixed clusters in the upper leaf axils and in terminal spikes or panicles. Fruiting bracteoles rhombic, c. 4 mm high and wide, spinulose on margin, free except at the deltoid base which passes into a short stipe, c. 0.5 mm long; appendages on both bracteoles forming a spiny semicircle on lower half, or the semicircle divided into two. Seed with erect radicle. Fig. 20V, 22.

Found in central and western W.A. from Balladonia north to Onslow, usually in heavy slightly saline soil. Map 145.

W.A.: Lake Damboring, *T. E. H. Aplin 568* (PERTH); 8 km SE of Carnarvon, *N. T. Burbidge 6500* (PERTH).

37. *Atriplex morrisii* R. Anderson, *Proc. Linn. Soc. New South Wales* 55: 504 (1930)

Morriella morrisii (R. Anderson) Aellen, *Bot. Jahrb. Syst.* 68: 423 (1938). T: near Broken Hill, N.S.W., Jan. 1920, *A. Morris 123*; same loc., Nov. 1921, *A. Morris*; same loc., Jan. 1924, *A. Morris 1075*; syn: NSW.

Illustrations: R. Anderson, *op. cit.* t. 18, fig. 1–2; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(17) (1982).

Erect rounded annual or short-lived perennial to 30 cm high, monoecious. Leaves broadly obovate, sinuate-dentate, scurfy or scaly on both surfaces, apex rounded, base cuneate and passing into a short petiole, in all 10–25 mm long. Flowers axillary. Male flowers mixed with a few female in glomerules in distal axils; perianth scurfy. Female flowers in scattered clusters of 1–3. Fruiting bracteoles shortly stipitate, broadly oblong, c. 5 mm long, fused to apex and bearing on each side a rugulose spongy appendage over lower $\frac{2}{3}$ of bracteole apical portion, flat, 3-toothed. Seed orbicular; radicle lateral, erect.

Found in central S.A., south-eastern N.T., far western N.S.W. and south-western Qld. Map 146.

N.T.: Andado Stn, *T. S. Henshall 604* (NT). S.A.: Lyndhurst Railway Stn, *T. R. N. Lothian & D. E. Francis 234* (AD). Qld: S of Eromanga, *S. T. Blake 11887* (BRD). N.S.W.: Byrnedale Homestead, *J. C. De Nardi 689* (NSW).

38. *Atriplex papillata* J.H. Willis, *Victorian Naturalist* 73: 152 (1957)

T: 4 miles (c. 6 km) SW of Nowingi, Vic., 28 Aug. 1955, *J. H. Willis*; holo: MEL.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(21) (1982).

Prostrate to spreading annual or short-lived perennial herb to 20 cm high, monoecious. Branches slender. Leaves thick, elliptic to narrowly elliptic, sessile, 10–20 mm long, incurved, with densely grey, scaly indumentum below, sparsely scurfy above. Male flowers, with 1–2 female, in terminal axillary glomerules. Female flowers in axillary clusters of 2–4. Fruiting bracteoles densely scurfy, sessile, broadly oblong, 1–4 mm long, fused to near apex; lower half bearing numerous prominent, soft, papilliform appendages; upper half smooth, flat, shortly 3-toothed. Seed circular; radicle lateral, erect. Fig. 21C.

Found in extreme north-western Vic. and neighbouring areas of S.A. and south-western N.S.W., in strongly saline or gypsum soil. Map 147.

S.A.: 3.2 km S of Yamba, 30 June 1979, *J. H. Browne* (AD). N.S.W.: Nulla Nulla, *J. W. Lawrie 1924* (NSW). Vic.: NW corner of Raak Plain, *M. G. Corrick 7416* (MEL).

39. *Atriplex spinulosa* Paul G. Wilson, *Fl. Australia* 4: 325 (1984)

T: $\frac{3}{4}$ mile (1.2 km) N of Nullagine, W.A., 6 Aug. 1974, G. W. Carr 4666 & A. C. Beauglehole 48444; holo: PERTH.

Erect rounded annual herb, c. 20 cm high, monoecious. Leaves thin with a scaly sheen on both surfaces, broadly elliptic to rhombic; lamina 10–15 mm long, obtuse, margin sinuate dentate, base cuneate and passing into a petiole, c. 5 mm long. Male flowers in glomerules arranged in \pm continuous spikes, c. 20 mm long, 5 mm diam., with scattered female flowers. Female flowers congested in distal axils. Fruiting bracteoles sessile to very shortly stipitate, \pm rhomboid, c. 2.5 mm long and wide; lower half fused, campanulate, biconvex with prominent reticulate veins from which arise on either surface 5–12 slender spines, 0.5–1.5 mm long; distal half flat with central triangular lobe c. 1 mm long and, at its base, 2–4 small acicular lateral lobes. Seed circular; radicle lateral, erect.

Known only from the type locality area in the Pilbara region of north-western W.A. Map 148.

W.A.: Nullagine township, A. C. Beauglehole 11395 (PERTH).

40. *Atriplex lobativalvis* F. Muell., *Iconogr. Austral. Salsolac. Pl.* t. 6 (1889), & in *Victorian Naturalist* 9: 187 (1893)

[*A. lativalve* T. Durand & B. D. Jackson, *Index Kew.* suppl. 1: 48 (1902), *orth. var.*] T: near the Marshall River, N.T., *Winnecke*; syn: *n.v.*; at Lake Yantara, N.S.W. *W. Baeuerlen* 395; syn: MEL.

A. muelleri var. *lobaticarpa* F. Muell., *Pl. Coll. Central Australia—Winnecke's Explor.* 1883: 15 (1884); *A. lobaticarpa* (F. Muell.) Domin, *Biblioth. Bot.* 89: 66 (1921). T: Central Australia, 1883, C. *Winnecke*; holo: MEL.

A. lobativalvis var. *biarcuata* Aellen, *Bot. Jahrb. Syst.* 68: 408 (1938). T: Stephens Creek, N.S.W., 1918, A. *Morris* 1350; iso: ADW.

Illustrations: F. Muell., *Iconogr. Austral. Salsolac. Pl.* t. 6 (1889); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(14) (1982).

Prostrate herb with branches to 20 cm long, monoecious. Leaves small, sessile or shortly petiolate, sparsely to moderately scurfy on both surfaces; lamina ovate to broadly elliptic or rhomboid, the broader leaves sessile, 5–10 mm long, remotely sinuate-dentate. Flowers in axillary clusters. Fruiting bracteoles scurfy, sessile slender stipitate, rhomboid to fan-shaped, 2–3 mm long and wide; basal half united into a deltoid tube prominently keeled on either side; distal half free, herbaceous, deeply divided into 3–5 narrowly triangular lobes. Seed circular, prominently biconvex corresponding to keels of bracteoles; radicle lateral, erect. Fig. 21D.

Found in central Australia from south-eastern N.T. to north-western N.S.W. in wet situations in heavy soil. Map. 149.

N.T.: Tobermory Stn, P. K. *Latz* 2600 (NT). S.A.: Goyder Lagoon, N. N. *Donner* 5107 (AD). Qld: Currawilla Stn, S. L. *Everist* 3973 (BRI). N.S.W.: Mt Sturt Stn, A. *Morris* 708 (ADW, NSW).

41. *Atriplex cordifolia* J. Black, *Trans. Roy. Soc. S. Australia* 69: 309 (1945)

T: near Lake Eyre, S.A., 1 Aug. 1939, R. L. *Crocker*; holo: AD; iso: NSW.

Annual or short-lived perennial, c. 30 cm high, branching from base, monoecious. Leaves sessile, triangular to narrowly triangular or ovate, cordate, acute 5–20 mm long, entire to sinuate-dentate in lower half, scaly tomentose or forming a grey punctate sheen with age. Flowers in axillary glomerules, the upper ones androgynous, the lower female. Fruiting bracteoles minutely stipitate, free to base, rhomboid-triangular, 2–3 mm high and wide, 3-nerved. Fig. 21E.

Found in east central S.A. and probably far north-western N.S.W., usually in gypseous or saline soil. Map 150.

S.A.: Blanchewater, R. H. *Kuchel* 824 (AD); 12 km NW of Quinyambie Homestead, D. J. E. *Whibley* 3590 (AD).

42. *Atriplex velutinella* F. Muell., *Rep. Pl. Babbage's Exped.* 20 (1859)

A. velutinella subsp. *levibractea* Aellen, *Bot. Jahrb. Syst.* 68: 381 (1937) *nom. illeg.*, based on *A. velutinella*. T: Stuarts Creek, S.A., *B. H. Babbage*; holo: MEL 607146.

A. velutinella f. *appendiculata* Aellen, *op. cit.* 382. T: Mt Lyndhurst, S.A., 1898 and 1899, *M. Koch*; syn: MEL, NSW.

A. velutinella f. *inappendiculata* Aellen, *op. cit.* 381. T: Mt Lyndhurst, S.A., 1898, *M. Koch*; *n.v.*

A. velutinella subsp. *tomentosa* Aellen, *op. cit.* 381, 382, consisting of f. *inappendiculata* Aellen and f. *appendiculata* Aellen.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 5 (1889); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(31), 246 (1982).

Erect short-lived perennial to 1 m high, monoecious; thinly lepidote to scaly tomentose all over. Leaves sessile, thin, broadly elliptic to broadly ovate, 1–3 cm long, sinuate to bluntly toothed or sinuate-lobed, acute to obtuse, base cuneate to rounded. Flowers in mixed clusters, axillary or forming interrupted spikes. Fruiting bracteoles sessile or shortly stipitate, appressed, free except at the short, broadly cuneate base, narrowly to broadly triangular, 4–8 mm long, entire or toothed at base, almost glabrous to tomentose, smooth or with 1 or 2 tubercles on either side near base. Seed circular; radicle erect. Fig. 21F.

Found from central S.A. to south-eastern N.T., south-western Qld and north-western N.S.W., usually around dams, creeks or bores in saline soil. Map 151.

N.T.: Andado Stn, *T. S. Henshall 1465* (NT). S.A.: 32 km NE of Lake Frome Homestead, *L. D. Williams 7723* (AD). Qld: 13 km from Birdsville, *R. W. Purdie 1140* (BRI). N.S.W.: 'Mt Mulyah', c. 96 km NW of Louth, *C. W. E. Moore 6359* (CANB).

This species is similar to *A. acutiloba* and specimens intermediate between the two have been collected. It evidently hybridises with *A. acutibractea* in eastern S.A. In north-eastern S.A., where the distribution of *A. velutinella* coincides with that of *A. cordifolia*, plants intermediate in morphology between the two species may be found.

43. *Atriplex acutiloba* R. Anderson, *Proc. Linn. Soc. New South Wales* 59: 270 (1934)

A. acutiloba var. *eu-acutiloba* Aellen, *Bot. Jahrb. Syst.* 68: 389 (1938) *nom. illeg.* T: Stephens Creek, near Quandong, N.S.W., 25 Oct. 1931, *A. Morris 2732*; holo: NSW; iso: AD.

A. acutiloba var. *velutinelliformis* Aellen, *Bot. Jahrb. Syst.* 68: 389 (1938). T: Koonamore Stn, S.A., 1935, *C. M. Eardley*; *n.v.*

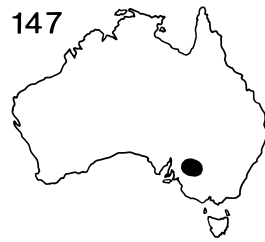
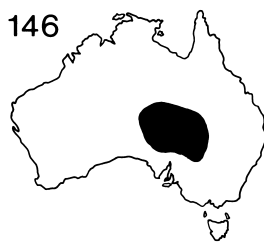
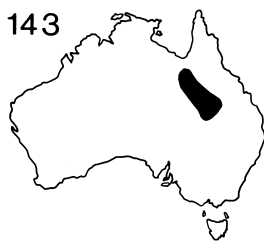
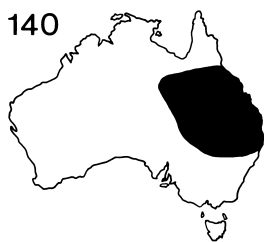
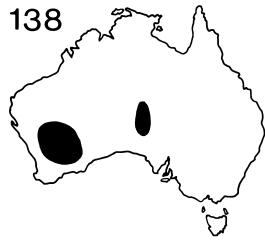
Illustrations: R. H. Anderson, *op. cit.* 271, fig. 1–2 (1934); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(2) (1982).

Short-lived perennial c. 50 cm high, monoecious. Leaves thin, petiolate; scurfy to scurfy-tomentose on both surfaces; lamina broadly ovate to broadly elliptic, 2–4 cm long, acute, acutely lobed, base cuneate; petiole half length of lamina. Flowers mixed in clusters, both axillary and forming short disjunct spikes. Fruiting bracteoles sessile or subsessile appressed, free to base, broadly triangular, c. 5 mm long and wide (to triangular), ± scurfy tomentose; margins prominently dentate; appendages small, semicircular, inflated, 0.5–1 mm wide, near base of each bracteole. Seed circular; radicle erect. Fig. 21G.

Found in north-western N.S.W. and central eastern S.A. Map 152.

S.A.: 80 km NE of William Creek, *A.C. Robinson 6* (AD). N.S.W.: Stephens Creek, *A. Morris 2732* (AD).

The typical variety of this species from western N.S.W. was described by Aellen, *loc. cit.*, as being glabrescent, and the var. *velutinelliformis* from eastern S.A. as being strongly pilose; the reverse is the case, however, and the epithet var. *velutinelliformis*, should, if used, be applied to the S.A. plant with scurfy leaves. Closely related to, and intergrading with *A. velutinella*.



136. *Atriplex spinibractea*

137. *Atriplex fissivalvis*

138. *Atriplex quadrivalvata*
var. *quadrivalvata*

139. *Atriplex quadrivalvata*
var. *sessilifolia*

140. *Atriplex muelleri*

141. *Atriplex suberecta*

142. *Atriplex elachophylla*

143. *Atriplex cornigera*

144. *Atriplex flabelliformis*

145. *Atriplex semilunaris*

146. *Atriplex morrisii*

147. *Atriplex papillata*

148. *Atriplex spinulosa*

149. *Atriplex lobativalvis*

150. *Atriplex cordifolia*

44. *Atriplex nessorhina* S. Jacobs, *Telopea* 2: 453 (1983)

T: 1.6 km NW of 'Janina', 1 Aug. 1973, N.S.W., *E. J. Pickard* 2403; holotype: NSW.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(33) (1982) as *A. sp.*

Rounded annual or short-lived perennial herb to 30 cm high, monoecious. Leaves thin with scaly sheen on each side, very narrowly oblong to oblanceolate, 1.5–5 cm long, acute to obtuse, entire or remotely dentate, narrowed at base to an indefinite petiole. Flowers in clusters, axillary and spicate, the glomerules well separated, terminal glomerules mixed male and female, the lower ones female. Fruiting bracteoles sessile, 5–10 mm long; upper half free, flat, 3-lobed, central lobe very narrowly oblong, acute, 3–5 mm long, lateral lobes erect, slender, acute, c. 1 mm long; basal half fused and covered on each side by a swollen inverted U-shaped appendage, spiny or entire. Seed circular; radicle lateral, erect. *Donald Duck Saltbush*. Fig. 21H.

Found in central S.A., far north-western N.S.W. and neighbouring region of Qld; in wet saline areas or on surrounding dunes. Map 153.

S.A.: S end of Lake Hart, *A. C. Beauglehole* 20025 (PERTH); Kenella Rocks, 50 km SE of Tarcoola, *B. Lay* 545 (AD). Qld: Dynevor Ridge, *L. S. Smith* 6337 (BRI). N.S.W.: Tongo, *R. J. Stanley* 2022 (NSW).

45. *Atriplex humilis* F. Muell., *Fragm.* 4: 48 (1863)

A. cinerea subsp. *humilis* (F. Muell.) Aellen, *Bot. Jahrb. Syst.* 68: 397 (1938). T: Flinders River, Qld, *F. Mueller*; holotype: MEL; isotype: K.

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 9 (1889).

Decumbent shrub to 30 cm high, monoecious. Leaves subsessile, narrowly oblong to narrowly ovate, 10–15 mm long, obtuse, entire, with scurfy lepidote sheen on both surfaces. Male flowers in a compact terminal ovoid to globular spike c. 5 mm diam. Female flowers in axillary clusters. Fruiting bracteoles with a short, thick, hard stipe c. 1 mm long; valves free, deltoid, 2.5–4 mm wide, flat but slightly thickened in centre at base, prominently reticulate veined, entire, smooth or with 1 or 2 short acicular appendages on each face. Seed circular; radicle lateral, erect.

Found on the Qld coast of the Gulf of Carpentaria; a littoral and estuarine plant. Map 154.

Qld: Massacre Inlet, *L. Brass* 199 (NSW).

Sect. V. *Dialysex****Atriplex* sect. *Dialysex* Moq., *Chenop. Monogr. Enum.* 64 (1840).**

Type: *A. cinerea* Poir.; lectotype: *fide* P. G. Wilson, *Fl. Australia* 322 (1984).

Atriplex ser. *Paniculatae* Benth., *Fl. Austral.* 5: 166, 168 (1870). T: not designated.

Atriplex ser. *Vesicariae* Benth., *op. cit.* 167, 172. T: *A. vesicaria* Heward ex Benth.

Atriplex sect. *Teutlioides* Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 514 (1934), *p.p.*

Atriplex ser. *Austrohalimus* Ulbr., *op. cit.* 514. T: not designated.

Atriplex sect. *Hymenotheca* Ulbr., *op. cit.* 515. T: *A. hymenotheca* Moq.

Atriplex sect. *Nummularia* Ulbr., *op. cit.* 516. T: *A. nummularia* Lindl.

Atriplex ser. *Stipitata* Ulbr., *op. cit.* 517. T: *A. stipitata* Benth.

Neopreissia Ulbr., *op. cit.* 520. T: *Atriplex isatidea* Moq.

Perennial herbs or shrubs, predominantly dioecious; stems smooth. Leaves with a closed reticulate venation. Female flowers with a pair of bracteoles and vertical seeds.

14 species endemic in Australia.

46. *Atriplex stipitata* Benth., *Fl. Austral.* 5: 168 (1870)

T: 7 collections cited, from N.S.W., Vic., and S.A.; all *n.v.*

Illustrations: G. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(28), 245 (1982).

Erect shrub to 1 m high, predominantly dioecious. Leaves narrowly elliptic to orbicular, entire obtuse or rounded at apex, sometimes conduplicate and recurved when dry; with scaly sheen on both surfaces; lamina 7–25 mm long; petiole 2–3 mm long. Male flowers in small disjunct glomerules forming spikes or panicles. Female flowers in well-spaced clusters forming slender spikes. Fruiting bracteoles on a slender stipe to 10 mm long; valves reniform, cordate, to 5 mm long and 10 mm wide, thin, appressed, joined at base to form a compressed turbinate tube, appendages absent. Seed with lateral, erect radicle. *Mallee Saltbush*, *Kidney Saltbush*. Fig. 21 I.

Found in semi-arid areas of southern Australia and southern N.T. Map 155.

W.A.: Lake Baladjie, 15 May 1980, R. A. Saffrey (PERTH). S.A.: 145 km S of Vokes Hill, T. R. N. Lothian 5714 (AD). Qld: Dynevor Downs, C. T. White 12009 (BRI). N.S.W.: 13 km E of Old Corona Well, S. Jacobs 162 (NSW). Vic.: Nursery Ridge, E of Red Cliffs, A. C. Beauglehole 19986 (PERTH).

47. *Atriplex quinii* F. Muell., *Victorian Naturalist* 5: 96 (1888)

T: Grey Ranges, N.S.W., 1887, W. Baeuerlen 352; syn: MEL; Kooringbirry, N.S.W., Sept. 1887, W. Baeuerlen 217; syn: MEL; beyond Mt Margaret, S.A., 1857, H. Babbage; syn: MEL.

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 12 (1889); J. M. Black, *Fl. S. Australia* 2nd edn, fig. 367 (1948); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 242 fig. 44(24) (1982).

Rounded perennial herb c. 20 cm high, monoecious. Leaves thin, narrowly obovate to narrowly oblanceolate, obtuse, narrowly cuneate at base, 20–30 mm long, entire, scalloped or coarsely toothed towards apex, covered with a grey scaly sheen on both surfaces. Male flowers in glomerules c. 2 mm diam. forming short interrupted spikes or panicles. Female flowers in axillary clusters. Fruiting bracteoles thin, reniform, c. 6 mm high, 10 mm wide, entire, free to the very short deltoid tube, with a swollen reniform appendage c. 5 mm wide, attached at base of each bracteole; stipe short, cylindrical to narrowly obconic, 2–4 mm long. Seed with erect radicle. Fig. 21 J.

Found in eremean regions of Australia from central W.A. to eastern N.S.W. and Qld. In rocky soils or slopes of hills. Map 156.

W.A.: Rudall River area, P. G. Wilson 10589 (PERTH). N.T.: New Crown Stn, T. S. Henshall 1531 (NT). S.A.: c. 1.6 km N of Wintinna, D. E. Symon 2717 (ADW). Qld: near Boulia, S. T. Blake 12372 (BRI). N.S.W.: 8 km N of Nuntherungie Homestead, J. C. De Nardi (NSW).

48. *Atriplex bunburyana* F. Muell., *S. Sci. Rec.* 2: 274 (1882)

T: Gascoyne River, W.A., 1882, *Miss Bunbury*; iso: PERTH.

A. paludosa subsp. *graciliflora* Aellen, *Bot. Jahrb. Syst.* 68: 404 (1938). T: Murchison River, W.A., *Oldfield*; holo: K.

Erect shrub to 1 m high, predominantly dioecious. Branches slender, often straight and rigid. Leaves elliptic to broadly elliptic, entire, with thin blueish scaly covering above and below; lamina 5–20 mm long; petiole 1–3 mm long. Male flowers in small disjunct glomerules c. 2 mm diam. forming slender panicles. Female flowers in disjunct clusters arranged in slender panicles. Fruiting bracteoles sessile or on a slender stipe to 3 mm long; valves thin, appressed, semicircular or slightly cordate, to 8 mm long and 12 mm wide, denticulate, united into a very small tube at base otherwise free; smooth or sometimes with 2 small antler-shaped appendages on each side near base. Seed with lateral, erect radicle. *Silver Saltbush*. Fig. 21 K.

Found in western W.A. both coastal and inland. Map 157.

W.A.: Lake Cowcowing, T. E. H. Aplin 2228 (PERTH); Rudall River area, A. S. George 10671 (PERTH); Onslow, A. A. Mitchell 724 (PERTH).

49. *Atriplex hymenotheca* Moq. in DC., *Prodr.* 13(2): 101 (1849)

T: Western Australia, *J. Drummond 3, 128 and 129*; syn: PERTH (coll. 129).

Spreading, diffuse shrub to 0.3 m high and 1 m wide, dioecious. Branches slender. Leaves sessile, narrowly elliptic to elliptic, 3–10 mm long, entire, with scaly sheen on upper and lower surfaces. Male flowers in disjunct glomerules c. 4 mm diam. forming slender spikes. Female flowers in few-flowered axillary clusters. Fruiting bracteoles, thin and soft, sessile, orbicular to broadly cordate, obtuse, to 12 mm long and wide; valves free except at base, entire; appendage attached near base of each valve, inflated and bladder-like or inverted horse-shoe shaped, from half as large to almost equal in size to bracteole. Seed with lateral, erect radicle. Fig. 21L.

Found in inland south-western W.A. in heavy soil on margin of salt lakes. Map 158.

W.A.: Southern Cross, *W. E. Blackall 925* (PERTH); Mt Stirling, *C. A. Gardner 6531* (PERTH); Baandee, *R. A. Saffrey 626* (PERTH).

50. *Atriplex vesicaria* Heward ex Benth., *Fl. Austral.* 5: 172 (1870)

T: Molle's Plain, N.S.W., July 1817, *A. Cunningham 388*; lecto: K; iso: BM, MEL, *fide* G. Parr-Smith, *Fl. Australia* 4: 320 (1984).

Pachypharynx neglecta Aellen, *Bot. Jahrb. Syst* 68: 429 (1938). T: Ooldea, S.A., 1926, *Lady Cecil*; syn: K; Koonamore, S.A., 1931, *C. M. Eardley*; syn: *n.v.*; Boulder, W.A., 1900, *W. D. Campbell*; syn: *n.v.*

Illustration: G. M. Cunningham et. al., *Pl. W. New South Wales* 242 fig. 44(32) (1982)

Erect or decumbent shrub to 1 m high, predominantly dioecious. Leaves elliptic to oblong or obovate, acute, obtuse, or rounded, usually entire, attenuate at base, sparsely to densely scaly, somewhat green; lamina 5–25 mm long, 3–15 mm wide. Male flowers in disjunct or contiguous glomerules arranged in a terminal spike or panicle 2–4 cm long. Female flowers 2 to many in upper axils. Fruiting bracteoles sessile with stipe 1–3 mm long; valves free or fused to above seed, orbicular to oval-triangular or rhomboid, obtuse, acute, or mucronate, 4–13 mm long and wide, entire or dentate towards apex, cuneate to cordate at base; appendages thin-walled and bladder-like attached to base of valves, or fused to one another below bracteoles, or to the bracteole margin, sometimes absent. *Bladder Saltbush*. Fig. 21M.

A highly variable species found in a variety of habitats in southern arid and semi-arid Australia. Eight subspecies are recognised.

- | | | |
|----|--|----------------------------------|
| 1 | Bladder-appendages almost as large as bracteoles or larger, often fused to one another below bracteoles and around stipe | |
| 2 | Bladder fused to bracteole near centre | 50g. subsp. macrocystidia |
| 2: | Bladder fused to bracteole near margin | 50h. subsp. sphaerocarpa |
| 1: | Bladder-appendages smaller than bracteoles or absent, never fused to each other | |
| 3 | Plant 0.3–0.6 m high | |
| 4 | Plant erect; bracteoles truncate to slightly cordate at base | 50b. subsp. appendiculata |
| 4: | Plant rounded; bracteoles rounded to cuneate at base | |
| 5 | Leaves c. 1 cm long, 2 mm wide | 50e. subsp. minor |
| 5: | Leaves consistently 2–3 cm long, 3–5 mm wide | 50a. subsp. vesicaria |
| 3: | Plant erect, 0.6–1 m high | |
| 6 | Bracteole base markedly cordate; bladder-appendages always absent | 50f. subsp. incompta |
| 6: | Bracteole base slightly cordate, truncate, or cuneate; bladder-appendages present on at least some bracteoles | |
| 7 | Leaves broadly elliptic to obovate, 6–12 mm wide, sometimes dentate, obtuse to rounded or emarginate | 50d. subsp. calcicola |
| 7: | Leaves narrowly-elliptic, 4–6 mm wide, entire, acute to obtuse | 50c. subsp. variabilis |

50a. *Atriplex vesicaria* Heward ex Benth. subsp. *vesicaria*

?*A. paludosa* var. *obovata* Moq., *Chenop. Monogr. Enum.* 66 (1840). T: Molles Plains, N.S.W., July 1817, A. Cunningham 385; lecto: K, fide P. Aellen, *Bot. Jahrb. Syst.* 68: 387 (1938).

Rounded shrub to 50 cm high. Leaves narrowly elliptic, 20–30 mm long, 3–5 mm wide. Fruiting bracteoles 5–10 mm long and wide. Seeds not dimorphic, all dark brown.

Found in the northern Riverine plain near the Lachlan River, N.S.W., in heavy red and grey clay soil. Map 159.

N.S.W.: 12 km S of Ivanhoe, G. A. Parr-Smith 1431 (CANB).

50b. *Atriplex vesicaria* subsp. *appendiculata* (Benth.) Parr-Smith, *Fl. Australia* 4: 320 (1984)

A. paludosa var. *appendiculata* Benth., *Fl. Austral.* 5: 170 (1870). T: 'NW of the head of the Great Bight, *Delisser*'; n.v.

Erect shrub to 60 cm high. Branches erect, wiry. Leaves narrowly elliptic to orbicular or obovate, obtuse to rounded, 5–15 mm long 3–8 mm wide, entire. Fruiting bracteoles sessile or very shortly stipitate; valves fused for 1 mm above base, orbicular to rhomboid or triangular, obtuse to acute, to 5 mm long and wide, entire or slightly denticulate, truncate or slightly cordate at base; bladder-appendages small or absent. Seed medium brown.

Found from the western Nullarbor Plain in S.A. to Norseman and Kellerberrin in W.A., growing in mixed scrub and woodland over limestone or loam. Map 160.

W.A.: Kellerberrin, Dec. 1903, F. H. Vachall (NSW); Eucla, 27 Sept. 1960, B. G. Briggs (NSW). S.A.: Koonalda, G. A. Parr-Smith 1137 (CANB, PERTH).

50c. *Atriplex vesicaria* subsp. *variabilis* Parr-Smith, *Fl. Australia* 4: 321 (1984)

T: 9 miles (14 km) S of White Cliffs on road to Wilcannia, N.S.W., 12 July 1971, G. A. Parr-Smith 1117V; holo: CANB.

Erect shrub to 1 m high. Leaves narrowly elliptic, acute or obtuse, 10–15 mm long, 4–6 mm wide, entire. Fruiting bracteoles sessile; valves free to base, orbicular, obtuse to rounded, 7–11 mm long, 6–10 mm wide, entire or with 2 large teeth above widest point, truncate to slightly cordate at base; bladder appendages smaller than bracteoles or absent from one or both valves. Seed brown.

Found in S.A., southern N.T. and central W.A., in sands or silty loams. Map 161.

W.A.: 70 km E of Meekatharra, C. A. Gardner 2376 (PERTH). N.T.: Acacia Well, 40 km E of Undoolya Stn, R. A. Perry 3292 (CANB). S.A.: Emu, 22 Aug. 1956, N. Forde (AD). N.S.W.: 56 km W of Wilcannia, 25 Sept. 1955, L. A. S. Johnson and E. J. Constable (NSW). Vic.: 20 km S of Benetook, 22 Sept. 1966, T. Henshall (NSW).

50d. *Atriplex vesicaria* subsp. *callicola* Parr-Smith, *Fl. Australia* 4: 320 (1984)

T: Koonamore Stn, S.A., 3 May 1982, M. Crisp 429; holo: PERTH; iso: CANB.

Similar to subsp. *variabilis* but leaves broadly orbicular, rounded or emarginate, 8–10 mm wide or more. Bracteoles attenuate, entire.

Found in far western N.S.W., central to eastern S.A., and southern N.T., in calcareous soils. Map 162.

N.T.: 27 km of Kulgera Stn, R. E. Winkworth 129 (AD). S.A.: Siccus R. crossing, 22 Oct. 1963, R. Hill (AD). N.S.W.: Mt Oxley, 1884, E. Betche (NSW).

50e. *Atriplex vesicaria* subsp. *minor* (Aellen) Parr-Smith, *Fl. Australia* 4: 321 (1984)

A. hymenotheca var. *minor* Aellen, *Bot. Jahrb. Syst.* 68: 387 (1938). T: Booroorban, N.S.W., 1910, F. A. G. Fisher; iso: NSW.

Rounded shrub 30–50 cm high and wide; branches finer than those of other subspecies. Leaves sessile, narrowly elliptic, acute, 10–15 mm long, 2–3 mm wide, entire, attenuate at base. Fruiting bracteoles orbicular, 3–8 mm long and wide; valves soft and somewhat membranous, entire, rounded to truncate at base; bladder appendages smaller than valves or absent. Seeds dimorphic, either flattened, 2 mm diam. and light-brown, or rounded, 1–1.5 mm diam. and shiny black, both types found on the one plant with the latter in the smaller bracteoles.

Found on the southern Riverine Plain of N.S.W. and northern Vic., in heavy red and grey clay soil. Map 163.

N.S.W.: 51 km N of Deniliquin, *J. N. Leigh 5563* (NSW); c. 2 km from Wentworth on road to Poorcarie, 26 May 1965, *J. C. De Nardi & L.A.S. Johnson* (NSW). Vic.: 17 km E of No. 9 lock on Murray R., W of Mildura, *G. A. Parr-Smith 1427* (CANB).

50f. *Atriplex vesicaria* subsp. *incompta* Parr-Smith, *Fl. Australia* 4: 320 (1984)

T: Edge of Yarra Yarra Lake, W.A., 17 Sept. 1971, *G. A. Parr-Smith 1152*; holotype: CANB.

Erect shrub to 0.8 m. Leaves elliptic to obovate, rounded at apex, 8–15 mm long, 2–8 mm wide, entire. Fruiting bracteoles sessile or on stipe 1 mm long; valves cordate-triangular to orbicular, rounded or obtuse, truncate to cordate at base, entire; bladder-appendages absent. Seed dark brown.

Found near the west coast of W.A. from south of Geraldton to Shark Bay, on sandy plains and margins of salt pans. Map 164.

W.A.: 1 km S of Billabong Roadhouse (Wannoo), *G. A. Parr-Smith 1153* (CANB, PERTH); 20 km S of Hamelin Stn, *G. A. Parr-Smith 1155* (CANB, PERTH).

50g. *Atriplex vesicaria* subsp. *macrocystidia* Parr-Smith, *Fl. Australia* 4: 321 (1984)

T: Oak Park, c. 32 km S of Yunta, S.A., 2 Oct. 1971, *N. N. Donner 3725*; holotype: AD; iso: PERTH.

Rounded shrub to 80 cm high. Leaves obovate, rounded to obtuse, 10–30 mm long, 4–8 mm wide, entire. Fruiting bracteoles sessile or on stipe 1 mm long; valves broadly orbicular, obtuse or slightly mucronate, to 9 mm long, 12 mm wide, fused up to 2 mm above base, entire or with a few teeth above widest point, truncate at base; bladder-appendages almost equal to valves, attached near base and often fused to each other below valves and around stipe. Seed light brown.

Found in central and western N.S.W., north-western Vic., west to southern N.T. and central S.A., on arid plains and silty or clay-loam soils. Map 165.

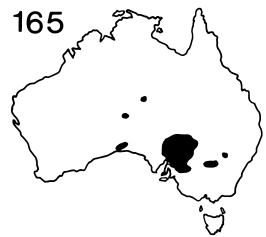
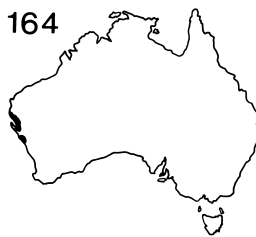
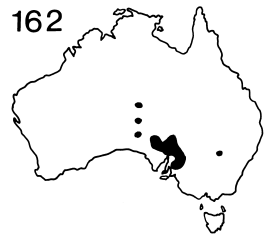
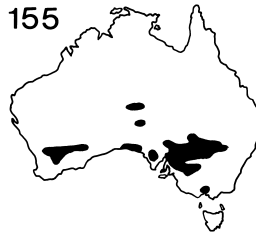
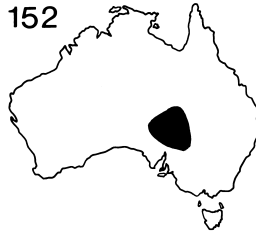
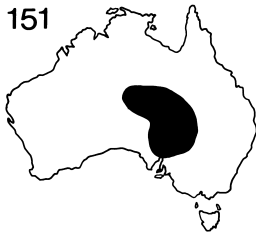
N.T.: 43 km E of Renner's Rock Homestead, *R. E. Winkworth 782* (PERTH). S.A.: 40 km W of William Creek, *B. G. Briggs 1293* (NSW); 73 km SE of Poepfels Corner, *D. E. Boyland 223, 225* (BRD). N.S.W.: Mt Oxley, 1884, *E. Betche* (NSW). Vic.: 3 km N of Lake Cullulleraine, *G. A. Parr-Smith 1423* (CANB).

50h. *Atriplex vesicaria* subsp. *sphaerocarpa* Parr-Smith, *Fl. Australia* 4: 321 (1984)

T: North Lake Gairdner, S.A., *B.G. Lay 317*; holotype: AD.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 246 (1982).

Decumbent shrub 30–50 cm high and wide. Leaves narrowly elliptic to ovate, obtuse or slightly retuse; usually entire; lamina 8–15 mm long, 5–8 mm wide; petiole 2 mm long. Female (and sometimes male) flowers black. Fruiting bracteoles with stipe 2–3 mm long but appearing subsessile due to bladder appendages; valves fused to above seed, broadly orbicular to rhomboid (appearing spherical), acute to mucronate, to 10 mm long and wide, entire or sparsely dentate, attenuate at base; bladder appendages exceeding valves



151. *Atriplex velutinella*
 154. *Atriplex humilis*
 157. *Atriplex bunburyana*
 160. *Atriplex vesicaria*
 subsp. *appendiculata*
 163. *Atriplex vesicaria*
 subsp. *minor*

152. *Atriplex acutiloba*
 155. *Atriplex stipitata*
 158. *Atriplex hymenotheca*
 161. *Atriplex vesicaria*
 subsp. *variabilis*
 164. *Atriplex vesicaria*
 subsp. *incompta*

153. *Atriplex nessorhina*
 156. *Atriplex quinii*
 159. *Atriplex vesicaria*
 subsp. *vesicaria*
 162. *Atriplex vesicaria*
 subsp. *calcicola*
 165. *Atriplex vesicaria*
 subsp. *macrocystidia*

and obscuring them, fused to near upper margin of valves and to each other below. Seed light brown.

Found in southern N.T., central S.A. and western N.S.W., on stony slopes and ridges of hills and occasionally on plains. Map 166.

N.T.: MacDonnell Ranges, *J. D. Nelson 1736* (PERTH). S.A.: Anna Creek Stn, *B. G. Lay 4* (CANB). N.S.W.: Eurowie, 31 May 1955, *L. A. S. Johnson & E. J. Constable* (NSW).

51. *Atriplex nana* Parr-Smith, *Fl. Australia* 4: 320 (1984)

T: 8.3 miles (c. 13 km) S of Wiluna near Mt Sir Samuel, W.A., *G. A. Parr-Smith 1159a*; holo: CANB; iso: PERTH.

Erect bushy shrub to 20 cm high, dioecious. Branches densely scaly. Leaves narrowly elliptic, acute, 5–14 (usually 7–8) mm long, usually boat-shaped, entire, with a thick scaly indumentum. Male flowers congested in a spike c. 3 mm diam., to 10 mm long. Female flowers 1–3 in axillary clusters. Fruiting bracteoles with short, cylindrical stipe 1–2 mm long; valves broadly deltoid, c. 6 mm long, 8 mm wide, often slightly cordate at base, sinuate-dentate on margin, free to base; appendages attached to centre of valves, bladder-like, often irregularly dentate and tuberculate, sometimes inverted horse-shoe shaped. Seed with lateral, erect radicle. Fig. 21N.

Found in inland semi-arid W.A. around gypsum or salt lakes. Map 167.

W.A.: 16 km S of Widgiemooltha, *R. A. Saffrey 1577* (PERTH); Lake Austin, *T. E. H. Aplin 2539* (PERTH); Lake Harris, *G. J. Keighery 3143* (PERTH).

52. *Atriplex paludosa* R. Br., *Prodr.* 406 (1810)

T: Port Dalrymple, Tas., *R. Brown, n.v.*

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 14 (1889)

Decumbent or erect shrub to 1 m high, predominantly dioecious. Leaves narrowly elliptic to orbicular, acute or obtuse, attenuate at base, entire; lamina 1–4 cm long, 2–15 mm wide; petiole 2–4 mm long. Male flowers in disjunct glomerules c. 2 mm diam. forming panicles 6–25 cm long. Female flowers in congested panicles c. 15 cm long. Fruiting bracteoles sessile or with slender or cylindrical stipe 1–3 mm long; valves free, orbicular to triangular, obtuse to acute, attenuate to cordate at base, 7–12 mm long and wide, entire or with a prominent antrorse tooth on either margin above widest point, or rarely denticulate; appendages absent, rarely present in subsp. *paludosa*.

Coastal Tas., Vic., S.A. and southern and south-western W.A., also inland south-western W.A. There are 4 subspecies.

- | | | |
|----|---|-------------------------------|
| 1 | Decumbent shrub; leaves glabrous above | 52a. subsp. paludosa |
| 1: | Erect shrub; leaves scaly all over | |
| 2 | Leaves elliptic to orbicular, rounded or emarginate; female inflorescence with wide-spreading branches as long as main axis | 52d. subsp. moquiniana |
| 2: | Leaves elliptic or narrowly elliptic, acute to obtuse; female inflorescence with short lateral branches, not divaricate | |
| 3 | Leaves elliptic, over 5 mm wide; male inflorescence usually over 10 cm long | 52c. subsp. baudinii |
| 3: | Leaves narrowly elliptic, under 5 mm wide; male inflorescence usually under 10 cm long | 52b. subsp. cordata |

52a. *Atriplex paludosa* R. Br. subsp. *paludosa*

A. paludosa subsp. *tridentata* Aellen, *Bot. Jahrb. Syst.* 68: 405 (1938). T: Port Albert, Vic., *F. Mueller*; holotype: K.

Decumbent shrub to 3 m diam. Leaves narrowly elliptic, acute, entire, glabrous above, white scaly below; lamina 15–30 mm long, 2–8 mm wide; petiole 2–3 mm long. Fruiting bracteoles sessile; valves somewhat fleshy, triangular, acute, to 1 cm long and wide, truncate or slightly cordate at base, entire or with 2 antrorse lobes above widest point (tridentate); appendages absent or rarely paired as in *A. cinerea*. *Marsh Saltbush*.

Found on landward edges of saltmarshes on coasts of eastern S.A., Vic., and Tas. Map 168.

S.A.: Upper Yorke Peninsula, *R. H. Kuchel* 8 (AD). Vic.: Port Fairy, June 1903, *H. B. Williamson* (MEL). Tas.: Stanley, Feb. 1948, *W. M. Curtis* (HO).

52b. *Atriplex paludosa* subsp. *cordata* (Benth.) Aellen, *Bot. Jahrb. Syst.* 68: 405 (1938)

A. paludosa var. *cordata* Benth., *Fl. Austral.* 5: 170 (1870). T: roadsides between Port and city of Adelaide, S.A., 1848, *F. Mueller*; lectotype: K, *n.v.*, *vide* Aellen, *loc. cit.*

?*A. reniformis* R. Br., *Prodr.* 406 (1810). T: Kangaroo Is., S.A., *R. Brown*, *n.v.*

?*A. paludosa* var. *acuticordata* Aellen, *op. cit.* 404. T: Kangaroo Is., S.A., *Anon.*; Lake Hamilton, S.A., *Wilhelmi*; *n.v.*

?*A. paludosa* var. *cordivalvis* Aellen, *op. cit.* 404. T: Seven collections cited from coastal South Australia; all *n.v.*

Pachypharynx acuminata Aellen, *op. cit.* 430. T: Lake Hamilton, S.A., *C. Wilhelmi*; iso: MEL.

Erect shrub. Leaves very narrowly elliptic, acute, entire, scaly; lamina 15–25 mm long, 2–4 mm wide; petiole c. 2 mm long. Male panicle to 6 cm long. Female panicle to 20 cm long, usually narrow and often spike-like. Fruiting bracteoles sessile or occasionally with a slender stipe to 3 mm long; valves orbicular to triangular, 7–10 mm long, 8–12 mm wide, acute, truncate to cordate at base, entire or tridentate; appendages absent. Fig. 21 O.

Occurs along the coast from Esperance in W.A. to Adelaide in S.A.; often on stable dunes. Map 169.

W.A.: Combe Is., Recherche Archipelago, *R. D. Royce* 6267 (PERTH); Eucla, 1886, *J. D. Batt* (PERTH). S.A.: Port Willunga, *Hj. Eichler* 14609 (AD); Cygnet Mouth, Kangaroo Is., *G. Jackson* 1780 (AD).

52c. *Atriplex paludosa* subsp. *baudinii* (Moq.) Aellen, *Bot. Jahrb. Syst.* 68: 403 (1938)

A. paludosa var. *baudinii* Moq. in DC., *Prodr.* 13(2): 102 (1849). T: West coast of W.A. (probably Shark Bay), 1801, *Voyage of Captain Baudin* 70, 416; syn: K.

A. drummondii Moq. in DC., *Prodr.* 13(2): 102 (1849). T: south-western W.A., *J. Drummond* 134 (♂) and 135 (♀); *n.v.*

Erect shrub to 1 m high. Leaves narrowly to broadly elliptic, acute or obtuse, entire, scaly all over; lamina 12–40 mm long, 5–10 mm wide; petiole 2–4 mm long. Fruiting bracteoles sessile or with stipe to 2 mm long; valves triangular, acute or rarely obtuse, 8–10 mm long and wide, entire or occasionally dentate at widest point; appendages absent.

Found in south-western W.A. both coastal and semi-arid inland, in saline situations. Map 170.

W.A.: Lake Hope, *J. S. Beard* 3797 (PERTH); Houtman Abrolhos, 6 Sept. 1959, *G. M. Storr* (PERTH); Kellerberrin, *E. M. Bennett* 2131 (PERTH).

52d. Atriplex paludosa subsp. **moquiniana** (Webb ex Moq.) Parr-Smith, *Fl. Australia* 4: 320 (1984)

A. moquiniana Webb ex Moq. in DC., *Prodr.* 13(2): 97 (1849). T: south-western W.A., *J. Drummond s.n.*; holotype: P.

Erect shrub to 1.5 m high. Leaves elliptic to orbicular, rounded to emarginate, entire, attenuate to truncate at base, bluish grey; lamina 15–20 mm long, 5–15 mm wide; petiole 2–3 mm long. Female panicles 8–15 cm long and wide. Fruiting bracteoles congested, subsessile; valves triangular to orbicular, obtuse or acute, 7–10 mm long and wide, entire; appendages absent.

Found from Murchinson River to Shark Bay, W.A. Map 171.

W.A.: 21 km S of Denham, *T. E. H. Aplin 3313* (PERTH); Hamelin Pool, *C. A. Gardner 2546* (PERTH); Dorre Is., *R. D. Royce 5865* (PERTH).

53. Atriplex hypoleuca Nees in Lehm., *Pl. Preiss.* 1: 633 (1845)

T: near Fremantle, W.A., *L. Preiss 1251, n.v.*

Decumbent perennial, monoecious. Branches slender. Leaves narrowly elliptic to elliptic or ovate, 15–40 mm long, acute, narrowed at base into a short petiole; glabrous above, with scaly sheen below. Male flowers in glomerules c. 3 mm diam., disjunct or forming slender dense spikes to 5 cm long. Female flowers in axillary clusters of 2–4. Fruiting bracteoles with stipe c. 1 mm long; valves flat, rhomboidal to broadly deltoid, acute, c. 4 mm long and wide, entire, fused in lower half, appressed. Seed with ascending radicle.

Found around the inlets and estuaries of south-western W.A. between Perth and Albany, in areas subject to tidal inundation. Map 172.

W.A.: Hardy Inlet, Augusta, *R. A. Congdon 740266* (PERTH); Alfred Cove, Swan River, *K. F. Kenneally 7184* (PERTH); Princess Royal Harbour, Albany, *C. A. Gardner 6606* (PERTH).

54. Atriplex isatidea Moq., *Chenop. Monogr. Enum.* 64 (1840)

Neopreissia isatidea (Moq.) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 520 (1934); *Atriplex cinerea* subsp. *isatidea* (Moq.) Aellen, *Bot. Jahrb. Syst.* 68: 395 (1938). T: West coast of W.A., 1822, holotype: P *vide* Aellen, *loc. cit.*

A. isatidea var. *brachythea* Moq. in DC., *Prodr.* 13(2): 101 (1849); *A. cinerea* var. *brachythea* (Moq.) Aellen, *Bot. Jahrb. Syst.* 68: 396 (1938). T: Abrolhos Islands, W.A., *Bynoe*; holotype: K.

?*A. halimus* var. *erecta* Nees in Lehm., *Pl. Preiss.* 1: 633 (1845). T: Rottnest Is., W.A., Aug. 1839, *L. Preiss 1259*; Fremantle, W.A., July. 1840, *L. Preiss 1258*; *syn: n.v.*

A. cinerea var. *macrothea* Aellen, *op. cit.* 396. T: South West Bay, W.A., *A. Oldfield*; *syn: MEL, PERTH*; between Perth & King George Sound, W.A., 1854, *W. H. Harvey*; *syn: n.v.*; Murchison R., W.A., *A. Oldfield*; *syn: n.v.*

Erect shrub to 2.5 m high, dioecious or sometimes monoecious. Branches stout with scurfy sheen. Leaves thick, shortly petiolate; lamina narrowly to broadly ovate, 25–60 mm long, entire, with a thick soft scurfy sheen on both surfaces. Male flowers in dense glomerules c. 4 mm diam. forming ± continuous terminal spikes or panicles. Female flowers in terminal leafless panicles and in mixed panicles. Fruiting bracteoles hard, sessile or with a short hard turbinate stipe, broadly deltoid or broadly triangular, free to near base, 4–8 mm long and wide, entire, centre thick and convex with 2–4 tubercular processes or rarely smooth. Seed circular; radicle lateral, erect. Fig. 21P.

Found in the south and west coasts of W.A. from Twilight Cove (Great Australian Bight) north to Onslow, principally in coastal dunes. Map 173.

W.A.: Mandurah, 20 Apr. 1953, *G. H. Burvill* (PERTH); Geraldton, *W. E. Blackall 4733* (PERTH).

55. *Atriplex cinerea* Poir. in Lam., *Encycl. Suppl.* 1: 471 (1811)

Neopreissia cinerea (Poir.) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 520 (1934). T: Australia, *J. J. H. de Labillardiere*; holo: P.

A. elaeagnoides Moq., *Chenop. Monogr. Enum.* 65 (1840); *A. cinerea* var. *elaeagnoides* (Moq.) Moq. in DC., *Prodr.* 13(2): 101 (1849). T: Moreton Bay, Qld, 23 Oct. 1824, *A. Cunningham*; iso: K.

?*A. halimus* var. *adscendens* Nees in Lehm., *Pl. Preiss.* 1: 633 (1845); *A. cinerea* var. *adscendens* (Nees) H. Eichler, *Suppl. Black's Fl. S. Austral.* 2nd edn, 108 (1965). T: Busselton, W.A., Dec. 1839, *L. Preiss 1260*; n.v.

A. cinerea f. *appendiculata* Aellen, *Bot. Jahrb. Syst.* 68: 394 (1938). T: Lord Howe Is., 1853, *J. MacGillivray 716*; holo: K, n.v.

A. cinerea var. *palmata* Aellen, *loc. cit.* T: Port Jackson, N.S.W., 1801, *Capt. Baudin*; syn: n.v.; Portland Town, Vic., *Robertson 395*; syn: K; Tasmania, 1837, *R. Gunn 385*, syn: n.v.

A. cinerea subsp. *globulosa* Aellen, *op. cit.* 396. T: Whyalla, S.A., 7 May 1936, *A. Morris 2793*; syn: ADW; Semaphore, S.A., 1926, J. M. Black; syn: n.v.; Brighton, near Adelaide, S.A., 1929, *A. Meebold 7967*; syn: n.v.

[*A. halimus* auct. non L.: R. Brown, *Prodr.* 406 (1810)]

[*A. capensis* auct. non Moq.: Moquin in DC., *Prodr.* 13(2): 100 (1849), as to Australian material]

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 15 (1889).

Spreading to erect shrub to 1.5 m high, dioecious or monoecious. Leaves thin, shortly petiolate, narrowly elliptic to elliptic or ovate, 2.5–4 cm long, entire, with scurfy sheen on both surfaces. Male flowers in dense glomerules mostly 5–7 mm diam. forming interrupted or continuous spikes or panicles. Female flowers in clusters axillary to upper foliage leaves. Fruiting bracteoles subsessile or shortly stipitate; stipe turbinate, hard; bracteoles ovoid to broadly deltoid or rhomboid, 6–10 mm long and wide, united towards base, often hard and swollen in centre, thin and entire on margin, smooth or with a verrucose appendage on one or both sides. Seed circular; radicle lateral, erect. *Grey Saltbush*, *Barilla* Fig. 21Q.

Found around the south coast of Australia from Geraldton, W.A., to the central coast of N.S.W.; occurs principally on edge of coastal dunes. Also on Lord Howe Is. Map 174.

W.A.: Rottneet Is., *R. D. Royce 5469* (PERTH). S.A.: Troubridge Shoal, *R. B. Major 11* (AD). N.S.W.: Sussex Inlet, *J. Campbell 93* (CANB); Vic.: Altona, *J. Cullimore 102* (MEL). Tas.: South Arm, *S. J. Jarman 32* (HO).

On the west coast of W.A. this species intergrades with *A. amnicola*, to which it is closely related.

56. *Atriplex amnicola* Paul G. Wilson, *Fl. Australia* 4: 322 (1984)

T: Yalgoo, W.A., 11 Oct. 1945, *C. A. Gardner 7751a*; holo: PERTH.

?*Atriplex cephalantha* Aellen, *Candollea* 12: 154 (1949). T: Leonora, W.A., 28 Sept. 1938, *collector unknown*; holo: G, not found.

[*A. cinerea* subsp. *rhagodioides* auct. non (F. Muell.) Aellen: Aellen, *Bot. Jahrb. Syst.* 68: 398 (1938) as to W.A. specimens cited]

[*A. rhagodioides* auct. non F. Muell.: D. Wilcox & J. Morrissey, *Pasture Pl. W. Austral. Shrublands* 48 (1977)]

Illustration: D. G. Wilcox & J. G. Morrissey, *loc. cit.* 48 (1977) as *A. rhagodioides*.

Spreading, divaricately branched shrub to 1.5 m high, sometimes layering; predominantly dioecious. Leaves, shortly petiolate, thin; lamina narrowly elliptic, narrowly oblong or narrowly hastate with short divaricate basal lobes, 10–25 mm long, obtuse, entire or remotely dentate, with a thin lepidote sheen on both surfaces or becoming glabrous above. Male flowers in compact glomerules c. 5 mm diam. forming terminal spikes. Female flowers in axillary clusters and forming short dense terminal spikes. Fruiting bracteoles with a short hard turbinate base (stipe); bracteoles fused along lateral margins, ovoid to fan-shaped, 4–6 mm wide, thick and hard all over or with a herbaceous margin; appendages absent. Seed circular; radicle lateral, erect. *Swamp Saltbush*.

Found in central and central-western W.A., coastal and inland along creeks and outer margins of salt lakes. Map 175.

W.A.: 13 km S of Moorarie Homestead, *T. E. H. Aplin* 2503 (PERTH); Wooleen, 22 Sept. 1950, *A. W. Humphries* (PERTH); Berrigarra, *N. H. Speck* 651 (PERTH).

This species possibly grades into *A. cinerea* on the west coast of W.A. but may be generally distinguished from the latter by the shape and texture of the leaves and by the shape of the fruiting bracteoles.

57. *Atriplex nummularia* Lindley in T. Mitch., *J. Exped. Trop. Australia* 64 (1848)

T: subtropical Australia, 1846, T.L. Mitchell; iso?: K, MEL.

A. halimoides var. *monumentalis* C. Sprenger, *Bull. Soc. Tosc.ortic.* 15: 42 (1890); *A. nummularia* var. *monumentalis* (C. Sprenger) Rodigas, *Bull. D'Arboriculture* 1891: 152 (1891). T: Cult. Italy, seed from S.A.; *n.v.*

Illustration: G.M. Cunningham *et al.*, *Pl. W. New South Wales* 241, 242 (1982).

Erect shrub to 3 m high, predominantly dioecious. Leaves broadly elliptic to ovate or obovate, obtuse, denticulate to coarsely dentate, smooth, grey-green; lamina 2–4 cm long, petiole 0.5–1 cm long. Male flowers in disjunct glomerules c. 6 mm diam. arranged in panicles. Female flowers in compact clusters arranged in panicles c. 20 cm long. Fruiting bracteoles sessile; valves free, orbicular to rhomboidal, 5–15 mm long, 5–11 mm wide, entire or denticulate, rounded at apex, cuneate to cordate at base, papery or thickened towards base around seed; appendages absent. *Oldman Saltbush*. Fig. 21R.

- | | | |
|----|--|-------------------------------|
| 1 | Bracteoles thickened and woody towards base, margins appressed or slightly spreading | |
| 2 | Bracteoles orbicular; base truncate or cordate | 57a. subsp. nummularia |
| 2: | Bracteoles almost rhomboidal; base cuneate | 57b. subsp. omissa |
| 1: | Bracteoles not thickened; margins prominently reflexed | 57c. subsp. spatulata |

57a. *Atriplex nummularia* Lindley subsp. nummularia

?*A. nummularia* subsp. *erosa* Aellen, *Bot. Jahrb. Syst.* 68: 379 (1937). T: S.A., McDouall Stuart's journey of 1859 to the interior of Australia; syn: *n.v.*; Mt Lyndhurst, S.A., 1898, 1899, *M. Koch*; syn: K.

Shrub 2–3 m high; lower branches decumbent. Leaves broadly elliptic; lamina 3–35 cm long, 3–4 cm wide; petiole to 1 cm long. Bracteoles variable but with valves appressed.

Found in semi-arid and arid regions of central and eastern Australia; often associated with heavy soils or flood plains. Map 176.

N.T.: 6 km S of Hermansburg Mission, *M. Lazarides* 5309 (CANB). S.A.: Musgrave Range, *R. Kuchel* 935 (AD). Qld: Bowen Downs, 1873, *C. W. Birch* (MEL). N.S.W.: Urana, *C. W. E. Moore* 1333 (MEL). Vic.: Hattah Lakes National Park, 25 Feb. 1970, *G. W. Anderson* (MEL).

57b. *Atriplex nummularia* subsp. omissa Aellen, *Bot. Jahrb. Syst.* 68: 379 (1937)

T: Darling Desert, N.S.W., Victorian Expedition; near the Darling River, N.S.W., *F. Mueller*; Kulkine, 1928, H. B. Williamson; Mildura, 1928, *collector unknown*; syn: *n.v.*

Shrub to 2 m high; lower branches decumbent. Leaves elliptic, rhomboidal, or orbicular, acute or obtuse, sparsely serrate; lamina mostly 1–2 cm long, 0.8–3 cm wide; petiole 2–15 mm long. Fruiting bracteoles rhomboidal, obtuse or rounded, cuneate at base, 8–10 mm long, 3–11 mm wide, thickened and woody towards base, minutely denticulate on margin.

Widespread in arid and semi-arid Australia. Map 177.

S.A.: 40 km S of Coober Pedy, *T. R. N. Lothian* 2252 (AD). N.S.W.: 17.6 km from Bourke on Nyngan Road, 14 Oct. 1972, *R. F. Martin* (BRI). Vic.: 5 km N of Lake Cullullerain township, *G. A. Parr-Smith* 1452 (CANB).

57c. *Atriplex nummularia* subsp. *spathulata* Aellen, *Bot. Jahrb. Syst.* 68: 380 (1937)

T: Mt Hunt, W.A., 1906, *A. Morrison*; n.v.

Erect shrub to 1.5 m high. Leaves elliptic to obovate, coarsely sinuate-dentate, 1.5–2 cm long, grading at base into an indistinct petiole. Fruiting bracteoles orbicular, entire or denticulate, the margins prominently reflexed.

Found in W.A. from north of Kalgoorlie to the Nullarbor Plain and in far south-western S.A. Map 178.

W.A.: 58 km E of Balladonia, *G. A. Parr-Smith 1313* (CANB); 30 km N of Karonie, *P. G. Wilson 7591* (AD). S.A.: 40 km E of W.A. border on Eyre Highway, *P. G. Wilson 1636* (AD).

58. *Atriplex rhagodioides* F. Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 74 (1858)

A. cinerea subsp. *rhagodioides* (F. Muell.) Aellen, *Bot. Jahrb. Syst.* 68: 398 (1938). T: Murray Desert, ?S.A., *F. Mueller*; lecto: MEL 607127, *vide* P. G. Wilson, *Fl. Australia* 4: 325 (1984).

Rounded shrub 1.5–3 m high, dioecious. Leaves shortly petiolate; thin, deltoid (or with rounded sides), sometimes very shortly hastate, entire or rarely slightly undulate; lamina 15–20 mm long, pale blueish grey, with scaly sheen on both surfaces. Male flowers in disjunct or continuous glomerules 2–3 mm diam. forming divaricately branched terminal panicles which usually bear a few female flowers towards their base. Female flowers in clusters in the small distal leaves or paniculate. Fruiting bracteoles sessile, leathery, rhomboid to fan-shaped, c. 3 mm long and wide, united only at the thickened base, entire or crenulate, eventually hard and much thickened all over, becoming ellipsoidal to broadly rhomboid, smooth. Seed circular with erect radicle. *River Saltbush*. Fig. 21S.

Found in the Murray River region of south-eastern S.A., north-western Vic., and extreme south-western N.S.W., usually on river banks or flats. Map 179.

S.A.: Berri, *B. Copley 1189* (AD). N.S.W.: 8 km W of 'Moorna' Stn, c. 40 km W of Wentworth, *L. A. S. Johnson & E. F. Constable* (NSW 48534). Vic.: Mildura, *A. C. Beaglehole 19981* (PERTH).

This species should possibly be treated as forming part of the polymorphic species *A. nummularia*; it is not part of the *A. cinerea* complex as was considered by Aellen.

59. *Atriplex incrassata* F. Muell., *Rep. Pl. Babbage's Exped.* 20 (1859)

A. cinerea subsp. *incrassata* (F. Muell.) Aellen, *Bot. Jahrb. Syst.* 68: 398 (1938). T: Emu Springs, S.A., *D. Herrgott*; iso: MEL.

Intricately branched shrub to 1 m high, dioecious. Leaves ovate-deltoid, sinuate-dentate, truncate or slightly cuneate at base, with thin scaly covering on both surfaces; lamina 15–20 mm long; petiole 2–3 mm long. Male flowers in disjunct or continuous glomerules c. 5 mm wide forming slender spikes or panicles. Female flowers in dense disjunct glomerules arranged in open leafy panicles. Fruiting bracteoles subsessile, orbicular to obtusely deltoid, c. 10 mm long and wide; valves smooth, entire or bluntly denticulate, free to near base, hard, ultimately thickened and convex except for papery reflexed margin. Seed with lateral, erect radicle. Fig. 21T.

Found in central S.A. Map 180.

S.A.: Mt Clarence tableland, 30 Aug. 1954, *W. S. Reid* (ADW); Abminga, *E. H. Ising 2635* (AD).

Atriplex incrassata is similar to *A. nummularia* and could well be treated as a subspecies of the latter; however, it is not closely related to *A. cinerea* as considered by Aellen.

Subg. II. Theleophyton

Atriplex subg. **Theleophyton** (Moq.) Volkens, *Nat. Pflanzenfam.* 3(1a): 66 (1893).

Theleophyton Moq. in DC., *Prodr.* 13(2): 44, 115 (1849); *Atriplex* ser. (or sect.) *Theleophyton* (Moq.) Benth., *Fl. Austral.* 5: 179 (1870). T: *A. billardieri* (Moq.) Moq.

Prostrate herb covered with glistening, watery bladder hairs, monoecious. Bracteoles connate forming an urceolate structure in fruit. Seed initially parallel with bracteoles but twisting so as to be at right-angles to them at maturity; radicle lateral, erect.

One species found in Australia and New Zealand.

60. Atriplex billardieri (Moq.) J.D. Hook., *Fl. Nov.-Zel.* 1: 215 (1853)

Obione billardieri Moq., *Chenop. Monogr. Enum.* 72 (1840); *Theleophyton billardieri* (Moq.) Moq. in DC., *Prodr.* 13(2): 116 (1849). T: Australia, ?J. J. H. de Labillardiere: n.v.

Atriplex chrystallina J. D. Hook., *London J. Bot.* 6: 279 (1847). T: Tasmania, R. C. Gunn; iso: MEL.

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl. t. 2* (1889) as *A. crystallinum*.

Plant prostrate to decumbent, monoecious. Branches pale brown, glabrescent. Leaves subsessile, succulent, broadly elliptic, 5–10 mm long, covered with watery bladder hairs when fresh, scurfy when dry. Male flowers in axillary clusters. Female flowers axillary, solitary or paired. Fruiting bracteoles shortly stipitate, united and urceolate, ± pouched on either side at base c. 5 mm high, 2-lipped, at first somewhat succulent, eventually papery, covered with bladder hairs. Seed elliptical, erect, initially parallel to bracteoles but twisting at maturity and becoming aligned at right-angles to them; radicle lateral, erect. Fig. 21U.

Coastal south-eastern and south-western Vic., coastal Tas.; on beaches just above high tide. Also in New Zealand. Map 181.

Vic.: Portland, A. C. Beaglehole 19978 (PERTH). Tas.: Rupert Point, Jan. 1954, W. D. Jackson (HO).

This species has been placed in the monotypic genus *Theleophyton* on account of the orientation of the seed, but the seed arises parallel to the bracteoles as in other species of *Atriplex*, and twists 90° at maturity to fit into their pouched bases.

Doubtful names

Atriplex patula var. *angustifolia* Rodway, *Tasman. Fl.* 156 (1903).

T: not designated. Probably synonymous with *A. australasica* Moq.

Atriplex patula var. *littoralis* Rodway, *loc. cit.*

T: not designated. Probably synonymous with *A. australasica* Moq.

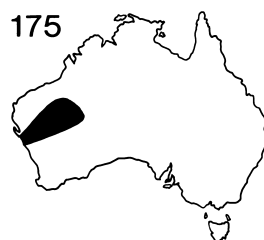
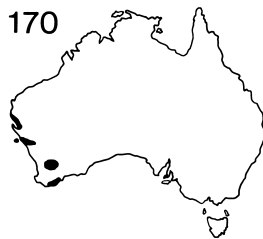
2. CHENOPODIUM

Chenopodium L., *Sp. Pl.* 1: 218 (1753); *Gen. Pl.* 5th edn, 103 (1754); from the Greek *chen* (goose) and *podos* (little foot), referring to the shape of the leaves of some species.

Type: *C. rubrum* L.

Orthosporum (R. Br.) T. Nees, *Gen. Fl. Germ.* ad t. [58] (1834); *Chenopodium* sect. *Orthosporum* R. Br., *Prodr.* 407 (1810). T: *Chenopodium carinatum* R. Br.

Annual or perennial herbs, occasionally weak shrubs, mealy with minute sessile vesicular hairs which may collapse to form a scaly covering, or with glandular hairs, or glabrous. Leaves alternate, flat, entire or dissected. Flowers small, usually clustered, axillary or in



166. *Atriplex vesicaria*
subsp. *sphaerocarpa*
169. *Atriplex paludosa*
subsp. *cordata*
172. *Atriplex hypoleuca*
175. *Atriplex amnicola*
178. *Atriplex nummularia*
subsp. *spathulata*

167. *Atriplex nana*
170. *Atriplex paludosa*
subsp. *baudinii*
173. *Atriplex isatidea*
176. *Atriplex nummularia*
subsp. *nummularia*
179. *Atriplex rhagodioides*

168. *Atriplex paludosa*
subsp. *paludosa*
171. *Atriplex paludosa*
subsp. *moquiniana*
174. *Atriplex cinerea*
177. *Atriplex nummularia*
subsp. *omissa*
180. *Atriplex incrassata*

panicules, bisexual or unisexual, the terminal often male or bisexual and the lateral female. Perianth 3–5-lobed, sometimes hardened in fruit. Stamens 1–5, free or united at base into a saucer-shaped disc. Stigmas 2 or 3. Pericarp membranous or rarely succulent. Seed lenticular to sub-globular, horizontal to vertical; testa crustaceous; embryo annular to horseshoe-shaped.

A cosmopolitan genus of over 70 species; 23 species recorded from Australia of which 14 are considered endemic. *Chenopodium giganteum* D. Don, a species closely related to *C. album* L., is sometimes cultivated as a vegetable and occasionally escapes.

G. Bentham, *Fl. Austral.* 5: 157–164 (1870); A. J. Scott, A review of the classification of *Chenopodium* L. and related genera (Chenopodiaceae), *Bot. Jahrb. Syst.* 100: 205–220 (1978). P. G. Wilson, *Chenopodium*, *Nuytsia* 4: 139–180 (1983).

- 1 Plants somewhat mealy, not glandular
- 2 Shrubs
 - 3 Fruit dry
 - 4 Spinescent shrub; leaves leathery, spatulate, to 3 cm long **15. C. nitrariaceum**
 - 4: Unarmed soft-wooded shrub; leaves papery, oblong-elliptic to hastate, to 4 cm long **14. C. auricomum**
 - 3: Fruit succulent
 - 5 Stigma strongly penicillate **12. C. gaudichaudianum**
 - 5: Stigma papillose **11. C. curvispicatum**
- 2: Herbs
 - 6 Tepals 5, eventually free, almost orbicular, very sparsely mealy, not shed with fruit; seed rounded on margin **13. C. auricomiforme**
 - 6: Tepals 3–5, if 5 then mealy and enclosing fruit when shed
 - 7 Leaves variously toothed
 - 8 Seed deeply muricate **8. C. erosum**
 - 8: Seed smooth or minutely pitted
 - 9 Perianth glabrous; seed horizontal or erect; perianth 3–5-lobed
 - 10 Perianth (at least of lateral flowers) shortly 3-lobed, urceolate **2. C. macrospermum**
 - 10: Perianth segments free **1. C. glaucum**
 - 9: Perianth mealy; seed horizontal; perianth 5-lobed
 - 11 Seed sharply keeled, finely pitted, dull; pericarp persistent **7. C. murale**
 - 11: Seed bluntly keeled, smooth to striate or weakly furrowed; pericarp readily detached
 - 12 Leaves much longer than broad, usually more than 3 cm long **3. C. album**
 - 12: Leaves about as long as broad, usually less than 3 cm long **4. C. opulifolium**
 - 7: Leaves entire or lobed
 - 13 Plant fetid (smelling of rotting fish)
 - 14 Tepals united to near apex; stamens 5 **5. C. vulvaria**
 - 14: Tepals free except near base
 - 15 Stamens 1 or 2 **6. C. detestans**
 - 15: Stamens 5 **10. C. desertorum**
 - 13: Plant not fetid

CHENOPODIACEAE

Chenopodium

- 16** Inflorescence a very slender panicle; tepals becoming black and enclosing fruit; leaf lamina mostly c. 10 mm long; indumentum very thin **9. C. hubbardii**
- 16:** Inflorescence a narrow to broad panicle; tepals not black in fruit
- 17** Erect annual; leaves mostly over 3 cm long with a thin mealy indumentum; panicle large **3. C. album**
- 17:** Prostrate to erect, usually perennial; leaves usually under 2 cm long, entire; panicle to 5 cm long **10. C. desertorum**
- 1:** Plant hairy or glandular, not mealy
- 18** Stamens 1 or 2; seeds lenticular, erect; leaves simple
- 19** Tepals 4; plant erect; flowers in open panicles **23. C. saxatile**
- 19:** Tepals 5
- 20** Tepals strongly crested
- 21** Perianth rostrate at apex; tepals free **21. C. cristatum**
- 21:** Perianth truncate at apex; tepals united **22. C. truncatum**
- 20:** Tepals rounded to acute on back or keeled
- 22** Tepals keeled at least towards apex **19. C. carinatum**
- 22:** Tepals rounded on back
- 23** Tepals firmly united in lower half, completely covering fruit, usually black **20. C. melanocarpum**
- 23:** Tepals free to near base, not completely covering fruit, white **18. C. pumilio**
- 18:** Stamens 5; seed horizontal to erect; leaves simple or pinnatisect
- 24** Leaves serrate; seed horizontal to oblique **16. C. ambrosioides**
- 24:** Leaves pinnatisect; seed erect **17. C. multifidum**

Subg. I. *Chenopodium*

Chenodopium L. subg. *Chenopodium*

Mealy (rarely glabrous) herbs or shrubs.

A subgenus of 9 sections, 6 of which are found in Australia.

Sect. I. *Chenopodium*

Chenopodium L. sect. *Chenopodium*

Chenopodium sect. *Pseudoblitum* J. D. Hook. in Benth. & J. D. Hook., *Gen. Pl.* 3: 52 (1880).

Type: *C. rubrum* L.

Annual herbs, more or less mealy. Flowers dimorphic in axillary and terminal panicles. Perianth 3–5-merous; tepals free or united in lower half. Stamens 1–5. Seed horizontal in terminal flowers, vertical in lateral; embryo annular.

Four cosmopolitan species of which one occurs in Australia.

1. *Chenopodium glaucum* L., *Sp. Pl.* 1: 220 (1753)

T: from Europe; *n.v.*

C. ambiguum R. Br., *Prodr.* 407 (1810); *C. glaucum* var. *ambiguum* (R. Br.) J. D. Hook., *Fl. Tasman.* 1: 313 (1857); *C. glaucum* subsp. *ambiguum* (R. Br.) Murr & Thellung ex Thellung, *Mem. Soc. Sci. Nat. Cherbours* 38: 196 (1912). T: Tasmania, *R. Brown*; holotype: BM.



Figure 23. *Chenopodium*. A–E, *C. ambrosioides*. A, bud $\times 10$; B, flower $\times 15$; C, ovary $\times 15$; D, fruit and seed $\times 15$; E, branch $\times 1.25$ (A–E, M. Menadue 35, PERTH). F–I, *C. macrospermum*. F, branch $\times 1.25$; G, flowers $\times 20$; H, ovary $\times 20$; I, fruit and seed $\times 15$ (F–I, P. Wilson 11699, PERTH). J–N, *C. album*. J, branch $\times 1.25$; K, flower $\times 10$; L, ovary $\times 12$; M, fruiting perianth $\times 10$; N, seed $\times 13$ (J–N, P. Wilson 11840, PERTH).

C. ambiguum var. *majus* Moq. in DC., *Prodr.* 13(2): 67 (1849). T: not designated.

C. ambiguum var. *minus* Moq., *loc. cit.*; *C. glaucum* f. *minus* (Moq.) Aellen, *Verh. Naturf. Ges. Basel* 41: 102 (1931). T: Western Australia, *J. Drummond* 225; iso: MEL.

C. littorale Moq., *Chenop. Monogr. Enum.* 24 (1840), *nom. illeg., non* (L.) Thunb. (1815). T: Australia [?Sydney region], *G. Caley*; *holo*: P.

C. glaucum var. *littorale* Rodway, *Tasman. Fl.* 155 (1903). T: not designated.

Prostrate to erect annual to 0.5 m high, branching from base. Leaves slightly fleshy, elliptic to deltoid, entire or sinuately lobed, obtuse; lamina 1–3 cm long, passing into a petiole c. half as long, glabrous above, densely mealy below. Inflorescence of compact glomerules arranged in paniculate cymes. Flowers glabrous; terminal flowers bisexual, the tepals 3 or 4, rarely 5, free, the stamens 1–4, rarely 5, seed horizontal; lateral flowers female or bisexual, the tepals 3, rarely 4, stamen 0 or 1, seed erect. Pericarp thin, free or almost so, somewhat green. Seed discoid with rounded margin, c. 1 mm diam.; testa reticulate, smooth or finely pitted, reddish brown to black; embryo circular. *Glaucous Goosefoot*.

A cosmopolitan species; occurs in muddy eutrophic conditions in southern inland and coastal Australia. Map 182.

W.A.: Herdsman Lake, *K. F. Kenneally* 1107 (PERTH). S.A.: 25 km S of Naracoorte, *D. Hunt* 677 (AD). N.S.W.: Front Beach, *L. A. S. Johnson* 8248 (NSW). Vic.: Thurla, *A. C. Beauglehole* 56212 (MEL). Tas.: Stewarts Bay, *J. H. Hemsley* 6735 (HO).

A polymorphic species in Australia which may include an endemic element (subsp. *ambiguum*) as well as an introduced element (subsp. *glaucum*).

Sect. II. *Degenia*

Chenopodium* sect. *Degenia Aellen, *Magyar Bot. Lapok* 25: 56 (1927).

Type: *C. macrospermum* J. D. Hook.

Annual herbs, sparsely mealy. Flowers slightly dimorphic in panicles. Lateral flowers; perianth connate to near apex, very shortly 3-lobed; stamens 0–3; pericarp membranous, free; seed usually vertical enclosed in sac-like perianth; embryo annular. Terminal flowers bisexual; perianth either similar to lateral flowers or divided into 5 tepals; stamens 5; seed vertical.

Three species in America and Europe; one species introduced into Australia.

2. **Chenopodium macrospermum* J. D. Hook., *Fl. Antarct.* 341 (1846)

T: Berkely Sound and St Salvador Bay, Falkland Islands, *C. Darwin*, *J. D. Hooker*; both *n.v.*

C. halophilum Philippi, *Anales Univ. Chile* 18: 67 (1861) *n.v.*; *C. macrospermum* subsp. *halophilum* (Philippi) Aellen, *Feddes Repert.* 26: 42 (1929). T: from Chile; *n.v.*

Erect annual to 1 m high, branching from base. Leaves somewhat fleshy, rhombic to deltoid, sinuate-dentate, glabrous above, mealy below when young; lamina c. 5 cm long; petiole as long as lamina. Inflorescence of axillary spike-like panicles c. 2 cm long. Lateral flowers of clusters: perianth urceolate, c. 1.5 mm high, very shortly 3-lobed, closely enclosing fruit, glabrous; stamen solitary; stigmas 2, very short, subsessile. Terminal flowers of clusters either similar to lateral flowers or 3–5-lobed and with 1–3 stamens. Seed vertical. Fig. 23F–I.

Found in south-western W.A. from Perth south to Bunbury, on margins of fresh or slightly brackish lakes. Map 183.

W.A.: Perry Lakes, Perth, *K. F. Kenneally* 7189 (PERTH); Lake Waneragup, 18 Apr. 1978, *B. K. Masters* (PERTH).

Sect. III. Leprophyllum

Chenopodium sect. **Leprophyllum** Dumort., *Fl. Belg.* 21 (1827).

Type: *C. album* L.

Chenopodium sect. *Chenopodiastrum* Moq. in DC., *Prodr.* 13(2): 61 (1849), *nom. illeg.* T: *C. album* L.

Annual herbs, somewhat mealy. Flowers in cymose clusters, spicate or paniculate, bisexual and female. Tepals 5, united in lower half. Stamens 5. Pericarp membranous. Seed horizontal; embryo annular.

Numerous species, mostly extra-Australian; many are cosmopolitan weeds.

Seven species in Australia.

3. *Chenopodium album L., *Sp. Pl.* 1: 219 (1753)

T: from Europe; lecto: LINN 313.8, *fide* J. P. M. Brenan, *Fl. Trop. E. Africa* 6 (1954), photo seen.

C. lanceolatum R. Br., *Prodr.* 407 (1810), *nom. illeg.* non Muhlenb. ex Willd. (1809); *C. browneanum* Roemer & Schultes, *Syst. Veg.* 6: 275 (1820). T: banks of Paterson River, N.S.W., Oct. 1804, *R. Brown*; holotype: BM.

C. album var. *hastatum* Klinggr., *Fl. Preussen* 2 Nachtr. 130 (1866) *n.v.*; *C. album* subsp. *hastatum* (Klinggr.) Graebner in Asch. & Graebner, *Syn. Mitteleur. Fl.* 5: 59 (1913). T: from Poland; *n.v.*

C. striatiforme Murr, *Deutsche Bot. Monatsschr.* 19: 50 (1901) *n.v.*; *C. album* var. *striatiforme* (Murr) Murr, *Magyar Bot. Lapok* 1: 364 (1902) *n.v.* T: from Europe; *n.v.*

C. probstii Aellen in R. Probst, *Mitt. Naturf. Ges. Solothurn* 20(8): 56 (1928). T: North Adelaide, S.A., *P. Aellen*; syn: AD; Derendingen, Switzerland, *collector unknown*; syn: *n.v.*

Illustrations: S. Ross-Craig, *Draw. Brit. Pl.* pt. 25: t. 15 (1968); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 259 (1982).

Erect annual c. 1 m high, mealy especially on flowers and undersurface of leaves. Leaves thin; lower leaves petiolate, ovate-rhombic, cuneate at base and variously dentate, the lamina 2–4 cm long; upper leaves narrowly ovate to lanceolate, entire, ± sessile. Inflorescence ± leafless, of glomerules aggregated into a large panicle. Flowers bisexual or female. Tepals 5 united in lower half, weakly keeled (terminal ones larger and more strongly keeled), green, mealy. Stamens 5, glabrous; disc absent. Pericarp membranous, readily detached. Seed horizontal, lenticular, c. 1.2 mm diam., bluntly keeled; testa smooth, glossy, striate or weakly furrowed, black. Seed shed within surrounding perianth. *Fat Hen*, *White Goosefoot*. Fig. 23J–N.

Found in all Australian States but rare in the tropics; cosmopolitan. A weed of agriculture favouring richly nitrogenous soil. Map 184.

W.A.: Albany, *G. Perry* 259 (PERTH). N.T.: Harper Springs, 26 Jan. 1949, *W. G. Steenson* (NT). Qld: Charleville, *M. M. Biddulph* 195 (BRI). Vic.: c. 5 km E of Tawonga, *R. V. Smith* 64/67 (MEL). Tas.: Macquarie Plains, Mar. 1861, *W. M. Curtis* (HO).

A variable species in which numerous infraspecific taxa have been described. *Chenopodium probstii* is recognised by some recent European authors as distinct and native to North America; both are hexaploid and therefore likely to hybridise.

4. *Chenopodium opulifolium Schrader ex Koch & Ziz, *Cat. Pl.* 6 (1814)

C. album subsp. *opulifolium* (Schrader ex Koch & Ziz) Maire, *Fl. Afr. N.* 8: 36 (1962). T: Pfalz, Germany, *Schrader*; holotype: S, photo seen.

?*C. triangulare* Forsskal, *Fl. Aegypt. Arab.* 205 (1775). T: from 'Taees', Yemen, *collector unknown*; *n.v.*

Illustration: R. W. Butcher & F. E. Strudwick, *Further Ill. Brit. Pl.* Fig. 301 (1946).

Very similar to *Chenopodium album*, differing in having long petiolate 3-lobed rhombic leaves 2–3 cm long and wide, prominently mealy below, and in having keeled, prominently mealy tepals.

Found in southern S.A.; native to Europe and North Africa. Map 185.

S.A.: Mintaro, *D. E. Symon 6699* (ADW, CANB).

5. *Chenopodium vulvaria L., *Sp. Pl.* 1: 220 (1753)

C. olidum Curtis, *Fl. Londin.* 5: t. 20 (fasc. index) = t. 68 (volume index) (1788) *nom. illeg.* T: from Europe; *n.v.*

Illustration: S. Ross-Craig, *Draw. Brit. Pl.* pt. 25: t. 14 (1968).

Spreading annual, branching from base, with a strong fish-like smell. Leaves ovate to broadly ovate or trullate, entire, subglabrous above, mealy below; lamina 1–2 cm long; petiole slender, c. half length of lamina. Inflorescence of dense clusters of flowers forming compact axillary and terminal panicles 1–2 cm long. Flowers bisexual and female. Perianth subglobose, shortly 5-lobed, enlarging with and enveloping fruit, densely mealy. Stamens 5, glabrous, united into a cup-shaped disc at base. Pericarp membranous, papillose, somewhat adherent to seed. Seed horizontal, lenticular with obvious keel, 1–2 mm diam.; testa radially lineate. *Stinking Goosefoot.*

Native to Northern Hemisphere. In Australia a weed of agriculture in eastern N.S.W., Vic. and south-eastern S.A. Map 186.

S.A.: Fullarton, *D. E. Symon 408* (ADW). N.S.W.: Binalong, Jan. 1922, *J.J. Parry* (NSW). Vic.: Omeo, *R. V. Smith 64/29* (NSW).

6. *Chenopodium detestans Kirk, *Trans. & Proc. New Zealand Inst.* 9: 550 (1877)

T: Trelissick Basin, New Zealand, *T. Kirk 827*; lecto: WELT, *vide* H. H. Allan, *Fl. New Zealand* 1: 228 (1961).

Prostrate to ascending fetid annual. Leaves trullate, entire or with a pair of lateral teeth, sparsely to moderately mealy; lamina thin, 5–10 mm long. Inflorescence of short dense axillary thyrses. Flowers mostly bisexual. Tepals 5, rarely 4, thin, broadly ovate with a short claw, cucullate and fleshy at apex, mealy outside. Stamen 1, rarely 2; disc absent. Pericarp membranous, prominently papillose, somewhat adherent to seed. Seed horizontal, discoid with rounded margin, c. 1.2 mm diam.; testa punctate, black.

A weed in south-eastern N.S.W.; native to New Zealand. Map 187.

N.S.W.: 'Nimitybelle' near Cooma, Dec. 1896, *J. H. Maiden* (NSW).

7. *Chenopodium murale L., *Sp. Pl.* 1: 219 (1753)

T: from Europe; *n.v.*

C. biforme Nees in Lehm., *Pl. Preiss.* 1: 636 (1845); *C. murale* var. *biforme* (Nees) Moq. in DC., *Prodr.* 13(2): 69 (1849). T: near Point Walter, Perth, W.A., *L. Preiss 1256*; iso: MEL.

C. congestum J. D. Hook., *London J. Bot.* 6: 280 (1847); *Rhagodia congesta* (J. D. Hook.) Moq. in DC., *Prodr.* 13(2): 51 (1849); *R. baccata* var. *congesta* (J. D. Hook.) J. D. Hook., *Fl. Tasman.* 1: 312 (1857); *R. billardierei* var. *congesta* (J. D. Hook.) Benth., *Fl. Austral.* 5: 153 (1870). T: Hobart, Tas., Oct. 1840, *R. Gunn 868*; holotype: K.

Illustrations: S. Ross-Craig, *Draw. Brit. Pl.* pt. 25: t. 17 (1968); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 261 (1982).

Erect much-branched annual to 1 m high, sparsely mealy, sometimes fetid when crushed. Leaves petiolate, broadly triangular to ovate, thin, acute, coarsely dentate with slightly incurved teeth, mealy when young; lamina 2–8 cm long. Inflorescence of compact cymes in rather open panicles, axillary and terminal. Flowers bisexual or female. Tepals 5, united towards base, prominently keeled, sparsely mealy outside. Stamens 5. Pericarp prominently papillose, persistent. Seed horizontal, lenticular, 1–1.5 mm diam., prominently keeled; testa glossy, minutely pitted; embryo circular. Seed shed with surrounding perianth. *Nettle-leaf Goosefoot, Green Fat Hen.* Fig. 25B.

Widely scattered throughout Australia but principally extra-tropical, in agricultural and disturbed areas, also coastal. Cosmopolitan, native to southern Europe and Asia. Map 188.

W.A.: Millstream, *M. I. H. Brooker 2103* (PERTH). N.T.: Alice Springs, 27 Jan. 1976, *A. Mitchell* (NT). Qld: Brisbane River, *A. Dietrich 2307* (NSW). Vic.: Port Phillip, Apr. 1886, *C. Walter* (NSW). Tas.: Hobart, *L. Rodway 9398* (HO).

A variable species in which numerous varieties have been described.

8. *Chenopodium erosum* R. Br., *Prodr.* 407 (1810)

T: Island of Kent Group, Bass Strait, Dec. 1804, *R. Brown*; holo: BM.

[*Chenopodium* sp. aff. *suecicum* Murr (1902): *J. H. Willis, Handb. Pl. Victoria* 2: 86 (1973)]

Erect annual to 1.5 m high. Leaves papery, triangular to ovate, acuminate, base somewhat truncate, margin deeply incised, lower surface sparsely mealy; lamina 3–15 cm long, 1.5–10 cm wide; petiole one third to half length of lamina. Inflorescence of compact terminal and axillary pedunculate cymes, becoming open with age. Flowers bisexual and female. Tepals 5, obovate, shortly united at base, sparsely mealy when young. Stamens 5, glabrous; disc absent. Pericarp membranous, dull, adherent. Seed horizontal, lenticular, c. 1.5 mm diam., rounded on margin; testa black, glossy, deeply muricate with radial striations. Seed eventually falling free from perianth. Fig. 25A.

Occurs from south-western Qld to Bass Strait and southern S.A.; also in New Zealand; in damp disturbed areas such as margins of forests and river banks. Map 189.

S.A.: South West River, Kangaroo Is., *J. B. Cleland* (AD). Qld: Gayndah, 13 May 1917, *C. T. White* (BRI). N.S.W.: Coneac, *L. A. S. Johnson & B. G. Briggs* (NSW 142705). Vic.: c. 5 km NE of Suggan Buggan, 22 Feb. 1962, *J. H. Willis* (MEL).

Known only from Australia and New Zealand; in both countries behaving as a weed although rarely collected.

9. *Chenopodium hubbardii* Aellen, *Candollea* 8: 19 (1940)

T: Mungallala, Qld, 31 Dec. 1930, *C. E. Hubbard & C. W. Winders 6022*; iso: BRI.

Erect annual, branching from base, c. 30 cm high. Leaves thin, ovate to hastate with rounded apex and lobes, entire, sparsely mealy above, densely so beneath; lamina c. 10 mm long; petiole slender, from half to as long as lamina. Inflorescence a terminal slender panicle c. 2 cm long, lengthening to 10 cm in fruit, of disjunct compact glomerules. Flowers depressed-globular, c. 1 mm diam. Tepals orbicular, sessile or shortly clawed, densely mealy outside. Stamens 5, united into a thick disc at base. Fruiting perianth eventually hard, black, closely enclosing fruit. Pericarp finely papillose, brown to black, adherent to testa. Seed lenticular, 1.5 mm diam., with rounded margin; testa finely and irregularly pitted. Seed shed with enveloping perianth. *Fish Weed*.

Found in south-central Qld, usually in heavy seasonally waterlogged soil. Map 190.

Qld: 112 km S of Blackall, *W. J. Bissett E233* (BRI); 28 km W of Jericho, *S. T. Blake 10395* (BRI).

Sect. IV. Desertorum

Chenopodium sect. *Desertorum* Paul G. Wilson, *Nuytsia* 4: 151 (1983).

Type: *Chenopodium desertorum* (J. Black) J. Black

Perennial herbs or weak shrubs with mealy indumentum. Flowers polygamous. Perianth 5-lobed, mealy. Stamens 5, united into a puberulous disc. Fruit baccate or dry; pericarp membranous to succulent, glabrous, free from seed. Seed horizontal, lenticular to depressed-spherical; embryo annular.

Three species endemic in Australia.

10. *Chenopodium desertorum* (J. Black) J. Black, *Fl. S. Australia* 181 (1924)

C. microphyllum var. *desertorum* J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 46: 566 (1922). T: Ooldea, S.A., Nov. 1921, *D. Bates*; lecto: AD, *fide* P. G. Wilson, *Nuytsia* 4: 152 (1983).

Annual or perennial herb, prostrate to erect, branching from base, mealy. Leaves opposite or alternate, subsessile or prominently petiolate, elliptic, deltate, hastate or orbicular; lamina 5–20 mm long. Inflorescence of small cymes aggregated into narrow or broad panicles. Flowers sessile, depressed-globular, 1–2 mm diam.; terminal flowers male or bisexual; lateral flowers female. Tepals 5, shortly united at base, densely mealy outside. Stamens 5, united into a circular disc which is sparsely pubescent within. Fruit enveloped by perianth. Pericarp membranous to succulent. Seed horizontal, lenticular with rounded margin, 1–1.5 mm diam.; testa almost smooth to slightly rugulose or striate, black.

There are five subspecies.

- | | | |
|----|--|----------------------------------|
| 1 | Perianth covered with glistening irregularly shaped vesicular hairs | 10a. subsp. desertorum |
| 1: | Perianth covered with dull, grey to white vesicular hairs | |
| 2 | Plant prostrate to decumbent; leaves up to 10 mm long; flowers c. 1 mm diam. in short inflorescences | |
| 3 | Leaves elliptic to orbicular, often glabrescent above; plant without a noticeable smell | 10b. subsp. microphyllum |
| 3: | Leaves narrowly elliptic, mealy on both surfaces; plant fetid | 10d. subsp. virosum |
| 2: | Plant erect; leaves 5–20 mm long; inflorescence usually exceeding terminal leaves; flowers 1–2 mm diam. | |
| 4 | Branches slender, straight and rigid; leaves small (to 10 mm long), orbicular to obovate, sparsely mealy; flowers small (c. 1 mm diam.), sparsely to moderately covered with sessile vesicular hairs | 10e. subsp. rectum |
| 4: | Branches straight or flexuose; leaves various, densely mealy, at least below; flowers with globular or branched often stipitate hairs | 10c. subsp. anidiophyllum |

10a. *Chenopodium desertorum* (J. Black) J. Black subsp. **desertorum**

Erect, rounded, much-branched herb to 20 cm high. Leaves deltoid to orbicular, densely covered when young with colourless, glistening, transparent, branched vesicular hairs; lamina 3–8 mm long. Inflorescence congested or lax, narrowly pyramidal or slender, exceeding leaves. Flowers 1.5–2 mm diam. Perianth with a felty indumentum of glistening vesicular hairs. Seed c. 1.5 mm diam.

Found from northern S.A. to central and western N.S.W. and north-western Vic., rare in southern W.A. and N.T. Map 191.

W.A.: Salmon Gums, *R. D. Royce 3539* (PERTH). N.T.: Ormiston Gorge area, *J. R. Maconochie 2244* (CANB). S.A.: 10 km W of Blanchetown, *D. J. E. Whibley 3747* (AD). N.S.W.: 8 km W of Moulamein, *C. W. E. Moore 3400* (CANB). Vic.: Wyperfeld National Park, *A. C. Beaglehole 29462* (MEL).

10b. *Chenopodium desertorum* subsp. **microphyllum** Paul G. Wilson, *Nuytsia* 4: 154 (1983)

C. microphyllum F. Muell., *Trans. Phil. Inst. Victoria* 2: 74 (1858) *nom. illeg., non* Thunb. (1794); *C. triandrum* var. *lanuginosum* F. E. Havil., *Proc. Linn. Soc. New South Wales* 35: 532 (1912); *C. pseudomicrophyllum* Aellen, *Candollea* 8: 8 (1939). T: Bacchus Marsh, Vic., 1853, *F. Mueller*; lecto: MEL 80671, *fide* P. G. Wilson, *loc. cit.*

Rhagodia prostrata A. Cunn. ex Moq. in DC., *Prodr.* 13(2): 52 (1849), non *C. prostratum* (Pallas) Roemer & Schultes (1820). T: north-east from Lachlan River, N.S.W., 5 Aug., *A. Cunningham*; lecto: K, *fide* P. G. Wilson, *loc. cit.*

C. cochlearifolium Aellen, *Candollea* 8: 10 (1939). T: lower Loddon River, Vic., Nov. 1887, *C. Walter*;

isolecto: MEL 80675, NSW 142716, *fide* P. G. Wilson, *loc. cit.*

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 27 (1889) as *C. microphyllum*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 262 (1982) as *C. pseudomicrophyllum*.

Intricately branched prostrate to decumbent perennial, not noticeably fetid. Leaves shortly petiolate, elliptic to orbicular, white-mealy below, glabrescent above; lamina 5–10 mm long. Inflorescence short, scarcely exceeding leaves. Flowers c. 1 mm diam. Perianth covered with white vesicular hairs. Seed c. 1 mm diam.

Found in N.S.W., Vic. and southern S.A., also occasionally in southern W.A.; usually grows in heavy soil in woodland. Map 192.

W.A.: 3 km NW of Ongerup, *K. Newbey* 3632 (PERTH). S.A.: 5 km W of Mannum, *D. G. Spooner* 2737 (AD). N.S.W.: 19 km S of Mt Hope, *C. W. E. Moore* 5945 (CANB). Vic.: 24 km W of Shepparton, *T. B. Muir* 2547 (MEL).

10c. *Chenopodium desertorum* subsp. *anidiophyllum* (Aellen) Paul G. Wilson, *Nuytsia* 4: 155 (1983)

C. anidiophyllum Aellen, *Candollea* 8: 9 (1939). T: Coolabah, N.S.W., Mar. 1907, *J. H. Maiden*; lecto: G, *fide* P. G. Wilson, *loc. cit.*

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 259 (1982) as *C. anidiophyllum*.

Erect perennial c. 20 cm high with slender branches. Leaves with slender petiole, ovate to broadly elliptic, deltoid or subreniform, mealy below, glabrescent above; lamina 10–20 mm long. Inflorescence equal to or greatly exceeding terminal leaves. Flowers c. 1.5 mm diam. Perianth with simple or branched white vesicular hairs. Pericarp membranous to succulent, wrinkled and orange when dry. Seed c. 1.5 mm diam.

The typical variant occurs in north-central N.S.W. and south-central Qld, while an eremaeian variant occurs in central Australia. Map 193.

N.T.: 38 km S of Alice Springs, *D. J. Nelson* 666 (CANB). S.A.: Strzelecki Creek, *D. E. Symon* 5845 (ADW). Qld: Tambo, *S. L. Everist* 1455 (BRI). N.S.W.: Condobolin, G. M. Cunningham 255 (NSW).

10d. *Chenopodium desertorum* subsp. *virosum* Paul G. Wilson, *Nuytsia* 4: 157 (1983)

T: 15 miles (24 km) N of Deniliquin, N.S.W., Oct. 1965, *W. E. Mulham* S393a; holo: NSW.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 263 (1982) as *Chenopodium* sp.

Spreading prostrate to decumbent perennial smelling strongly of rotten fish when crushed. Leaves shortly petiolate, narrowly elliptic, acute to obtuse, covered with grey vesicular hairs; lamina c. 10 mm long. Inflorescence not exceeding terminal leaves. Flowers depressed, c. 1.5 mm diam. Perianth densely covered with vesicular hairs. Pericarp membranous or slightly succulent. Seed c. 1.5 mm diam.

Found in south-central N.S.W. and central Vic., in heavy soil. Map 194.

N.S.W.: 24 km N of Deniliquin, *W. E. Mulham* S393 (NSW); between Morundah and Urana, *C. W. E. Moore* 1372 (CANB). Vic.: Daylesford, *R. Wallace* 182 (MEL).

10e. *Chenopodium desertorum* subsp. *rectum* Paul G. Wilson, *Nuytsia* 4: 158 (1983)

T: Porcupine Hill, Musgrave Range, S.A., 29 Oct. 1966, *J. Z. Weber* 180; holo: AD; iso: PERTH.

Erect perennial to 40 cm high. Branches slender, straight, spreading. Leaves with slender petiole, broadly elliptic to broadly obovate or orbicular, when dry often leathery and with red margins, sparsely mealy below, glabrescent above; lamina 5–10 mm long. Inflorescence slender, equal to terminal leaves. Flowers c. 1 mm diam. Perianth sparsely to moderately mealy with small grey vesicular hairs. Pericarp membranous to slightly succulent. Seed 1 mm diam.

Found in south-eastern W.A., southern N.T. and north-western S.A., western N.S.W. and north-western Vic., growing in deep sand. Map 195.

W.A.: 24 km E of Zanthus, *R. D. Royce* 5577 (PERTH). N.T.: Petermann Reserve, *T. S. Henshall* 764 (NT). S.A.: 5 km S of Maralinga, *B. Copley* 2698 (AD). N.S.W.: 21 km SE of Mt Hope, *C. R. Dunlop* 1538 (CBG). Vic.: Hattah Lakes National Park, 20 Feb. 1969, *G. Anderson* (MEL).

11. *Chenopodium curvispicatum* Paul G. Wilson, *Nuytsia* 4: 159 (1983)

T: 3 km E of Sanderston, S.A., 30 Mar. 1959, *R. Schodde* 1082; holotype: AD; isotype: CANB.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 277 (1982) as *Rhagodia gaudichaudiana*.

Weak intricately branched shrub to 1 m high. Branches frequently curved downwards. Leaves opposite or subopposite, with slender petiole, triangular to hastate with rounded angles, densely mealy with rounded white vesicular hairs; lamina 1–1.5 cm long and wide. Inflorescence a drooping pyramidal panicle 2–5 cm long. Flowers polygamo-monoecious, sessile or shortly pedicellate, globular, c. 2 mm diam. Perianth 5-lobed, densely covered with white stipitate vesicular hairs. Stamens 5, united into a sparsely hairy disc. Stigmas 2, slender, papillose. Fruiting perianth at first closed but eventually opened out and c. 5 mm diam. hard, often red above. Pericarp succulent, red (orange on drying). Seed lenticular with rounded margin, c. 1.5 mm diam.; testa prominently reticulate with a honeycomb matrix, black. Fig. 25D.

Found from south-western N.S.W. and north-western Vic. westwards to south-eastern W.A., usually in light often calcareous soil. Map 196.

W.A.: 20 km W of Naretha, *D. W. Goodall* 822 (PERTH). S.A.: 38 km N of Morgan, *N. N. Donner* 311 (AD). N.S.W.: c. 48 km W of Euston, *T. R. Whaithe* 1838 (NSW). Vic.: Raak Salt Plain, *A. C. Beaughlehole* 16089 (MEL).

12. *Chenopodium gaudichaudianum* (Moq.) Paul G. Wilson, *Nuytsia* 4: 160 (1983)

Rhagodia gaudichaudiana Moq., *Chenop. Monogr. Enum.* 11 (1840). T: Shark Bay, [W.A.], *C. Gaudichaud*; isotype: BM.

R. coralliocarpa S. Moore, *J. Bot.* 35: 168 (1897). T: Kilkenny Soak, W.A., June 1895, *S. Moore*; holotype: BM.

Scrambling shrub to 2 m high. Leaves alternate with slender petiole, triangular to narrowly hastate, densely mealy with cream-coloured vesicular hairs; lamina 5–15 mm long. Inflorescence a pyramidal panicle 5–10 cm long with distinct clusters of flowers; branches and main axis flexuose. Flowers polygamo-monoecious, subsessile, depressed-globular, c. 1.5 mm diam. enlarging to 3.5 mm in fruit, eventually spreading and c. 7 mm wide. Perianth 5-lobed, densely mealy outside with vesicular hairs. Stamens 5, united at base into puberulous disc. Stigmas 2, delicate, strongly penicillate. Fruit a berry, rarely dry; perianth at first closed but eventually spreading. Pericarp usually succulent, orange to red. Seed lenticular with rounded margin, c. 1.4 mm diam., testa deeply reticulate with a rough surface, dark reddish brown. Fig. 26L.

Occurs in W.A. between Geraldton and Dampier, extending south-east to northern edge of Nullarbor Plain and northern Eyre Peninsula in S.A.; grows in sand or clay soil, often slightly saline. Map 197.

W.A.: 37 km S of Learmonth, *A. S. George* 1258 (PERTH). S.A.: Tarcoola, *E. H. Ising* 1408 (AD).

Chenopodium gaudichaudianum may be distinguished from other species of *Chenopodium* and from species of *Rhagodia* by the strongly penicillate stigmas.

Sect. V. Auricoma

Chenopodium sect. **Auricoma** Aellen, *Feddes Repert.* 69: 69 (1964).

Type: *Chenopodium auricomum* Lindley

Herbs or weak shrubs, mealy with vesicular hairs and, in the inflorescence, villous with tubular hairs. Leaves chartaceous. Inflorescence of compact glomerules forming dense spikes, paniculately arranged. Flowers bisexual. Perianth 5-lobed. Stamens 5; disc absent. Stigmas 2, slender. Pericarp thin. Seed horizontal or rarely oblique or erect; lenticular; embryo annular.

Two species endemic in Australia.

13. *Chenopodium auricomiforme* Murr & Thellung in Schinz, *Vierteljahrsschr. Naturf. Ges. Zürich* 60: 432 (1915)

T: Derendingen, Switzerland, 1914, *R. Probst*; holo: G.

Erect annual to 1 m high. Leaves with slender petiole, thin, narrowly ovate to ovate or rarely hastate, entire or coarsely toothed, glabrescent above, mealy below when young; lamina 2–10 cm long. Inflorescence a terminal panicle with slender densely flowered branches; axis villous with tubular hairs. Flowers bisexual, sessile, spherical, c. 1 mm diam. Perianth almost glabrous, 5-lobed, the lobes imbricate, broadly elliptic to circular, yellow-green, ciliate. Stamens 5; disc absent. Pericarp membranous, papillate, adherent. Seed horizontal, lenticular, c. 1 mm diam., rounded on margin; testa minutely punctulate. Fig. 25C.

Found in south-eastern Qld and north-eastern N.S.W. on seasonally waterlogged black-soil plains. Map 198.

Qld: Pittsworth, *C. T. White 6659* (BRI). N.S.W.: Bow via Merriwa, July 1923, *H. Sturt* (NSW).

This species was first described from Switzerland where it had been introduced in wool; it is a native of Australia.

14. *Chenopodium auricomum* Lindley in T. Mitchell, *J. Exped. Trop. Australia* 94 (1848)

T: Narran River, N.S.W., 14 Mar. 1846, *T. L. Mitchell*; iso: MEL, NSW.

C. auricomum f. *subglabrum* Aellen in *R. Probst, Mitt. Naturf. Ges. Solothurn* 20(8): 56 (1928). T: Derendingen, Switzerland; *n.v.*

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 29 (1889); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 259 (1982).

Soft-wooded bluish-grey shrub to 2 m high. Leaves with slender petiole c. 1 cm long, oblong-elliptic to hastate; lamina mostly 2–4 cm long, the basal lobes and apex rounded; upper surface glabrescent; lower surface with a thin, mealy, grey to very pale yellow indumentum. Inflorescence a broad panicle c. 10 cm long with ovoid to cylindrical branches; axis villous with tubular hairs. Flowers bisexual, sessile, depressed-globular, c. 1 mm diam. Perianth united in lower half, pubescent with irregular tubular and vesicular hairs; lobes imbricate, broadly obovate, ciliate. Stamens 5; disc absent. Fruit enveloped by perianth. Pericarp papery, free, white. Seed usually horizontal, lenticular, c. 1.5 mm diam. with rounded margin; testa minutely reticulate. *Queensland Bluebush*.

Found from central Qld and central N.S.W. westwards to northern W.A.; grows in heavy soil subject to periodic waterlogging. Map 199.

W.A.: De Grey River district, N. T. Burbidge 2305 (NT). N.T.: Mt Andado Stn, T. S. Henshall 601 (NT). S.A.: Murnpeowie Stn, *D. E. Symon 5653* (ADW). Qld: Noondoo Stn, *S. L. Everist 814* (BRI). N.S.W.: Mt King Stn, *R. A. Perry 5777* (NSW).

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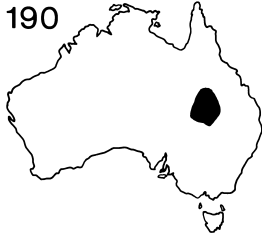
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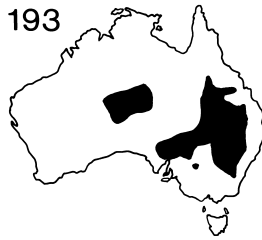
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181. *Atriplex billardierei*182. *Chenopodium glaucum*183. *Chenopodium macrospermum*184. *Chenopodium album*185. *Chenopodium opulifolium*186. *Chenopodium vulvaria*187. *Chenopodium detestans*188. *Chenopodium murale*189. *Chenopodium erosum*190. *Chenopodium hubbardii*191. *Chenopodium desertorum*
subsp. *desertorum*192. *Chenopodium desertorum*
subsp. *microphyllum*193. *Chenopodium desertorum*
subsp. *anidiophyllum*194. *Chenopodium desertorum*
subsp. *virosus*195. *Chenopodium desertorum*
subsp. *rectum*

Sect. VI. Rhagodioides

Chenopodium sect. **Rhagodioides** Benth., *Fl. Austral.* 5: 158 (1870).

Type: *Chenopodium nitrariaceum* (F. Muell.) F. Muell. ex Benth.

Spinescent shrubs with a thin mealy indumentum that collapses to form a silvery sheen. Flowers unisexual or bisexual. Perianth 5-lobed. Stamens 5, glabrous; disc absent. Ovary pubescent. Pericarp membranous, pubescent. Seed horizontal to vertical; embryo annular.

One species endemic in Australia.

15. Chenopodium nitrariaceum (F. Muell.) F. Muell. ex Benth., *Fl. Austral.* 5: 158 (1870)

Rhagodia nitrariacea F. Muell., *Trans. Philos. Inst. Victoria* 2: 73 (1858). T: near the Murray River, ?Vic., Feb. 1847, and Avoca, 2 Dec. 1852, *F. Mueller*; lecto: MEL 80673, *fide* P. G. Wilson, *Nuytsia* 4: 164 (1983).

C. lycioides Gand., *Bull. Soc. Bot. France* 66: 224 (1919). T: Warracknabeal, Vic., 8 Oct. 1903, *F. M. Reader*; holo: LY.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 28 (1889); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 261 (1982).

Divaricately branched spinescent shrub c. 2 m high. Leaves alternate, often clustered, spatulate with rounded apex, passing at base into a short petiole, in all 10–30 mm long, thick, sparsely mealy with minute collapsed vesicular hairs. Inflorescence a terminal spiny panicle to 15 cm long or reduced to a short spike; flowers polygamous, clustered. perianth depressed-globular to turbinate, 1.5–2 mm diam., 5-lobed, pubescent with small branched tubular hairs. Stamens 5; disc absent. Ovary pubescent above; stigmas 2, slender. Fruit enveloped by perianth, dry. Pericarp membranous, white, free, pubescent above. Seed horizontal to vertical, depressed-globular to subreniform, c. 1 mm diam.; testa punctate, reddish brown to black, glossy; embryo horseshoe-shaped to annular. *Nitre Goosefoot*.

Widespread in central Australia extending to north-western Vic. and north-eastern N.S.W.; common in heavy periodically waterlogged soil. Map 200.

N.T.: 19 km SE of Tempe Downs Homestead, *N. M. Henry* 585 (NT). S.A.: 3 km W of Hawker, *B. Copley* 218 (AD). Qld: Noondoo Stn, *S. L. Everist* 831 (BRI). N.S.W.: Bourke, May 1918, *J. L. Boorman* (NSW). Vic.: Dimboola, *E. T. Muir* (MEL).

Subg. II. Ambrosia

Chenopodium subg. **Ambrosia** A.J. Scott, *Bot. Jahrb. Syst.* 100: 211 (1978).

Type: *C. ambrosioides* L.

Glandular herbs.

A subgenus of 5 sections, 2 of which occur in Australia.

Sect. VII. Ambrina

Chenopodium sect. **Ambrina** J. D. Hook. in Benth. & J. D. Hook., *Gen. Pl.* 3: 51 (1880).

Type: *C. multifidum* L.

Annual or perennial herbs with yellow glandular hairs, aromatic. Flowers in dense axillary glomerules. Stamens 3–5. Pericarp with geniculate glandular hairs. Seed horizontal to vertical; embryo horseshoe-shaped to subannular.

About 8 American species, 2 of which are naturalised in Australia.

16. *Chenopodium ambrosioides L., Sp. Pl. 1: 219 (1753)

T: Lusitania, Mexico, *collector unknown*; *n.v.*

C. anthelminticum L., *Sp. Pl.* 1: 220 (1753); *C. ambrosioides* var. *anthelminticum* (L.) A. Gray, *Man. Bot.* 5th edn, 408 (1867). T: from Pennsylvania and Buenos Aires, *n.v.*

C. suffruticosum Willd., *Enum. Pl. Hort. Berol.* 290 (1809); *C. ambrosioides* var. *suffruticosum* (Willd.) Graebner in Asch. & Graebner, *Syn. Mitteleur. Fl.* 5: 20 (1913). T: from Pennsylvania and Mexico; *n.v.*

Ambrina spathulata Moq., *Chenop. Monogr. Enum.* 39 (1840); *Chenopodium spathulatum* (Moq.) Moq. in DC., *Prodr.* 13(2): 73 (1849); *Chenopodium ambrosioides* f. *spathulatum* (Moq.) Aellen, *Feddes Repert.* 26: 34 (1929). T: from Porto-Rico, Martinique, Brazil, *n.v.*

C. integrifolium Vorosch., *J. Bot. URSS* 27: 42 (1942). T: from Hungary, *n.v.*

C. suffruticosum subsp. *remotum* Vorosch., *J. Bot. URSS* 27: 44 (1942). T: from Uruguay, *n.v.*

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 259 (1982).

Perennial herb c. 1 m high, strongly aromatic. Branches glabrous or almost so. Leaves elliptic to narrowly elliptic, coarsely serrate or incised, narrowed at base into short petiole, in all c. 10 cm long; undersurface with sessile globular oil-filled hairs. Flowers in small glomerules forming leafy or leafless panicles. Terminal flower of glomerule bisexual; perianth deeply 5-lobed, glabrous; lobes cucullate; stamens 5; ovary pubescent above with shortly stipitate geniculate hairs. Lateral flowers female; perianth depressed, shortly 5-toothed. Pericarp free. Seed horizontal or oblique, obtusely lenticular, c. 1 mm diam., smooth, glossy; embryo horseshoe-shaped. *Mexican Tea*. Fig. 23A–E.

Widespread in mainland Australia and frequently found in disturbed situations. Native of tropical America. Map 201.

W.A.: Fremantle, *P. G. Wilson 8687* (PERTH). S.A.: Adelaide, *A. G. Spooner 3973* (AD). Qld: Moreton Is., *L. Durrington 1464* (BRI). N.S.W.: Kogarah, *E. F. Constable 5940* (NSW).

P. Aellen in Hegi, *Illust. Fl. Mitt.-Europ.* 3: 588 (1960) considered the following 3 species distinct although closely related to *C. ambrosioides*; he recognised them as also occurring in Australia: *C. spathulatum* Moq., *C. integrifolium* Vorosch., and *C. suffruticosum* Willd.

Both *C. ambrosioides* var. *ambrosioides* and var. *anthelminticum* occur in Australia; they have at times been cultivated, the former as a herb and as a source of Mexican tea and the latter for use as a vermifuge. *C. ambrosioides* var. *ambrosioides* has leafy bracts in the inflorescence while var. *anthelminticum* has slender spike-like flowering branches with very small bracts or these are absent, however, all intermediates between the typical forms of the two varieties may be found.

17. *Chenopodium multifidum L., Sp. Pl. 1: 220 (1753)

T: Buenos Aires, Argentina, *collector unknown*; *n.v.*

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 260 (1982).

Perennial herb, prostrate to erect and 1 m high, aromatic. Branches with cottony hairs. Leaves pinnatisect, to 6 cm long and 3 cm wide; segments linear with recurved margins; undersurface densely covered with pale yellow glandular hairs, sparsely cottony. Flowers in glomerules arranged in spike-like panicles. Bisexual flower: perianth hemispherical, shortly 5-lobed; stamens 5; ovary pubescent above with amber geniculate glandular hairs. Female flower: perianth obovoid minutely lobed. Fruiting perianth c. 2.5 mm long, coriaceous, reticulate. Pericarp membranous, free. Seed erect, lenticular with rounded margin; testa reddish brown, glossy; embryo horseshoe-shaped. *Scented Goosefoot*.

Found in coastal extra-tropical Australia and eastern N.S.W. and Vic., in sand and other disturbed areas. Native of South America. Map 202.



Figure 24. *Chenopodium*. A-E, *C. pumilio*. A, branch $\times 1.25$; B, bisexual flower, entire and without perianth $\times 20$; C, female flower $\times 20$; D, seed, entire and L.S. $\times 20$; E, fruiting perianth $\times 20$ (A-E, P. Wilson 1183, PERTH). F-G, *C. saxatile*. F, branch $\times 1.25$; G, bisexual flower $\times 20$ (F-G, A. George 12137, PERTH). H-K, fruiting perianth $\times 20$. H, *C. cristatum* (Hyden, W.A., T. McDowell, PERTH). I, *C. carinatum* (A. Beaglehole 36646, PERTH). J, *C. melanocarpum* (A. George 12128, PERTH). K, *C. truncatum* (Palamatta Bore, N.S.W., Nov. 1901, PERTH)

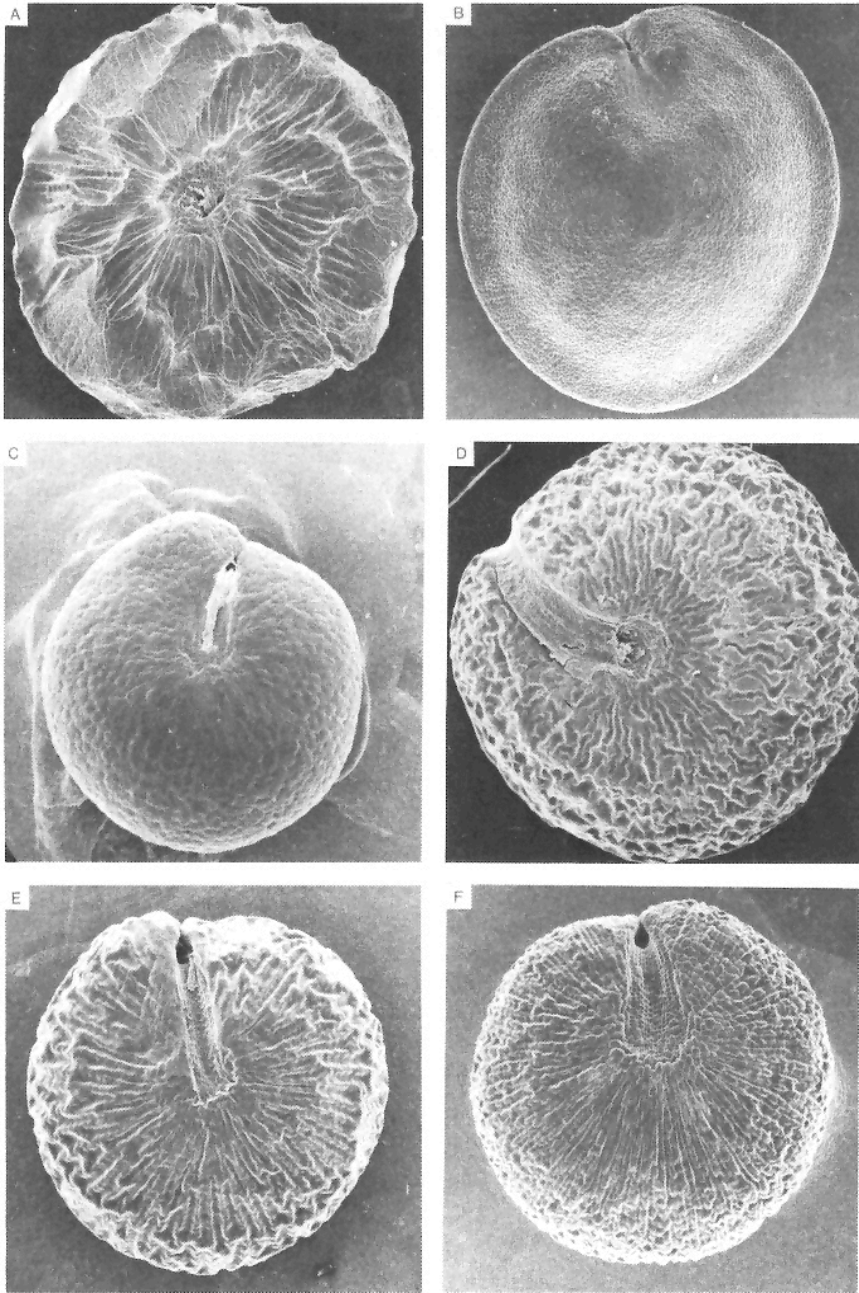


Figure 25. Seeds. **A–D**, *Chenopodium*. **A**, *C. erosum*, upper surface with pericarp attached $\times 50$ (A. Beaglehole 37201, PERTH). **B**, *C. murale*, lower surface $\times 50$ (CANB 31776). **C**, *C. auricomiforme*, lower surface $\times 65$ (L. Webb & C. White 1105, CANB). **D**, *C. curvispicatum*, lower surface $\times 60$ (R. Schodde 1082, CANB). **E–F**, *Einadia* **E**, *E. nutans* subsp. *nutans*, lower surface $\times 55$ (H. Eichler 12241 AD). **F**, *E. hastata*, lower surface $\times 50$ (CBG 046601). Reproduced by permission from *Nuytsia* 4: 239, fig. 4 (1983).

W.A.: Harvey, Dec. 1967, *K. S. Cole* (PERTH). S.A.: Port Adelaide, *D. E. Symon 1233* (ADW). Qld: near Warwick, Nov. 1958, *Shirley* (BRI). N.S.W.: Hay, Feb. 1970, *B. M. Alchin* (NSW). Vic.: Seymour, *R. V. Smith 64/105* (MEL).

Sect. VIII. Orthosporum

Chenopodium sect. **Orthosporum** R. Br., *Prodr.* 407 (1810).

Blitum sect. *Orthosporum* (R. Br.) C. Meyer in Ledeb., *Fl. Alt.* 11 (1829); *Orthosporum* (R. Br.) T. Nees, *Gen. Pl. Fl. Germ.* ad. t. [58] (1834); *Orthospermum* Opiz, *Seznam* 70 (1852); *Chenopodium* sect. *Carinatum* Standley, *N. Amer. Fl.* 21: 11, 27 (1916), *nom. illeg.*

T: *Chenopodium carinatum* R. Br.

Annual herbs, pilose with simple segmented hairs and with sessile or stipitate gland-tipped hairs, aromatic. Flowers in dense axillary clusters or paniculate. Tepals 4 or 5, variously thickened and enlarged in fruit. Stamen 0 or 1, rarely 2. Seed erect, lenticular; embryo horseshoe-shaped around apex of seed.

Six species endemic in Australia, some of which have become widely dispersed. One species endemic in New Zealand.

Hybridisation commonly occurs between species of this section.

18. Chenopodium pumilio R. Br., *Prodr.* 407 (1810)

Blitum pumilio (R. Br.) C. A. Meyer ex Steudel, *Nom. Bot.* 2nd edn, 1: 210 (1840); *Ambrina pumilio* (R. Br.) Moq., *Chenop. Monogr. Enum.* 42 (1840). T: Kangaroo Island, [S.A.], *R. Brown*; *n.v.*

Blitum glandulosum Moq. in DC., *Prodr.* 13(2): 82 (1849); *Chenopodium glandulosum* (Moq.) F. Muell., *Fragm.* 7: 11 (1869); *C. pumilio* f. *glandulosum* (Moq.) Aellen, *Verh. Naturf. Ges. Basel* 44: 315 (1933). T: Australia, *collector unknown*; *n.v.*

[*C. pumilio* var. *oblongifolium* J. Black, *Fl. S. Australia* 2nd edn, 289 (1948), *nom. inval.*]

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 262 (1982).

Spreading annual or short-lived perennial, aromatic. Leaves sparsely pilosulose with simple and gland-tipped hairs, narrowly to broadly elliptic or ovate, obtuse, entire to sinuate or obtusely lobed; lamina 10–20 mm long; petiole slender, about ½ length of lamina. Flowers in compact axillary glomerules, subsessile or pedicellate, c. 0.5 mm high. Tepals 5, erect, united towards base, thin, sparsely pilosulose towards apex. Stamen 0 or 1. Fruiting perianth globular, c. 1 mm high, crustaceous, white; tepals erect, narrowly naviculiform. Pericarp transparent, adherent. Seed erect, lenticular, c. 0.5 mm long. Fruit dispersed with perianth. *Clammy Goosefoot*, *Small Crumbweed*. Fig. 24A–E.

Widespread in southern Australia, occasional in the north, commonly occurring as a weed of agriculture. Map 203.

W.A.: Wyola, *T. E. H. Aplin 2203* (PERTH). N.T.: Burt Plain, *G. Chippendale* (NT 8033). Qld: Longreach, *S. T. Blake 6615* (BRI). N.S.W.: 125 km W of Cobar, *J. C. De Nardi 225* (NSW). Tas.: Cape Barren Is., *J. S. Whinray 733* (AD).

19. Chenopodium carinatum R. Br., *Prodr.* 407 (1810)

Salsola carinata (R. Br.) Sprengel, *Syst. Veg.* 1: 923 (1824); *Ambrina carinata* (R. Br.) Moq., *Chenop. Monogr. Enum.* 41 (1840); *Blitum carinatum* (R. Br.) C. A. Meyer ex Steudel, *Nom. Bot.* 2nd edn, 1: 210 (1840). T: Hawkesbury River, N.S.W., *R. Brown*; *holo: BM.*

C. cristatum var. *holopterum* Thellung, *Vierteljahrsschr. Naturf. Ges. Zürich* 64: 724 (1919); *C. holopterum* (Thellung) Thellung & Aellen in R. Probst, *Mitt. Naturf. Ges. Solothurn* 20(8): 57 (1928); *C. carinatum* var. *holopterum* (Thellung) Aellen, *Verh. Naturf. Ges. Basel* 44: 312 (1933). T: from Switzerland, *collector unknown*; *n.v.*

Ambrina carinata var. *parvifolia* Moq., *Chenop. Monogr. Enum.* 42 (1840); *Blitum glandulosum* var. *parvifolium* (Moq.) Moq. in DC., *Prodr.* 13(2): 82 (1849). T: Port Jackson, N.S.W., *D'Urville*; *lecto: P n.v., fide P. Aellen, Verh. Naturf. Ges. Basel* 44: 308–318 (1933).

C. carinatum f. *foliosum* Domin, *Biblioth. Bot.* 89: 65 (1921). T: Brisbane River, Qld, A. Dietrich 968; iso: NSW.

Decumbent to erect annual, branching from base, aromatic. Branches pilosulose with both slender and sessile to stipitate gland-tipped hairs. Leaves ovate to broadly ovate, shortly lobed to coarsely serrate, glandular-puberulous below on veins; lamina 5–20 mm long; petiole slender, c. ½ length of lamina. Flowers in dense axillary clusters. Tepals 5, erect. Stamen 0 or 1. Fruiting perianth thick, coriaceous, white, c. 1 mm long; tepals erect, prominently keeled, truncate at apex, hirtellous on keel. Pericarp transparent, adherent. Seed erect, lenticular, c. 0.5 mm long. *Keeled Goosefoot, Green Crumbweed.* Fig. 24 I.

Found in eastern Qld, eastern N.S.W. and eastern Vic.; frequently an agricultural weed or invader of disturbed sites. Map 204.

Qld: Hughenden, S. T. Blake 6181 (BRD). N.S.W.: Kunghur, E. F. Constable 6578 (NSW). Vic.: Suggan Buggan, A. C. Beaglehole 36646 (MEL).

20. *Chenopodium melanocarpum* (J.Black) J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 58: 173 (1934)

C. carinatum var. *melanocarpum* J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 46: 566 (1922). T: Broken Hill, N.S.W., Sept. 1918, per T. G. B. Osborn; lecto: AD, fide P. G. Wilson, *Nuytsia* 4: 175 (1983).

C. carinatum f. *leucocarpum* Aellen, *Verh. Naturf. Ges. Basel* 44: 313 (1933); *Chenopodium melanocarpum* f. *leucocarpum* (Aellen) Paul G. Wilson, *Nuytsia* 4: 176 (1983). T: Minderoo, W.A., Oct. 1905, A. Morrison; neo: PERTH; iso: K, fide P. G. Wilson, *loc. cit.*

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 260 (1982).

Prostrate annual branching from base, aromatic. Stems pilosulose with both slender and sessile to stipitate gland-tipped hairs. Leaves broadly elliptic, bluntly lobed to entire, glandular-puberulous below over veins; lamina c. 15 mm long; petiole slender c. 7 mm long. Flowers in dense axillary clusters. Tepals 5, erect. Stamen 0 or 1. Fruiting perianth bluntly stellate in T.S., c. 1 mm long, crustaceous, black, pale fawn in f. *leucocarpum*, firmly united below, completely covering fruit; tepals strongly and bluntly keeled, sparsely hirtellous. Pericarp transparent, adherent. Seed erect, lenticular, c. 0.5 mm long. *Black Crumbweed.* Fig. 24J.

Found in arid and semi-arid areas of Australia south of 22°S lat., usually in well-drained situations. Map 205.

W.A.: Mileura Stn, P. G. Wilson 8987 (PERTH). N.T.: Palm Valley, A. C. Beaglehole 10403 (PERTH). S.A.: Amoorinyirra Hill, D. J. E. Whibley 1124 (AD). Qld: 50 km SW of Eulo, M. Law 43 (BRD). N.S.W.: 19 km E of Turlee, J. De Nardi 340 (NSW).

This species comprises two forms that may be distinguished by the colour of their fruiting perianths: f. *melanocarpum* develops a black perianth while in f. *leucocarpum* (Aellen) Paul G. Wilson the perianth remains pale fawn.

21. *Chenopodium cristatum* (F. Muell.) F. Muell., *Fragm.* 7: 11 (1869)

Blitum cristatum F. Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 73 (1858). T: Flinders Range, S.A., Oct. 1851, F. Mueller; lecto: MEL; iso: PERTH, fide P. G. Wilson, *Nuytsia* 4: 176 (1983).

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 31 (1889).

Prostrate to ascending annual branching from base, aromatic. Stems pilosulose with both slender and sessile to shortly stipitate gland-tipped hairs. Leaves elliptic to broadly elliptic, entire to coarsely toothed, sparsely puberulous; lamina c. 10 mm long; petiole slender, c. 5 mm long. Flowers in dense axillary clusters. Tepals 5, erect, acuminate. Stamen 0 or 1. Fruiting perianth spherical in outline, c. 2 mm diam., strongly 5-winged, white; tepals free to base, cartilaginous, strongly crested (vertically winged), semiorbicular, rostrate, completely enclosing fruit. Pericarp transparent, adherent. Seed erect, lenticular, c. 0.5 mm diam. *Crested Goosefoot, Crested Crumbweed.* Fig. 24H.

Found in arid and semi-arid regions of Australia south of 20°S lat., frequently in red sandy soil. Map 206.

W.A.: Fraser Range, *P. G. Wilson* 5898 (PERTH). N.T.: Trephina Gorge, *B. G. Briggs* 1229 (NSW). S.A.: Koonamore, *H. Eichler* 12492 (AD). Qld: Oakwood Stn, *L. S. Smith* 846 (BRI). Vic.: 23 km NNW of Manangatang, *A. C. Beauglehole* 55812 (MEL).

22. *Chenopodium truncatum* Paul G. Wilson, *Nuytsia* 4: 177 (1983)

T: 65 miles (105 km) W of Henbury Homestead, N.T., 10 Dec. 1968, *P. K. Latz* 255; holo: PERTH; iso: CBG, NT.

Prostrate to ascending annual branching from base, aromatic. Stems pilosulose with slender and sessile to shortly stipitate gland-tipped hairs. Leaves elliptic, obtuse, entire to slightly undulate, glandular-puberulous all over and pilosulose below along veins; lamina c. 10 mm long; petiole slender c. 5 mm long. Flowers in compact axillary clusters. Tepals 5, erect, united to near apex. Stamen 0 or 1. Fruiting perianth cartilaginous, white or black, very broadly obtriangular in side view, flat above or the lobes ascending, c. 2 mm wide; tepals firmly united to apex, toothed or lacerate on margin, not rostrate. Pericarp transparent, adherent. Seed erect, lenticular, c. 0.7 mm diam. Fig. 24K.

Found in south-western Qld, western N.S.W., northern S.A. and southern N.T., usually in deep red sand. Map 207.

N.T.: Old Andada Homestead, *A. C. Beauglehole* 27967 (NT). S.A.: NE corner of Lake Gairdner, *B. Lay* 341 (AD). Qld: Thylungra, *S. L. Everist* 5717 (CANB). N.S.W.: Calindry Stn, *J. H. Leigh* W183 (NSW).

23. *Chenopodium saxatile* Paul G. Wilson, *Nuytsia* 4: 179 (1983)

T: 24 km east of Depot Springs Homestead, W.A., 27 Aug. 1970, *P. G. Wilson* 8909; holo: PERTH.

Erect annual to 30 cm high, aromatic, moderately pilose all over with weak gland-tipped and stiffer simple hairs. Leaves thin, ovate to elliptic, entire to sinuate or obtusely lobed; lamina 10–20 mm long; petiole slender, c. ½ length of lamina. Flowers sessile in small clusters forming a paniculate inflorescence with flexuose branches. Perianth spherical, c. 1 mm high. Tepals 4, erect, shortly pilose. Stamens 0–2. Fruiting perianth herbaceous; tepals navicular, c. 1.5 mm long, ± free. Pericarp transparent, adherent. Seed erect, lenticular, c. 0.6 mm diam., minutely puncticulate. Fig. 24F–G.

Found in central W.A. on rocky outcrops and at base of breakaways. Map 208.

W.A.: Mt Magnet, Sept. 1903, *W. V. Fitzgerald* (NSW); Rawlinson Range, *A. S. George* 12137 (PERTH).

Hybrids in sect. *Orthospermum*

Hybridisation commonly occurs between most of the species of this section and several names have been given to such crosses. These are listed below.

Chenopodium × *bontei* Aellen, *Verh. Naturf. Ges. Basel* 44: 317 (1933).

Considered by Aellen to be a hybrid between *C. carinatum* and *C. cristatum*. He described two varieties:

n-var. *cristatiforme* Aellen, *op. cit.* 318.

T: Derendingen, Switzerland, 9 Sept. 1923, *R. Probst*; lecto: G, *vide* P. G. Wilson, *Nuytsia* 4: 171 (1983).

Probably a hybrid between *C. carinatum* and *C. cristatum*.

n-var. *submelanocarpum* Aellen, *op. cit.* 318.

T: Derendingen, Switzerland, 5 Sept. 1926, *R. Probst*; lecto: G, *vide* P. G. Wilson, *loc. cit.*

Probably a hybrid between *C. cristatum* and *C. melanocarpum*.

Chenopodium × *christii* Aellen, *op. cit.* 317.

Considered by Aellen to be a hybrid between *C. carinatum* and *C. pumilio*. He described two varieties:

n-var. *intermedium* Aellen, *op. cit.* 317.

T: 120 miles (c. 192 km) S of Perth, W.A., 1901, *C. Andrews 1st coll. no. 697; n.v.*

This is probably a variant of *C. pumilio*.

n-var. *semiconnatum* Aellen, *op. cit.* 317.

T: Port Jackson, N.S.W. *C. Gaudichaud; n.v.*

Probably a variant of *C. pumilio*.

Chenopodium trigonocarpum Aellen, *Verh. Naturf. Ges. Basel* 41: 99 (1930).

T: Derendingen, Switzerland, 31 July 1929, *R. Probst*; lecto: G. *fide* P. G. Wilson, *loc. cit.*

Probably a hybrid between *C. cristatum* and *C. melanocarpum*.

Other names

Chenopodium ficifolium Smith, *Fl. Brit.* 1: 276 (1800)

Recorded as a weed in Qld by F. M. Bailey, *Queensland Agric. J.* 31: 320 (1913). No Australian collections seen.

Chenopodium viride L., *Sp. Pl.* 1: 219 (1753)

Recorded for Australia by J. D. Hooker, *Fl. Tasmaniae* cix (1859). No Australian collections seen.

3. DYSPHANIA

Dysphania R. Br., *Prodr.* 411 (1810); *Chenopodium* sect. *Dysphania* (R. Br.) Aellen, *Bot. Jahrb. Syst.* 63: 486 (1930); from the Greek *dysphanes* (obscure), apparently in reference to the small flowers.

Type: *D. littoralis* R. Br.

Chenopodium sect. *Tetrasepala* Aellen, *Bot. Jahrb. Syst.* 63: 490 (1930); *Dysphania* sect. *Tetrasepala* (Aellen) A. J. Scott, *Bot. Jahrb. Syst.* 100: 218 (1978). T: *Chenopodium inflatum* Aellen.

Dysphania sect. *Caudatae* A. J. Scott, *Bot. Jahrb. Syst.* 100: 218 (1978). T: *Dysphania plantaginella* F. Muell.

Annual or short-lived perennial herbs with subsessile glands or simple and gland-tipped hairs, aromatic. Leaves alternate, simple, entire or variously dissected. Flowers without bracts, minute, bisexual (or male) and female, in compact clusters, axillary, spicate, or paniculate in arrangement. Tepals 1–4 (3 or 4 in terminal bisexual flowers of glomerule), free or united towards base; limb hooded and often inflated or spongy. Stamens 1 or 2; disc absent. Ovary ellipsoidal; styles 1 or 2, linear, delicate. Pericarp usually diaphanous. Seed erect to horizontal, globular to ellipsoidal or laterally compressed; testa crustaceous, smooth; embryo lateral or basal, situated beneath a groove (embryo-groove); radicle inferior or superior.

A genus of 10 species all endemic in mainland Australia.

G. Bentham, *Dysphania*, *Fl. Austral.* 5: 164–165 (1870); A. J. Scott, A review of the classification of *Chenopodium* L. and related genera (Chenopodiaceae), *Bot. Jahrb. Syst.* 100: 205–220 (1978); P. G. Wilson, *Dysphania*, *Nuytsia* 4: 180–196 (1983).

- 1 Tepals 1–3
- 2 Flowers in axillary clusters
- 3 Tepals of lateral flowers of clusters 1 or 2; seed erect, ellipsoidal to obovoid or laterally flattened **3. D. valida**
- 4 Tepals united at base and shed with seed enclosed
- 5 Seed lenticular, the embryo curved around its base **1. D. glomulifera**
- 5: Seed obovoid or ellipsoidal, the embryo lateral
- 4: Tepals free; seed and tepals shed separately
- 6 Seed strongly flattened laterally (usually slightly twisted), ± obovate; pericarp almost smooth **4. D. platycarpa**
- 6: Seed ellipsoidal, obovoid, or lenticular; pericarp smooth or glandular-papillate
- 7 Pericarp smooth, punctulate, or minutely papillate; seed ellipsoidal to obovoid or lenticular **1. D. glomulifera**
- 7: Pericarp prominently papillate; seed asymmetrically narrowly obovoid, the embryo side flat **2. D. glandulosa**
- 3: Tepals 3; seed turnip-shaped to subglobular **5. D. littoralis**
- 2: Flowers in spike-like inflorescences
- 8 Seed compressed-globular; embryo oblique to erect **7. D. sphaerosperma**
- 8: Seed ellipsoidal or broadly pear-shaped, erect
- 9 Tepals free, rounded or inconspicuously keeled on back **6. D. plantaginella**
- 9: Tepals united into a hard cup-shaped tube in lower half, prominently and horizontally keeled **8. D. simulans**
- 1: Tepals 4
- 10 Plant prostrate or decumbent with erect flowering stems; seed (i.e. pericarp) glossy, compressed-globular; inflorescence slender, spicate **10. D. kalpari**
- 10: Plant erect with one main stem; seed dull (rarely glossy), almost globular; inflorescence paniculate **9. D. rhadinostachya**

1. *Dysphania glomulifera* (Nees) Paul G. Wilson, *Nuytsia* 4: 183 (1983)

Atriplex glomulifera Nees in Lehmann, *Pl. Preiss.* 1: 634 (1845). T: Swan River, W.A., Jan. 1840, *L. Preiss* 1257; holo: LD; iso: P.

D. myriocephala Benth., *Fl. Austral.* 5: 165 (1870); *Chenopodium myriocephalum* (Benth.) Aellen, *Bot. Jahrb. Syst.* 63: 488 (1930). T: Western Australia, *J. Drummond* 206; lecto: K; iso: MEL, *vide* P.G. Wilson, *loc. cit.*

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 264 (1982) as *Dysphania littoralis*.

Prostrate to erect annual or short-lived perennial to 15 cm high, sparsely covered with sessile or stipitate gland-tipped hairs. Leaves narrowly to broadly elliptic, entire; lamina c. 5 mm long; petiole slender, c. ½ length of lamina. Flowers in axillary glomerules. Terminal flower of glomerule bisexual; tepals 3, obovate, c. 0.7 mm long, fleshy except scarious margin, glabrous or almost so, free or shortly united; stamens 2; style 1 or 2. Lateral flowers of glomerule female; tepals 1 or 2 with a white bladder hooded limb, the claw narrow; styles 1 or 2. Fruiting tepals 0.7–1 mm long; limb inflated and fungoid covering fruit. Pericarp dull, adherent, punctulate, papillate, or granulate. Seed erect, bluntly ellipsoidal or compressed-obovoid, c. 0.5 mm long; embryo slightly curved on dorsal-lateral margin beneath embryo-groove; radicle inferior.

There are two subspecies.

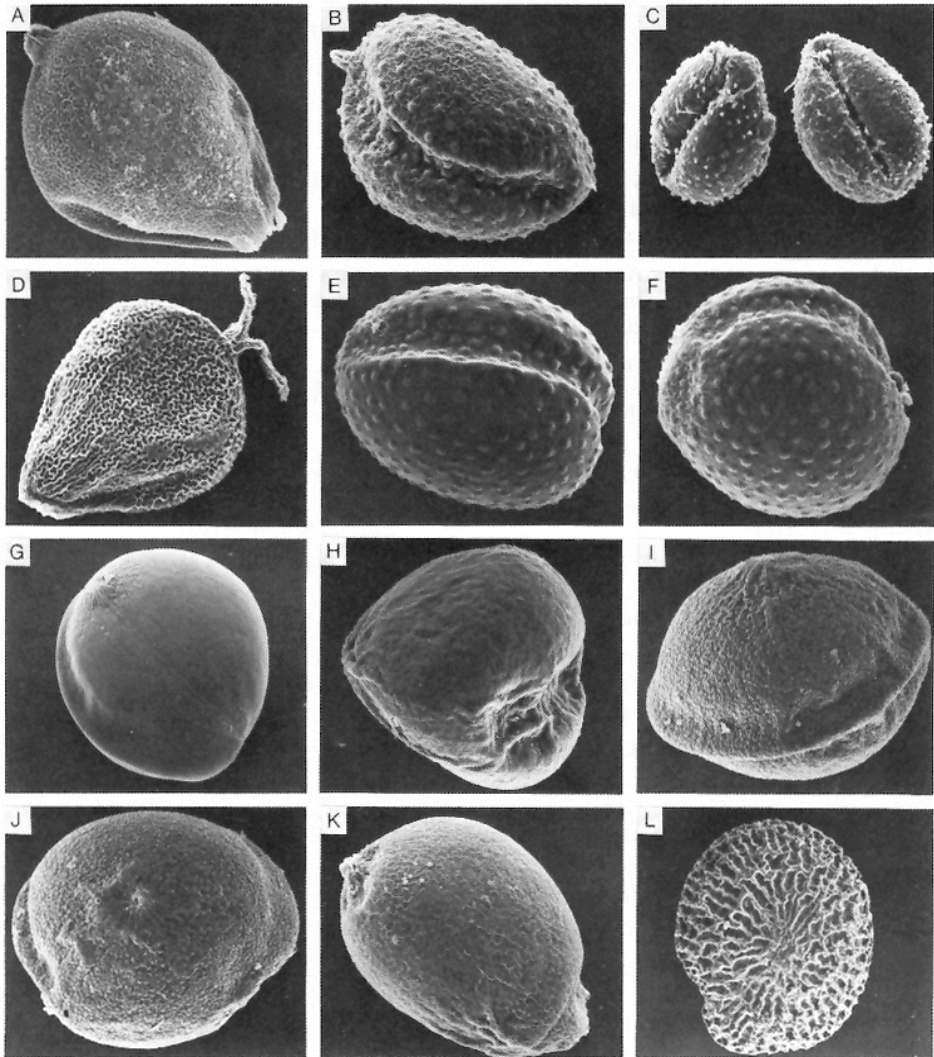


Figure 26. Seeds. **A–K**, *Dysphania*. **A–G**, side view. **A–B**, *D. glomulifera*. **A**, subsp. *glomulifera*, $\times 10$ (Guildford, W.A., C. Andrews, PERTH). **B**, subsp. *eremaea*, showing embryo-groove $\times 12$ (R. Royce 1493, PERTH). **C**, *D. glandulosa*, showing embryo-groove $\times 10$ (A. George 717, PERTH). **D**, *D. platycarpa*, $\times 8$ (A. George 8927 PERTH). **E–F**, *D. sphaerosperma* showing vertical embryo-groove $\times 11$ (T. Henshall 1243, NT). **G**, *D. kalpari*, showing raphe $\times 5$ (D. Nelson 830, NT). **H**, *D. littoralis*, oblique lateral view $\times 11$ (Townsville, Qld, P. Wilson, PERTH). **I–J**, *D. rhadinostachya* subsp. *rhadinostachya*; **I**, oblique lateral view $\times 6$; **J**, upper surface showing horizontal embryo-ridge $\times 6$ (R. Chinnock 3855, PERTH). **K**, *D. plantaginella*, side view $\times 8$ (A. Beaglehole 48362, PERTH). **L**, *Chenopodium gaudichaudianum*, upper surface $\times 30$ (P. Wilson 9911, PERTH). Reproduced by permission from *Nuytsia* 4: 241–242, figs 6–7 (1983).

Seed compressed-obovoid to bluntly lenticular; pericarp smooth or rarely papillate

1a. subsp. glomulifera

Seed ellipsoidal; pericarp granulate

1b. subsp. eremaea

1a. *Dysphania glomulifera* (Nees) Paul G. Wilson subsp. *glomulifera*

Lateral flowers of glomerules with 1, rarely 2 tepals, the claws filiform to linear, readily separating from pedicel. Seed broadly compressed-obovoid to bluntly lenticular; pericarp smooth or minutely punctulate. Tepals and seed shed separately. Fig. 26A.

Found in south-western W.A., eastern S.A., Vic., eastern N.S.W. and Qld, principally along banks of rivers and in muddy areas but also recorded from forests, hillsides and as an agricultural weed. Map 209.

W.A.: Guildford, 12 Aug. 1901, *C. R. P. Andrews* (NSW). S.A.: Loxton, *Hj. Eichler 12326* (AD). Qld: Moonie Ponds, *S. L. Everist 3718* (BRI). N.S.W.: Booligal, *E. M. Canning 3859* (CBG). Vic.: Lake Eildon, 14 May 1973, *J. H. Willis* (MEL).

1b. *Dysphania glomulifera* subsp. *eremaea* Paul G. Wilson, *Nuytsia* 4: 184 (1983)

T: 55 miles [88.5 km] W of Commonwealth Hill Stn Homestead, S.A., 19 Feb. 1965, *D. E. Symon 3380*; holo: ADW.

D. benthamiana Domin, *Biblioth. Bot.* 89: 103 (1926). T: S of Wills Creek, S.A., *J. P. Murray*; iso: MEL.

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 36 (1890) as *Dysphania littoralis*.

Lateral flowers of glomerules with 2 tepals, the claws narrowly oblong, sometimes united at base; limb strongly inflated. Seed bluntly ellipsoidal; pericarp granulate. Tepals and seed usually shed as unit. Fig. 26B.

Found over a large area of arid Australia, often in sand near fresh water. Map 210.

W.A.: c. 29 km E of Meekatharra, *T. E. H. Aplin 2460* (PERTH). N.T.: Doreen Stn, *P. K. Latz 2002* (NSW). S.A.: Millars Creek Stn, *R. J. Chinnock 2573* (AD). Qld: Birdsville, *S. T. Blake 12224* (BRI). N.S.W.: Wanaaring, *L. A. S. Johnson 547/125* (NSW).

2. *Dysphania glandulosa* Paul G. Wilson, *Nuytsia* 4: 186 (1983)

T: 28 km NE of Nambi Homestead, W.A., 29 Aug. 1968, *P. G. Wilson 7503*; holo: PERTH.

Prostrate annual c. 20 cm diam. with many stems, sparsely or shortly pilose with simple and glandular hairs. Leaves narrowly elliptic, entire; lamina c. 3 mm long; petiole equal to lamina. Flowers in axillary glomerules c. 1 mm diam. in fruit. Terminal flower of glomerule bisexual; tepals 3, free; stamens 2; styles 2. Lateral flowers female; tepals 2, rarely 1, free, in fruit 0.5 mm long, delicate, incompletely covering fruit, the limb slightly inflated, claw linear. Pericarp adherent, prominently papillate. Seed erect, asymmetrically semi-obovoid, c. 0.3 mm long; testa reddish brown; embryo-groove along flattened side of seed; embryo lateral; radicle inferior. Tepals and seed shed as unit. Fig. 26C.

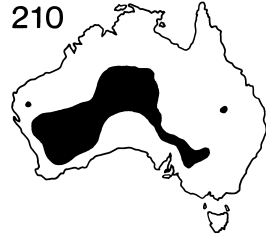
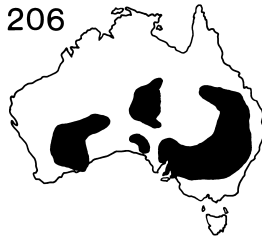
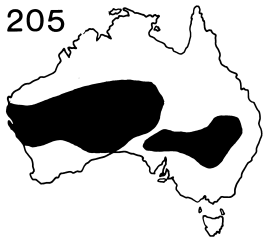
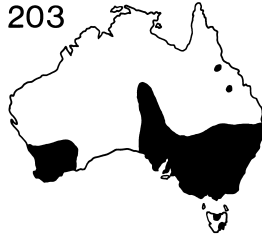
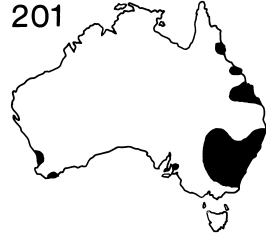
Found in central-western region of W.A. in seasonally waterlogged areas. Map 211.

W.A.: Belele Stn, *D. W. Goodall 3351* (PERTH); Glenorn Stn, Aug. 1938, *N. T. Burbidge* (PERTH).

3. *Dysphania valida* Paul G. Wilson, *Nuytsia* 4: 187 (1983)

T: near Morven, Qld, 6 April, 1941, *C. T. White 11895*; holo: BRI.

Short-lived prostrate perennial to 60 cm diam., almost glabrous to sparsely pilose with simple and gland-tipped hairs. Leaves narrowly oblong to narrowly elliptic, obtuse, entire; lamina 10–15 mm long; petiole c. half length of lamina. Flowers in axillary glomerules 3–5 mm diam. Terminal flower of glomerule male; tepals 3, shortly united; stamens 2; pistillode minute. Lateral flowers of glomerule female; tepals 2, in fruit c. 1.3 mm long, with an inflated limb, the short broad claws united; styles 2, short. Pericarp adherent,



196. *Chenopodium curvispicatum*

197. *Chenopodium gaudichaudianum*

198. *Chenopodium auricomiforme*

199. *Chenopodium auricomum*

200. *Chenopodium nitriaceum*

201. *Chenopodium ambrosioides*

202. *Chenopodium multifidum*

203. *Chenopodium pumilio*

204. *Chenopodium carinatum*

205. *Chenopodium melanocarpum*

206. *Chenopodium cristatum*

207. *Chenopodium truncatum*

208. *Chenopodium saxatile*

209. *Dysphania glomulifera*
subsp. *glomulifera*

210. *Dysphania glomulifera*
subsp. *eremaea*

smooth. Seed erect, lenticular, c. 0.6 mm long; embryo semicircular around lower two-thirds of seed; radicle and cotyledons erect. Tepals and seed shed as unit.

Found in southern Qld. Map 212.

Qld: Morven, *S. T. Blake 10914* (BRI); Eulo, Aug. 1967, *M. Law* (BRI).

4. *Dysphania platycarpa* Paul G. Wilson, *Nuytsia* 4: 187 (1983)

T: W of W.A.—N.T. border at 23°10'S, 26 July 1967, *A. S. George 8927*; holo: PERTH.

Prostrate annual to 20 cm diam. with many stems, sparsely pilosulose with simple or glandular hairs. Leaves elliptic, obtuse, almost glabrous; lamina 5–10 mm long; petiole ± equal to lamina. Flowers in axillary glomerules c. 2.5 mm diam. in fruit. Terminal flower of glomerule bisexual; tepals 3, free, prominently cucullate with filiform claw; stamens 2; styles 2. Lateral flowers female; tepals 1 or 2, in fruit with white inflated limb and filamentous claw, in all c. 0.7 mm long. Pericarp adherent, minutely granulate. Seed erect, obovate to deltoid, flat, c. 0.4 mm long, slightly twisted or with sunken faces; embryo lateral, radicle inferior. Tepals and seed shed separately. Fig. 26D.

Found in central Australia in clay by fresh water. Map 213.

N.T.: Andado Stn, *P. K. Latz 6826* (NT). S.A.: 13 km NW of Quinyambie Homestead, *N. N. Donner 3593* (AD). Qld: Birdsville, *S. T. Blake 12224* (BRI). N.S.W.: Broken Hill district, *A. Morris 890* (NSW).

5. *Dysphania littoralis* R. Br., *Prodr.* 412 (1810)

Chenopodium blackianum Aellen, *Bot. Jahrb. Syst.* 63: 487 (1930), based on *D. littoralis*. T: Port 1 [near Gladstone, Qld], 6 Aug. 1802, *R. Brown*; holo: BM.

Prostrate annual c. 30 cm diam. with many stems, sparsely and shortly pilose with simple and glandular hairs. Leaves elliptic, obtuse; lamina 5–10 mm long; petiole somewhat shorter than lamina. Flowers in axillary glomerules c. 2 mm diam. Terminal flower of glomerule male; tepals 3, shortly united, obovate with inflated limb; stamens 2; pistillode minute. Lateral flowers female; tepals 3, rarely 4, obovoid and inflated when in fruit, white, with narrowly oblong claw, in all c. 0.8 mm long; style 1. Pericarp glossy, adherent. Seed turnip-shaped to depressed-globular, horizontal to oblique, 0.3–0.4 mm high, slightly furrowed over horizontal embryo. Tepals and seed shed as unit. *Red Crumbweed*. Fig. 26H.

Found in northern N.S.W. and south-eastern and east coastal Qld, possibly also north-western W.A., on tidal midflats and inland in open forest. Map 214.

W.A.: Upper Murchison, 1890, *I. Tyson* (MELU). Qld: Gladstone, *A. Dietrich 2417* (MEL). N.S.W.: South Wanaaring, *P. L. Milthorpe & G. M. Cunningham 4768* (NSW).

The only record from W.A., cited above, represents such an isolated occurrence as to throw doubt on the accuracy of the herbarium label.

6. *Dysphania plantaginella* F. Muell., *Fragm.* 1: 61 (1858)

Chenopodium plantaginellum (F. Muell.) Aellen, *Bot. Jahrb. Syst.* 63: 487 (1930). T: Sturts Creek, March 1856, *F. Mueller*; lecto: MEL *vide* P. G. Wilson, *Nuytsia* 4: 190 (1983).

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 35 (1890).

Annual with several prostrate to ascending stems. Leaves elliptic to broadly elliptic, entire, with sessile glandular hairs; lamina 1–2 cm long passing into a short petiole. Flowers in dense globular clusters in slender erect spikes; pedicels slender, 0.3–0.5 mm long. Terminal flower of cluster bisexual; tepals 3, free but persistent, with strongly inflated limb that has a rounded to spreading keel, ciliolate, otherwise glabrous; stamen 1; style 1. Lateral flowers of cluster female, otherwise similar to terminal flower. Pericarp adherent, smooth. Seed ellipsoidal, erect, c. 0.5 mm long; embryo lateral and basal; radicle inferior. Tepals and seed shed as unit. Fig. 26K.

Found from north and north-western W.A. through N.T. and northern S.A. to central N.S.W., usually in sand, either coastal or on margins of waterholes and inland saltlakes. Map 215.

W.A.: Nita Downs Stn, *R. A. Saffrey 1680* (PERTH). N.T.: 10 km S of Hermannsburg Mission, *P. K. Latz 793* (AD). S.A.: Koonamore Stn, *Hj. Eichler 17177B* (AD). N.S.W.: 23 km N NW of Conoble, *J. Pickard 1943* (NSW).

7. *Dysphania sphaerosperma* Paul G. Wilson, *Nuytsia* 4: 191 (1983)

T: Woodstock Stn, S of Port Hedland, W.A., 28 Apr., 1958, *N. T. Burbidge 5924*; holo: CANB; iso: AD.

Prostrate to ascending annual with several stems; pilosulose with simple and glandular hairs. Leaves elliptic, obtuse, entire, often undulate; lamina 0.5–1.5 cm long; petiole short. Flower clusters in a narrow cylindrical spike to 15 cm long, subsessile or on thick pedicels c. 0.1 mm long. Terminal flower of cluster bisexual or female; tepals 3, glabrous, c. 1 mm long in fruit, free but persistent, the limb rounded, inflated, claw broad; stamen 1; style 1. Lateral flowers similar to terminal but female. Pericarp minutely granulate-papillose. Seed compressed-globular, c. 0.5 mm high; embryo semicircular, oblique or erect; radicle inferior. Tepals and seed shed as unit. Fig. 26E–F.

Found from southern N.T. westwards to Shark Bay area of W.A.; usually associated with gypseous or calcareous soils, frequently around salt lakes. Map 216.

W.A.: Dirk Hartog Is., *A. S. George 11413* (PERTH). N.T.: Curtin Springs Stn, *T. S. Henshall 728* (NT).

8. *Dysphania simulans* F. Muell. & Tate ex Tate, *Trans. & Proc. Roy. Soc. S. Australia* 8: 71 (1886)

Chenopodium simulans (F. Muell. & Tate ex Tate) F. Muell. & Tate ex F. Muell., *Sec. Syst. Census* 50 (1889). T: Cootanoorina, S.A., *M. Murray*; holo: AD.

Chenopodium osbornianum Aellen, *Bot. Jahrb. Syst.* 63: 488 (1930). T: 'Koonamore Head Station [S.A.], 1914', *T. G. B. Osborn*; ?iso: AD 96630144.

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 34 (1890).

Annual 10–30 cm high with decumbent to ascending branches, pubescent, the hairs simple on branches, glandular on leaves and perianth. Leaves elliptic, soon falling; lamina 1–2 cm long, obtuse to acuminate, with 2–4 pairs of prominent lobes; petiole shorter than lamina. Inflorescence an erect spike of crowded 7-flowered cymes, 5–25 cm long, 4 mm diam., sessile in branch axils. Terminal flower of cyme bisexual; tepals 3, hooded, c. 1 mm long, united in lower half into an indurated papillose tube; stamen 1; styles 2. Lateral flowers female, otherwise similar to but smaller than terminal flower. Fruiting perianth cartilaginous, firmly attached; tepal limbs with horizontal hyaline wings. Seed erect, broadly pear-shaped, c. 0.6 mm long; embryo vertical; radicle superior. Tepals and seed shed as unit.

Found in central Australia in saline or calcareous soil, often around salt lakes. Map 217.

W.A.: 37 km N of Agnew, *D. E. Symon 9941* (ADW). N.T.: 11 km SW of Eriksdunda Stn, *T. S. Henshall 46* (NT). S.A.: Koonamore Stn, *M. D. Crisp 709* (AD). Qld: Poeppel Corner, *D. E. Boyland 237* (NSW). N.S.W.: c. 101 km SE of Wanaaring, *W. E. Mulham W 445* (NSW). Vic.: 28.8 km W of Nowingi, 29 July 1979, *J. M. Browne* (MEL).

9. *Dysphania rhadinostachya* (F. Muell.) A. J. Scott, *Bot. Jahrb. Syst.* 100: 218 (1978)

Chenopodium rhadinostachyum F. Muell., *S. Sci. Rec.* 2: 98 (1882). T: Finke River, N.T., *H. Kempe 413*; holo: MEL.

Erect annual to 30 cm high with 1 main stem, much-branched above base, pilose with short glandular and larger simple hairs, aromatic. Leaves elliptic, undulate or obtusely lobed; lamina 10–20 mm long; petiole somewhat shorter. Flowers in compact clusters of

3–7 in paniculately-arranged spikes, bisexual and female. Tepals 4, erect, c. 1 mm long, united below, sometimes horizontally keeled, glabrous to hirsute, inflated in fruit; stamen 1 or absent; styles 2. Pericarp dull, somewhat adherent. Seed subglobular, horizontal to erect, 0.5 mm diam.; embryo semicircular; radicle superior. Tepals and seed shed as unit.

There are 2 subspecies.

Tepals hirsute

9a. subsp. rhadinostachya

Tepals glabrous or sparsely hirtellous

9b. subsp. inflata

9a. *Dysphania rhadinostachya* (F. Muell.) A. J. Scott subsp. *rhadinostachya*

Inflorescence much-branched; bracts smaller than or exceeding flower clusters. Tepals hirsute, rounded or slightly keeled. Pericarp dull. Seed oblique to erect. Fig. 26 I–J.

Found in western Qld, northern S.A., NW and central W.A. and southern N.T., usually in skeletal soil on rocky slopes. Map 218.

W.A.: Dampier, 30 Mar. 1971, *M. Hukin* (PERTH). N.T.: Mann Range, *D. J. Nelson* 362 (NT). S.A.: Mt Morris, *Hj. Eichler* 17333 (AD). Qld: Woodstock, *S. T. Blake* 6499 (BRI).

9b. *Dysphania rhadinostachya* subsp. *inflata* (Aellen) Paul G. Wilson, *Nuytsia* 4: 194 (1983)

Chenopodium inflatum Aellen, *Bot. Jahrb. Syst.* 63: 490 (1930); *Dysphania inflata* (Aellen) A.J.Scott, *Bot. Jahrb. Syst.* 100: 218 (1978). T: Bulloo Range, Qld, 29 Aug. 1923, *McGillivray*; iso: ADW, BRI, *vide* P.G.Wilson, *op. cit.* 193.

Inflorescence of long slender spikes often with disjunct glomerules; bracts inconspicuous. Tepals glabrous or almost so, ciliate, rounded on back. Pericarp dull, rarely glossy. Seed horizontal or slightly oblique.

Found in north-western W.A., southern N.T., central Qld, and northern N.S.W., usually in skeletal soil. Map 219.

W.A.: Mt Anderson Stn, *R. D. Royce* 6919 (PERTH). N.T.: Stirling Swamp, *T. S. Henshall* 510 (NT). Qld: Boulia, *S. T. Blake* 6475 (BRI). N.S.W.: Byrock, *E. McBarron* 14706 (NSW).

10. *Dysphania kalpari* Paul G. Wilson, *Nuytsia* 4: 195 (1983)

T: W end of Hopkins Lake, W.A., 1 Aug. 1962, *D. E. Symon* 2354; holo: PERTH; iso: AD, ADW.

Prostrate to decumbent annual with several stems, moderately pilose with sessile or shortly stipitate glandular hairs and larger simple hairs, aromatic. Leaves elliptic, deeply undulate; lamina 1–5 cm long; petiole half length of lamina. Flowers in clusters of 5–7 in erect slender spikes to 15 cm long, bisexual and female. Tepals 4, erect, obovate, c. 1 mm long, united below, rounded on back, hirtellous; stamen 1 or absent; styles 2. Pericarp not apparent. Seed vertical, compressed-spherical with rounded margins, c. 0.5 mm diam.; testa glossy; embryo semicircular, basal; radicle and cotyledons superior. Tepals and seed shed as unit. Figs 26G, 30.

Widespread inland in all mainland States except Victoria, usually on loam and gravelly flats and red sand plains, often associated with *Mulga* (*Acacia aneura*). Map 220.

W.A.: 71.6 km E of Carnegie Stn, *A. R. Fairall* 1999 (PERTH). N.T.: c. 26 km NW of Hamilton Downs, *G. Chippendale* (NT 1779). S.A.: 48 km W of Tallaringa Well, *T. R. N. Lothian* 3847 (AD). Qld: Boatman Stn, *S. L. Everist* 2935 (BRI). N.S.W.: 70 km N of Bourke, *S. Jacobs* 2061 (NSW).

4. EINADIA

Einadia Raf., *Fl. Tellur.* 4: 121 (1838); probably from the Greek *ein* (one) and *andros* (man), in reference to the one or two stamens in the flowers of the type species.

Type: *Einadia linifolia* (R. Br.) Raf.

Chenopodium sect. *Polygonoidea* Aellen, *Feddes Reper.* 69: 69 (1964), & in Hegi, *Ill. Fl. Mitt.-Eur.* 2nd edn, 3(2): 577 (1960) without Latin description. T: *Chenopodium polygonoides* (Murr) Aellen.

Herbaceous or weakly woody perennials. Leaves opposite or alternate, linear to broadly hastate, mealy when young. Flowers small, in clusters arranged in racemose or open panicles; pedicels constricted at apex. Terminal flower of cluster bisexual; lateral flowers female, without staminodes. Tepals 5, rarely 4. Stamens 1–3, glabrous; disc absent. Ovary glabrous; stigmas 2, slender. Fruit with the pericarp either membranous or succulent, not enveloped by perianth. Seed horizontal, lenticular with rounded margin; embryo annual; perisperm central and copious.

A genus of 6 species, 4 endemic in Australia and 2 in New Zealand.

P. G. Wilson, *Einadia*, *Nuytsia* 4: 199–212 (1983).

- | | | |
|----|--|---------------------------|
| 1 | Fruit succulent | |
| 2 | Leaves triangular to broadly hastate with rounded apex, dark green | 3. E. hastata |
| 2: | Leaves linear to broad triangular, sometimes hastate, grey to green | 1. E. nutans |
| 1: | Fruit dry | |
| 3 | Tepals in fruit with hard circular (often black) limb; leaves narrowly oblong-elliptic to narrowly hastate | 4. E. polygonoides |
| 3: | Tepals in fruit narrowly to broadly oblong or obovate; leaves broadly ovate to triangular, often hastate | 2. E. trigonos |

1. ***Einadia nutans*** (R. Br.) A. J. Scott, *Feddes Reper.* 89: 3 (1978)

Rhagodia nutans R. Br., *Prodr.* 408 (1810). T: Oyster Cove, [Tas.], Feb. 1804, R. Brown; lecto: BM, *vide* P. G. Wilson, *op. cit.* 200.

Scrambling perennial with woody base. Leaves opposite or alternate; lamina linear to broadly triangular, entire, rounded to truncate or hastate at base, usually 10–20 mm long, moderately mealy when young, abruptly petiolate. Inflorescence a narrow panicle 2–4 cm long. Perianth depressed-globular, 0.7–1.5 cm diam., mealy to glabrescent; tepals oblong, enlarging and becoming red and fleshy in fruit. Stamens 0–2, rarely 3. Pericarp succulent, c. 4 mm diam. Seed 1–1.5 mm diam.; testa rugulose to areolate-reticulate, black. *Climbing Saltbush*.

A polymorphic species. The following subspecies represent the principal variants.

- | | | |
|----|--|-----------------------------|
| 1 | Leaves linear to narrowly oblong | 1c. subsp. linifolia |
| 1: | Leaves either broader than above or hastate to sagittate | |
| 2 | Leaves narrowly sagittate, subcoriaceous; seed c. 1.5 mm diam. (central Australia) | 1d. subsp. eremaea |
| 2: | Leaves narrowly to broadly hastate or deltoid, thin; seed c. 1 mm diam. | |
| 3 | Leaves narrowly hastate; berry ovoid | 1b. subsp. oxycarpa |
| 3: | Leaves variable; berry depressed- globular | 1a. subsp. nutans |

1a. ***Einadia nutans*** (R. Br.) A. J. Scott subsp. **nutans**

Rhagodia chenopodioides Moq., *Chenop. Monogr. Enum.* 11 (1840). T: Port Jackson, N.S.W., 1830, C. Gaudichaud; lecto: P, *vide* P. G. Wilson, *op. cit.* 200.

Chenopodium triangulare subsp. *convolvulinum* Murr, *Allg. Bot. Z. Syst.* 16: 56 (1910); *C. triangulare* var.

convolvulinum (Murr) Maiden & E. Betche, *Census New South Wales Pl.* 66 (1916). T: Stonehenge, N.S.W., Dec. 1899, *J. H. Maiden*; lecto: NSW, *vide* P. G. Wilson, *op. cit.* 202.

? *Rhagodia nutans* var. *fallacina* Domin, *Biblioth. Bot.* 89: 62 (1921). T: Cheltenham, Vic., Apr. 1910, *K. Domin*; *n.v.*

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 24 (1890) as *Rhagodia nutans*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 278 (1982) as *Rhagodia nutans*.

Leaves thin, hastate to triangular and shortly lobed at base. Inflorescence slender or branched at base. Fruits sessile or pedicellate. Berry depressed-globular. Seed variably reticulate, c. 1 mm diam. Fig. 25E.

Found in central and SE Australia including Tas., in loam or heavy soil. Map 221.

N.T.: 30 km S of Alice Springs, *R. Pullen 10556* (CANB). S.A.: Wilpena Pound, *A. E. Orchard 2594* (AD). Qld: Thallon, *R. Roe 26* (CANB). N.S.W.: 8 km S of Cobar, *C. W. E. Moore 4480* (CANB). Tas.: Lewisham, 3 Mar. 1952, *W. M. Curtis* (HO).

1b. *Einadia nutans* subsp. *oxycarpa* (Gauba) Paul G. Wilson, *Nuytsia* 4: 203 (1983)

Rhagodia nutans var. *oxycarpa* Gauba, *Victorian Naturalist* 65: 167 (1948). T: near Loveday, S.A., 28 May 1943, *E. Gauba*; holo: MEL.

Scrambling subshrub to 1 m high. Leaves somewhat leathery, narrowly hastate, acute, c. 15 mm long; basal lobes narrow, acute. Inflorescence branched; flowers and fruits sessile. Fruiting perianth fleshy and reflexed, red. Berry ovoid, c. 4 mm long. Seed horizontal to erect, c. 1 mm diam.; testa moderately reticulate.

Found in N.S.W. and S.A. Map 222.

S.A.: c. 3 km NW of Lake Bonney, *B. Copley 2577* (AD). N.S.W.: 56 km N of Wentworth, 29 Aug. 1969, *A. Rodd* (NSW).

1c. *Einadia nutans* subsp. *linifolia* (R. Br.) Paul G. Wilson, *Nuytsia* 4: 204 (1983)

Rhagodia linifolia R. Br., *Prodr.* 408 (1810); *Einadia linifolia* (R. Br.) Raf., *Fl. Tellur.* 4: 121 (1838); *E. nutans* var. *linifolia* (R. Br.) A. J. Scott, *Feddes Repert.* 89: 4 (1978). T: Broad Sound, [Qld], Sept. 1802, *R. Brown*; lecto: BM, *vide* P. G. Wilson, *op. cit.* 200.

Chenopodium australasicum Moq., *Chenop. Monogr. Enum.* 20 (1840). T: 'Nova Hollandia' [probably N.S.W.], *G. Caley*; *n.v.*

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 23 (1890) as *Rhagodia linifolia*.

Prostrate or scrambling perennial. Leaves thin, linear to narrowly oblong. Inflorescence slender. Fruits often on slender pedicels. Tepals enlarged and reflexed or spreading in fruit. Berry depressed-globular. Seed 1 mm diam.; testa finely reticulate.

Found in eastern Qld and N.S.W. and in northern Vic., usually in heavy soil. Map 223.

Qld: Noondoo Stn, *S. L. Everist 829* (BRI). N.S.W.: Warrah, Mar. 1920, *W. W. Froggatt* (BRI). Vic.: Echuca, *H. King 4* (MEL).

1d. *Einadia nutans* subsp. *eremaea* Paul G. Wilson, *Nuytsia* 4: 204 (1983)

T: near Ayers Rock, N.T., 25 Aug. 1973, *A. A. Munir 5132*; holo: AD; iso: DNA, NT.

Scrambling perennial to 1 m high. Leaves narrowly triangular, sagittate, grey; lamina somewhat leathery, 15-40 mm long. Inflorescence paniculate. Flowers and fruits sessile. Berry depressed-globular. Seed c. 1.5 mm diam.; testa strongly alveolate.

Found in central and western Qld, north-western N.S.W., northern S.A., east-central W.A. and N.T., usually growing in sand. Map 224.

W.A.: 8 km S of Giles, *R. H. Kuchel 161* (AD). N.T.: Petermann Creek, *N. M. Henry 576* (NT). S.A.: 48 km W of Todmorden Stn, *T. Reichstein 24* (AD). Qld: Earlston Stn, *S. T. Blake 5480* (BRI). N.S.W.: Tundulya, *C. W. E. Moore 4559* (CANB).

2. Einadia trigonos (Schultes) Paul G. Wilson, *Nuytsia* 4: 206 (1983)

Chenopodium triangulare R. Br., *Prodr.* 407 (1810), *nom. illeg.* non Forsskal (1775); *C. trigonon* Schultes in Roemer & Schultes, *Syst. Veg.* 6: 275 (1820). T: Nepean and Hawkesbury Rivers, N.S.W., *R. Brown*; holo: BM.

Weak prostrate or straggling perennial. Leaves thin, broadly ovate to triangular or hastate with short spreading lobes; lamina 8–15 mm long, glabrescent above, sparsely mealy below. Inflorescence a congested to slender panicle; flowers sessile. Perianth depressed-globular, 0.5–1 mm diam.; tepals linear to ovate or obovate, sparsely mealy or glabrous. Stamen 1 or absent. Fruiting perianth: tepals oblong to obovate, herbaceous or indurated, smooth; pericarp thin, often black and prominently papillose. Seed c. 1 mm diam.; testa slightly granular or striate.

A variable species with three subspecies.

- | | | |
|----|---|------------------------------|
| 1 | Tepals spatulate to linear; pericarp strongly papillose, frequently black | 2b. subsp. stellulata |
| 1: | Tepals ovate to obovate; pericarp almost smooth | |
| 2 | Leaves broadly hastate or deltoid, the apex rounded | 2a. subsp. trigonos |
| 2: | Leaves hastate to narrowly hastate, acute | 2c. subsp. leiocarpa |

2a. Einadia trigonos (Schultes) Paul G. Wilson subsp. **trigonos**

Plant prostrate to decumbent. Leaves broadly hastate or deltoid with rounded apex. Tepals ovate to obovate, herbaceous in fruit. Pericarp almost smooth.

Found in southern Vic. and south-eastern N.S.W. Map 225.

N.S.W.: Moona Plains, Feb. 1899, *S. R. Crawford* (NSW). Vic.: Mt Tingaringy, *A. C. Beauglehole* 35726 (MEL).

North of Sydney this subspecies grades into subsp. *stellulata*.

2b. Einadia trigonos subsp. **stellulata** (Benth.) Paul G. Wilson, *Nuytsia* 4: 208 (1983)

Chenopodium triangulare var. *stellulatum* Benth., *Fl. Austral.* 5: 161 (1870); *C. stellulatum* (Benth.) Aellen, *Verh. Naturf. Ges. Basel* 41: 93 (1930), *nom. illeg., non* Aellen (1928). T: River Severn, N.S.W., *C. Stuart* 44; lecto: MEL, *vide* P. G. Wilson, *loc. cit.*

C. stellulatum Aellen in R. Probst, *Mitt. Naturf. Ges. Solothurn* 20(8): 57 (1928). T: Derendingen, Switzerland, 1916, *R. Probst*; *n.v.*

Prostrate to spreading herb with stout taproot. Inflorescence a slender racemose panicle with disjunct glomerules. Tepals spatulate to linear, frequently indurated in fruit. Pericarp strongly papillose, frequently black. *Fishweed, Tar Vine.*

Found in south-eastern Qld and eastern N.S.W., usually in moist situations in partial shade; a ready coloniser of disturbed areas. Map 226.

Qld: Waterford, *W. Jones* 3345 (CANB). N.S.W.: Swan Bay, 8 June 1957, *L. A. S. Johnson* (NSW).

2c. Einadia trigonos subsp. **leiocarpa** Paul G. Wilson, *Nuytsia* 4: 209 (1983)

T: Pilliga, N.S.W., Nov. 1932, *H. M. R. Rupp* 5; holo: NSW.

Erect perennial herb branching from base. Leaves hastate to narrowly hastate, acute, mealy below; lamina c. 15 mm long; petiole slender, c. ½ length of lamina. Tepals broadly elliptic to obovate. Pericarp smooth, translucent, not blackened. Seed c. 1.2 mm diam.; testa glossy, radially striate.

Found in north-eastern N.S.W. Map 227.

N.S.W.: Boggabri, *R. H. Cabbage* 3655 (NSW); Moree, Feb. 1907, *J. T. Scott* (NSW).

3. *Einadia hastata* (R. Br.) A. J. Scott, *Feddes Repert.* 89: 4 (1978)

Rhagodia hastata R. Br., *Prodr.* 408 (1810). T: Port Jackson, near Duck River on Parramatta Road, N.S.W., *R. Brown*; holotype: BM.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 25 (1890) as *Rhagodia hastata*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 278 (1982) as *Rhagodia hastata*.

Spreading perennial to 1.5 mm high, branching at base. Leaves opposite or subopposite, triangular to broadly hastate, entire, somewhat leathery and resinous when dry, glabrous or with scattered vitreous vesicular hairs when young; lamina 10–25 mm long; apex rounded and often apiculate; lateral lobes short and obtuse; petiole slender. Inflorescence a slender racemose panicle with scattered glomerules; flowers sessile or subsessile. Tepals oblong-obovate, thickened and hooded at apex, red and somewhat succulent in fruit. Stamens 1 or 2. Fruit a berry, depressed-globular, clasped by persistent tepals, c. 3 mm diam. Seed 1.5 mm diam., radially rugulose. *Saloop, Berry Saltbush.* Fig. 25F.

Found in Vic., eastern Qld and N.S.W., in gullies, on rocky slopes and plains. Map 228.

Qld: Russell Is., *C. T. White 3405* (BRI). N.S.W.: Tallebung, *G. M. Cunningham 645* (NSW). Vic.: Mt Wheeler, *A. E. Orchard 2662* (AD).

4. *Einadia polygonoides* (Murr) Paul G. Wilson, *Nuytsia* 4: 212 (1983)

Chenopodium triangulare var. *polygonoides* Murr, *Bull. Herb. Boiss.* 2nd ser., 4: 994 (1904); *C. triangulare* subsp. *polygonoides* (Murr) Murr, *Allg. Bot. Syst.* 16: 56 (1910); *C. polygonoides* (Murr) Aellen in R. Probst, *Mitt. Naturf. Ges. Solothurn* 20(8): 213 (1928). T: 'Port Jackson district N.S.W., leg. Ernst Betche [Betche], 2. 1898, comm. Charles Walter (v. in herb. Turic.)'; ?iso: MEL, NSW.

C. triangulare var. *angustifolium* Benth., *Fl. Austral.* 5: 161 (1870). T: Armadilla, N.S.W., *W. Barton 140*; lecto: MEL, *fide* P. G. Wilson, *loc. cit.*

Spreading weak grey-green perennial with numerous stems arising from taproot. Leaves opposite or alternate, narrowly oblong-elliptic to narrowly hastate; lamina 0.5–1.5 cm long, acute, thin, glabrescent above, mealy below when young; petiole short and slender. Inflorescence a terminal racemose panicle elongating in fruit to 15 cm with disjunct glomerules; axis at first with globular hairs, short tubular hairs, and small gland tipped hairs; flowers sessile, 0.5–1 mm diam. Tepals broadly obovate. Stamens 1 or 2. Fruiting tepals imbricate and enveloping seed, leathery with circular limb, somewhat resinous, eventually straw-coloured to black; pericarp thin, prominently papillose. Seed c. 1 mm diam.; testa finely radially rugulose.

Found in central-eastern Qld, central-eastern N.S.W. and as an introduction on Eyre Peninsula and around Adelaide, S.A., in heavy soil. Map 229.

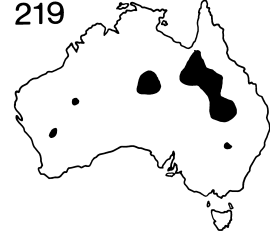
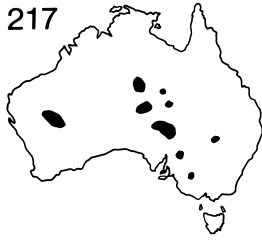
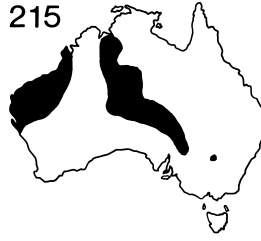
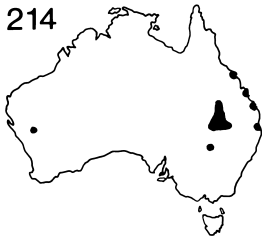
S.A.: Arno Bay, Jan. 1920, *T. G. B. Osborn* (AD). Qld: Kinson Stn, *L. S. Smith 514* (BRI). N.S.W.: Narellan, *E. McBarron 13673* (NSW).

5. RHAGODIA

Rhagodia R. Br., *Prodr.* 408 (1810); from the Greek *rhagodes* (berry-like), in reference to the fruit.

Type: *Rhagodia billardierei* R. Br. = *R. baccata* (Labill.) Moq.

Diocious shrubs, mealy at least when young with globular hairs which may collapse to form a scurfy or continuous silvery sheen. Leaves opposite or alternate, simple, entire or obtusely lobed at base. Flowers clustered, forming panicles or spike-like thyrses; bracts small or absent. Perianth globular; tepals 5, shortly united, often spreading and enlarged in fruit. Male flowers: stamens 5, usually united at base into a disc that is puberulous or woolly within, rarely glabrous; pistillode minute. Female flower: if terminal with staminodes and a woolly disc; if lateral with or without small glabrous staminodes; ovary glabrous; stigmas 2, sessile. Fruit a depressed-globular berry c. 3 mm diam.; pericarp



211. *Dysphania glandulosa*
 214. *Dysphania littoralis*
 217. *Dysphania simulans*
 220. *Dysphania kalpari*
 223. *Einadia nutans*
 subsp. *linifolia*

212. *Dysphania valida*
 215. *Dysphania plantaginella*
 218. *Dysphania rhadinostachya*
 subsp. *rhadinostachya*
 221. *Einadia nutans*
 subsp. *nutans*
 224. *Einadia nutans*
 subsp. *eremaea*

213. *Dysphania platycarpa*
 216. *Dysphania sphaerosperma*
 219. *Dysphania rhadinostachya*
 subsp. *inflata*
 222. *Einadia nutans*
 subsp. *oxycarpa*
 225. *Einadia trigonos*
 subsp. *trigonos*

succulent, viscous on drying. Seed horizontal, depressed-globular to lenticular; testa crustaceous, black, smooth to reticulate; embryo circular; perisperm copious, central.

A genus of 11 species, all endemic in Australia.

G. Bentham, *Rhagodia*, *Fl. Austral.* 5: 151–157 (1870); A. J. Scott, *Feddes Repert* 89: 1–11 (1978); P. G. Wilson, *Nuytsia* 4: 213–235 (1983).

- 1 Leaves c. 3 mm long; intricately branched spinescent shrubs
- 2 Stamens woolly at base; seed radially verruculose (W.A.) **4. R. acicularis**
- 2: Stamens glabrous; seed smooth to minutely granular (W.A., S.A., N.S.W.) **3. ulicina**
- 1: Leaves more than 3 mm long, or plant not spinescent
- 3 Perianth glabrous or almost so
- 4 Leaves linear to narrowly or broadly obovate, scurfy below **5. R. preissii**
- 4: Leaves narrowly elliptic, mealy with minute spherical or saucer-shaped vesicular hairs, rarely glabrous **6. R. baccata**
- 3: Perianth mealy
- 5 Leaves becoming scaly and covered with a silvery sheen; staminodes present in female flowers
- 6 Leaves flat, papery or slightly fleshy **1. R. candolleana**
- 6: Leaves fusiform or semiterete, fleshy **2. R. crassifolia**
- 5: Leaves mealy with spherical to irregular vesicular hairs or glabrous, not becoming scaly or covered by a sheen
- 7 Indumentum of spherical or saucer-shaped vesicular hairs.
- 8 Leaves oblong to narrowly elliptic, c. 30 mm long, glabrous above, sparsely mealy below (coastal south-western W.A.) **6. R. baccata**
- 8: Leaves elliptic to deltoid or circular (inland or eastern States)
- 9 Leaves narrowly elliptic; lamina mostly 7–10 mm long; female flowers lacking both disc and staminodes; seed almost smooth (W.A.) **8. R. drummondii**
- 9: Leaf shape variable; lamina mostly 5–20 mm long; lateral female flowers with disc and often staminodes; seed prominently reticulate (central and eastern Australia) **9. R. spinescens**
- 7: Indumentum of irregular vesicular hairs
- 10 Leaves broadly obovate to orbicular or obtusely hastate, flat; inflorescence pyramidal
- 11 Leaves obovate to orbicular, often conduplicate; indumentum of dense glossy, irregular vesicular hairs (Shark Bay to Geraldton, W.A.) **7. R. latifolia**
- 11: Leaves broadly ovate to obtusely hastate, flat; indumentum of very minute vesicular hairs, dull (N.T., S.A., eastern Australia) **11. R. parabolica**
- 10: Leaves linear to elliptic or oblong-elliptic
- 12 Leaves semiterete, somewhat fleshy; panicle narrow, often racemose (Geraldton area, W.A.) **7. R. latifolia**
- 12: Leaves elliptic to ovate (inland regions, or coastal south-western W.A.)
- 13 Leaves ovate or oblong-ovate, c. 15 mm long, sparsely mealy below with minute hairs; flowers in dense slender spikes sometimes paniculately arranged; staminodes usually absent (inland W.A., N.T., S.A.) **10. R. eremaea**
- 13: Leaves elliptic, 10–20 mm long, densely mealy below; flowers in panicles (coastal south-western W.A.) **6. R. baccata**

1. *Rhagodia candolleana* Moq., *Chenop. Monogr. Enum.* 10 (1840)

R. baccata var. *candolleana* (Moq.) Moq. in DC., *Prodr.* 13(2): 50 (1849). T: New Holland, *J. J. H. de Labillardière*; lecto: P, *vide* P. G. Wilson, *Nuytsia* 4: 214 (1983).

R. baccata var. *parvifolia* Moq. in DC., *Prodr.* 13(2): 50 (1849). T: Port Jackson, *D'Urville*; holo: P.

Chenopodium furfuraceum Moq. in DC., *Prodr.* 13(2): 64 (1849). T: d'Entrecasteaux Channel, [Tas.], 1802, herb. *Delessert*; holo: P.

[*R. billardierei* auct. non R. Br.: G. Bentham, *Fl. Austral.* 5: 152 (1970) *p.p.*, excluding W.A. specimens cited]

[*R. baccata* auct. pl. non (Labill.) Moq.: J. Black, *Fl. S. Australia* 2nd edn, 287 (1948); N. C. W. Beadle *et al.*, *Fl. Sydney Reg.* 192 (1972); J. H. Willis, *Handb. Pl. Victoria* 2: 83 (1973)]

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 21 (1890) as *R. billardieri*.

Weak shrub, spreading or erect, to 5 m high. Leaves opposite to alternate, shortly petiolate; lamina thin to leathery, narrowly to broadly elliptic, broadly ovate or hastate, acute to obtuse, mostly 10–25 mm long, sparsely scaly to glabrous above, scaly below and developing a grey to silvery sheen, or glabrescent. Inflorescence a pyramidal panicle to 15 cm long. Perianth densely mealy outside; tepals ovate with thickened midrib. Male flowers: disc saucer-shaped, puberulous within; pistillode minute or similar to ovary but with erect stigmas. Female flower: staminodes with ovate membranous filaments; disc thick, woolly; stigmas spreading. Berry clasped at base by fleshy red perianth. Seed depressed-globose, 1.5–2.5 mm diam.; testa almost smooth to rugulose.

There are two subspecies.

Leaves elliptic to broadly ovate or obtusely hastate; lower surface grey or glabrescent

1a. subsp. *candolleana*

Leaves hastate, acute; lower surface with a silvery sheen

1b. subsp. *argentea*

1a. *Rhagodia candolleana* Moq. subsp. *candolleana*

Leaves narrowly to broadly elliptic, broadly ovate, or obtusely hastate, obtuse; lower surface covered with a grey sheen or glabrescent.

Found in coastal situations in southern N.S.W., Vic., Tas., S.A. and in the Recherche Archipelago, W.A. Map 230.

W.A.: Middle Is., Recherche Archipelago, A. S. Weston 8856 (PERTH). S.A.: Port Noarlunga, L. D. Williams 5134 (AD). N.S.W.: c. 3 km N of Bermagui, H. Salasoo 5107 (NSW). Vic.: Coringale, N. W. Wakefield 4274 (MEL). Tas.: Sulphur Creek, Jan. 1954, W. M. Curtis (HO).

1b. *Rhagodia candolleana* subsp. *argentea* Paul G. Wilson, *Nuytsia* 4: 215 (1983)

T: Maralinga Village, S.A., 15 July 1972, T. R. N. Lothian 5547; holo: AD.

Shrub covered with a silvery sheen. Leaves somewhat hastate, acute, 10–25 mm long.

Found on the north-western plains of S.A. Map 231.

S.A.: Ifould Lake, T. R. N. Lothian 5429 (AD); Maralinga, 7 Feb. 1960, H. Turner (AD).

2. *Rhagodia crassifolia* R. Br., *Prodr.* 408 (1810)

T: Goose Island Bay, [W.A.], 15–16 Jan. 1802, R. Brown; lecto: BM, *vide* P. G. Wilson, *Nuytsia* 4: 218 (1983).

R. parvifolia Moq. in DC., *Prodr.* 13(2): 52 (1849). T: Swan River, W.A., 1843, J. Drummond 715; holo: P.

Shrub to 1.5 m high. Leaves alternate, fleshy, fusiform to semiterete, often channelled above or falcate, 1–2 cm long, mealy when young, the vesicles later fusing to form a metallic sheen. Panicle to 5 cm long or reduced to a short spike. Flowers and fruit as in *R. candolleana* Moq.

Principally a coastal species of S.A. and southern W.A.; an inland variant occurs from south-eastern W.A. to north-western Vic., usually in calcareous soil. Map 232.

W.A.: Corbett Is., Recherche Archipelago, *R. D. Royce 6189* (PERTH). S.A.: Port Lincoln, 17 Dec. 1941, *J. B. Cleland* (AD). Vic.: 8 km E of Murrayville, 29 Aug. 1955, *J. H. Willis* (MEL).

This species intergrades with *R. candolleana* Moq. in S.A. The inland variant has a strongly divaricate habit; it has more slender leaves than the coastal plant.

3. *Rhogodia ulicina* (Gand.) Paul G. Wilson, *Nuytsia* 4: 53 (1982)

Chenopodium ulicinum Gand., *Bull. Soc. Bot. France* 66: 224 (1919). T: Mt Lyndhurst, S.A., Apr. 1900, *M. Koch 366*; holo: LY; iso: PERTH.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 263 (1982) as *Chenopodium ulicinum*.

Dense, intricately branched spinescent shrub to 1 m high. Leaves alternate, often clustered, elliptic, fleshy, 2–5 mm long, closely mealy with vesicular hairs. Inflorescence a narrow condensed cyme (sometimes spinescent) with 1–4 lateral and a large terminal flower. Perianth globose, 1.5 mm diam., mealy. Male flower: disc inconspicuous, glabrous; pistillode minute. Female flower: staminodes minute; style minute; stigmas spreading, slender, subulate. Berry at first enveloped by perianth. Seed c. 1.5 mm diam.; testa smooth to minutely granular.

Found from south-eastern W.A. to western N.S.W. and north-western Vic., usually in rocky situations or on limestone. Map 233.

W.A.: 19 km NNW of Mt Glasse, *K. Newbey 5609* (PERTH). S.A.: Wilkawillina Gorge, *T. R. N. Lothian 5126* (AD). N.S.W.: Fowlers Gap, *S. Jacobs 2268* (NSW). Vic.: Yatpool, *J. H. Browne 117* (PERTH).

4. *Rhogodia acicularis* Paul G. Wilson, *Nuytsia* 4: 51 (1982)

T: Wongan Hills, W.A., 15 Feb. 1980, *P. G. Wilson 11713*; holo: PERTH; iso: CANB.

Illustration: P. G. Wilson, *op. cit.* 52.

Compact intricately branched shrub c. 0.5 m high, closely mealy with minute vesicular hairs. Branchlets spinescent. Leaves alternate, narrowly elliptic, fleshy, 2–5 mm long, glabrescent above, mealy below. Inflorescence spicate with a spinescent axis c. 10 mm long; flowers few. Male flowers broadly turbinate, c. 1 mm long; perianth mealy; filaments woolly near base, united into a thick cup-shaped disc; pistillode minute. Terminal female flower, sterile, densely filled with woolly hairs arising from staminodes. Lateral female flowers fertile, spherical c. 1.2 mm diam.; staminodes absent; stigmas slender. Berry clasped around margin by perianth. Seed c. 1.5 mm diam., radially verruculose. Fig. 27.

Found in the Wongan Hills, W.A., in eucalypt woodland on lateritic slopes. Map 234.

W.A.: Wongan Hills, *K. F. Kenneally 2384, 6448* (PERTH).

5. *Rhogodia preissii* Moq. in DC., *Prodr.* 13(2): 49 (1849)

Chenopodium preissii (Moq.) Diels, *Bot. Jahrb. Syst.* 35: 181 (1904). T: near York, W.A., Sept. 1839, *L. Preiss 1252*; iso: K, MEL.

Shrub to 2 m high. Leaves linear to spatulate or broadly obovate, thin to leathery; lamina 3–4 cm long, tapering into a slender petiole, sparsely and minutely mealy beneath when young. Inflorescence a pyramidal panicle c. 5 cm long. Flowers spherical, c. 1 mm diam. Tepals glabrous. Male flowers: filaments somewhat pilose at base, united into a saucer-shaped disc. Female flowers: terminal flowers usually sterile with densely pilose linear staminodes; lateral flowers fertile, without staminodes. Berry depressed-spherical, c. 3 mm diam. Seed c. 1.5 mm diam.; testa with faint radial ribbing.

There are two subspecies.

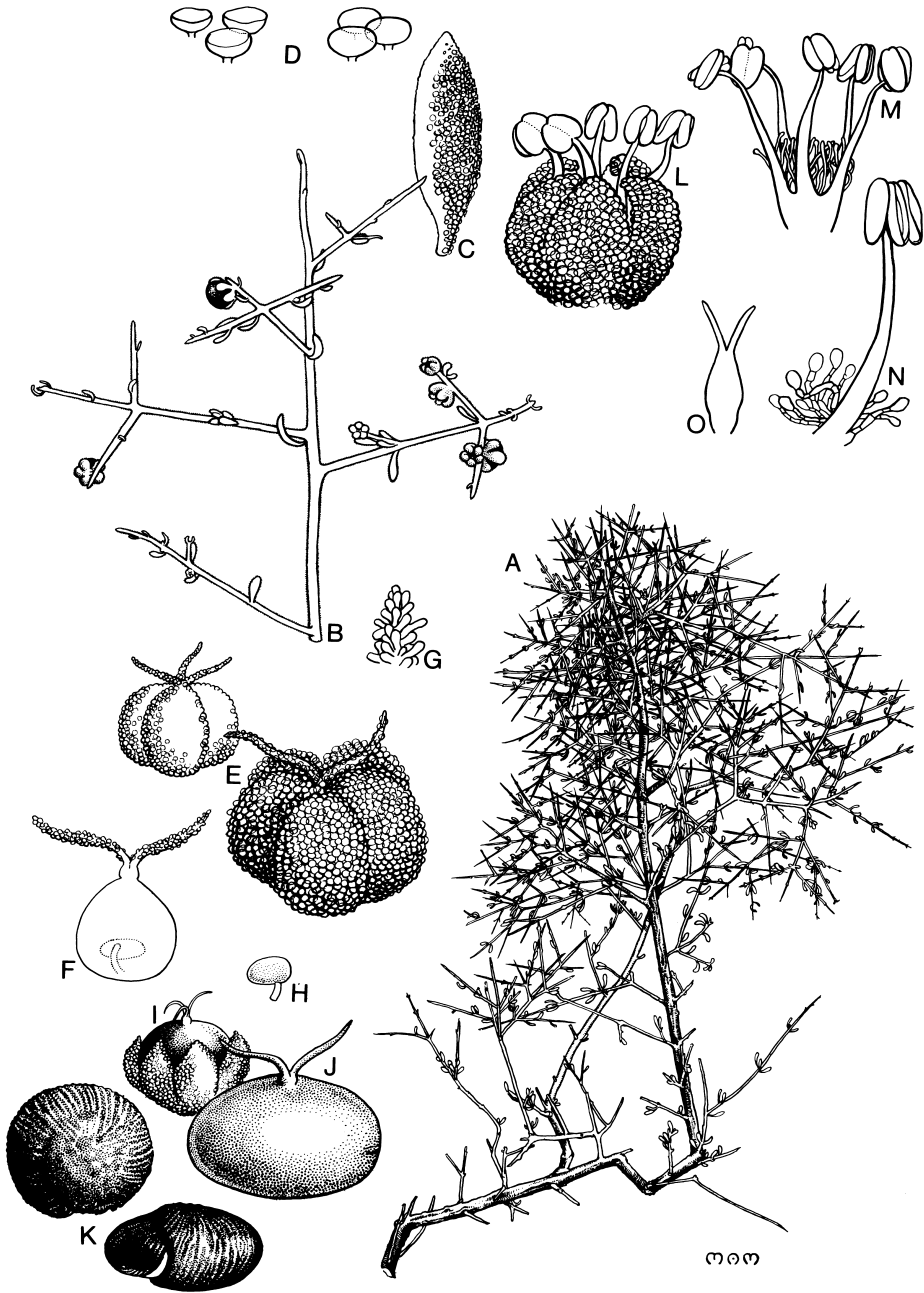


Figure 27. *Rhagodia acicularis*. **A**, habit $\times 0.5$; **B**, female branch $\times 2$; **C**, young leaf $\times 12.5$; **D**, vesicular hairs collapsed and inflated $\times 125$; **E**, female flowers $\times 12.5$ & $\times 25$; **F**, ovary $\times 25$; **G**, stigma tip $\times 125$; **H**, ovule $\times 25$; **I**, perianth and fruit $\times 12.5$; **J**, fruit $\times 25$; **K**, seed from above and side $\times 25$ (**A–K**, P. Wilson 11713, PERTH). **L**, male flower $\times 25$; **M**, androecium $\times 25$; **N**, stamen $\times 50$; **O**, pistillode $\times 25$ (**L–O**, K. Kenneally 2384, PERTH). Reproduced by permission from *Nuytsia* 4: 52, fig. 1 (1982).

Leaves linear to narrowly obovate, usually thin

5a. subsp. preissii

Leaves broadly obovate, leathery

5b. subsp. obovata

5a. *Rhagodia preissii* Moq. subsp. **preissii**

Leaves linear to narrowly obovate or spatulate, usually thin, flat or cymbiform. Perianth glabrous.

Found in W coastal and south-western W.A. and southern S.A., in deep sand. Map 235.

W.A.: Merredin, *M. Koch* 2882 (NSW). S.A.: Dublin, *J. C. Noble* 84 (AD).

5b. *Rhagodia preissii* subsp. **obovata** (Moq.) Paul G. Wilson, *Nuytsia* 4: 222 (1983)

Rhagodia obovata Moq., *Chenop. Monogr. Enum.* 10 (1840). T: 'Nouv. holland. côte meridionale' [probably W coast of W.A.], 1821, collector unknown; holotype: P.

Leaves broadly obovate, rounded to truncate, apiculate, narrowed into a slender petiole, in all 1.5–3 cm long, leathery, glabrescent to sparsely mealy. Perianth glabrous to sparsely mealy.

Found from Shark Bay to Geraldton, W.A. Map 236.

W.A.: Dorre Is., *A. S. Weston* 10496 (PERTH); Kalbarri to Red Bluff, *R. J. Hnatiuk* 760494 (PERTH).

6. *Rhagodia baccata* (Labill.) Moq. in DC., *Prodr.* 13(2): 50 (1849)

Chenopodium baccatum Labill., *Nov. Holl. Pl.* 1: 71, t. 96 (1805); *R. billardierei* R. Br., *Prodr.* 408 (1810), *nom. illeg.* T: 'Capite Van-Diemen' in error, correctly south-western Australia, *J. J. H. de Labillardière*; lecto: FI, *fide* P. G. Wilson, *op. cit.* 223–225.

Spreading shrub to 2 m high. Leaves opposite or alternate, narrowly oblong-elliptic to elliptic, rounded to obtuse, shortly petiolate; lamina 1–4 cm long, 3–8 mm wide; margin often recurved; upper surface glabrous or sparsely mealy; lower surface sparsely to densely mealy with collapsed, saucer-shaped vesicular hairs, minutely mealy in subsp. *dioica*. Inflorescence an open panicle. Perianth mealy. Male flowers with glabrous filaments and disc. Female: terminal flowers with lanceolate staminodes and woolly disc; lateral flowers glabrous within, lacking staminodes and disc; ovary globular, glabrous. Fruiting perianth spreading to reflexed, pale fawn. Berry depressed-globular, red. Seed c. 1.8 mm diam.; testa glossy, minutely and irregularly tuberculate.

Endemic in south-western W.A. There are 2 subspecies.

Leaves thin; margins recurved when dry; lower surface with discrete saucer-shaped hairs

6a. subsp. baccata

Leaves fleshy; margins not recurved; lower surface mealy with minute hairs

6b. subsp. dioica

6a. *Rhagodia baccata* (Labill.) Moq. subsp. **baccata**

R. radiata Nees in Lehm., *Pl. Preiss.* 1: 637 (1845); *R. billardierei* var. *linearis* Benth., *Fl. Austral.* 1: 153 (1870); *R. baccata* var. *linearis* (Benth.) J. Black, *Fl. S. Australia* 683 (1929). T: near Fremantle, W.A., Dec. 1838, *L. Preiss* 1250; iso: MEL.

R. baccata var. *angustifolia* Moq. in DC., *Prodr.* 13(2): 50 (1849). T: south-western Australia, *J. J. H. de Labillardière*; lecto: P; iso: FI, *fide* P. G. Wilson, *loc. cit.*

R. cygnorum Gand., *Bull. Soc. Bot. France* 66: 224 (1919). T: Fremantle, W.A., 15 Mar. 1899, *A. Morrison*; holotype: LY.

Leaves narrowly oblong-elliptic to oblong-elliptic, 2–4 cm long, 4–8 mm wide, thin; margins recurved; lower surface sparsely to densely mealy with saucer-shaped hairs, rarely glabrous. Fig. 28.

Found around the coast of south-western W.A. from c. 80 km north of Perth to Cape Arid. Map 237.



Figure 28. *Rhagodia baccata* subsp. *baccata*. A–C, male plant. A, flowering branch $\times 1.2$; B, flower $\times 12$; C, L.S. flower $\times 12$ (A–C, N. Marchant 73/98, PERTH). D–G, female plant. D, flower $\times 12$; E, seed $\times 12$; F, fruit $\times 12$; G, fruiting branch $\times 1.2$ (D–G, J. Green $\times 331$, PERTH).

W.A.: Nornalup Inlet, 15 Jan. 1947, *M. B. Johnson* (PERTH); c. 45 km S of Perth, *R. A. Saffrey* 877 (PERTH).

6b. *Rhogodia baccata* subsp. *dioica* (Nees) Paul G. Wilson, *Nuytsia* 4: 225 (1983)

R. dioica Nees in Lehm., *Pl. Preiss.* 1: 636 (1845). T: Fremantle, W.A., *L. Preiss* 1253; lecto: K; iso: MEL, *vide* P. G. Wilson, *op. cit.* 223.

Leaves elliptic, obtuse, fleshy, 10–20 mm long, 3–7 mm wide; margins not recurved; upper surface glabrescent; lower surface densely white-mealy with minute hairs.

Found in coastal south-western W.A. from Geographe Bay north to Fremantle. Map 238.

W.A.: Garden Is., May 1946, *G. R. Meadly* (PERTH); Fremantle, *P. G. Wilson* 8693 (PERTH).

This subspecies grades into subsp. *baccata* where the two are sympatric.

7. *Rhogodia latifolia* (Benth.) Paul G. Wilson, *Nuytsia* 4: 228 (1983)

R. crassifolia var. *latifolia* Benth., *Fl. Austral.* 5: 155 (1870). T: Dirk Hartog Is., W.A., Jan. 1822, *A. Cunningham* 321; holo: K; iso: MEL.

Shrub to 1.5 m high. Leaves opposite or alternate, linear to orbicular, densely mealy all over with vesicular hairs, leathery or fleshy; lamina c. 1 cm long; petiole c. 5 mm long. Inflorescence pyramidal or spike-like. Perianth c. 1.5 mm diam., densely mealy. Male flower: disc cup-shaped, woolly within. Female flowers, if terminal with short membranous staminodes and woolly disc, if lateral without staminodes and with glabrous disc. Berry c. 3.5 mm diam., exceeding perianth which is red within. Seed c. 1.3 mm diam. with faint radial markings.

Occurs in W.A. along the central W coast. There are two subspecies.

Leaves elliptic to orbicular; inflorescence pyramidal

7a. subsp. *latifolia*

Leaves semiterete; inflorescence spicate

7b. subsp. *recta*

7a. *Rhogodia latifolia* (Benth.) Paul G. Wilson subsp. *latifolia*

Divaricately-branched shrub. Leaves elliptic to orbicular, often conduplicate, leathery, densely mealy with spherical vesicular hairs. Inflorescence pyramidal.

Found in coastal W.A. from Shark Bay to the Murchison River, on sand dunes, often over limestone. Map 239.

W.A.: Dirk Hartog Is., *A. S. George* 11580 (PERTH); Dorre Is., *A. S. Weston* 10482 (PERTH).

7b. *Rhogodia latifolia* subsp. *recta* Paul G. Wilson, *Nuytsia* 4: 228 (1983)

T: Geraldton, W.A., Jan. 1901, *L. Diels & E. Pritzel* 212; holo: PERTH.

Branches ascending. Leaves semiterete, fleshy, c. 10 mm long, 1 mm wide, ± flat and glabrous above, densely mealy below with minute irregularly-shaped vesicular hairs. Inflorescence a spike-like panicle.

Found in coastal W.A. from near Geraldton north to the Murchison River on sand dunes. Map 240.

W.A.: Mt Hill, *A. Oldfield* (MEL); Geraldton, *C. H. Ostenfeld* 343 (PERTH).

This subspecies appears to grade northwards into subsp. *latifolia*.

8. *Rhogodia drummondii* Moq. in DC., *Prodr.* 13(2): 52 (1849)

T: Western Australia, *J. Drummond* 133; holo: P.

Open, often scrambling shrub to 1.5 m high. Leaves opposite or alternate, narrowly elliptic to elliptic, somewhat fleshy, shortly petiolate; lamina usually 7–10 mm long and



226. *Einadia trigonos*
subsp. *stellulata*

229. *Einadia polygonoides*

232. *Rhagodia crassifolia*

235. *Rhagodia preissii*
subsp. *preissii*

238. *Rhagodia baccata*
subsp. *dioica*

227. *Einadia trigonos*
subsp. *leiocarpa*

230. *Rhagodia candolleana*
subsp. *candolleana*

233. *Rhagodia ulicina*

236. *Rhagodia preissii*
subsp. *obovata*

239. *Rhagodia latifolia*
subsp. *latifolia*

228. *Einadia hastata*

231. *Rhagodia candolleana*
subsp. *argentea*

234. *Rhagodia acicularis*

237. *Rhagodia baccata*
subsp. *baccata*

240. *Rhagodia latifolia*
subsp. *recta*

2–3 mm wide, acute, glabrescent above, densely mealy below with grey saucer-shaped vesicular hairs. Inflorescence spicate or paniculate, to 2.5 cm long. Perianth densely mealy. Male flowers: staminal filaments united into a fleshy disc which is woolly within. Female: terminal flowers with minute staminodes and disc, slightly woolly; lateral flowers glabrous within, lacking staminodes and disc. Fruiting perianth eventually spreading, pale fawn or red within. Seed c. 1.8 mm diam., faintly radially rugulose.

Found in southern inland W.A. and in the extreme west of S.A., in somewhat saline soil. Map 241.

W.A.: Dowerin, A. M. Ashby 2849 (AD); Lake Hinds, K. F. Kenneally 4731 (PERTH). S.A.: 12 km E of the Serpentine Lakes, D. E. Symon 12540 (ADW).

9. *Rhagodia spinescens* R. Br., *Prodr.* 408 (1810)

T: Bay XIV (Spencer Gulf), [S.A.], Mar. 1802, R. Brown; holo: BM.

R. spinescens var. *deltophylla* F. Muell., *Rep. Pl. Babbage's Exped.* 19 (1859); *R. deltophylla* (F. Muell.) A. J. Scott, *Feddes Repert.* 89: 10 (1978). T: NE of Lake Gairdner, S.A., H. Babbage; lecto: MEL 87960, *vide* P. G. Wilson, *op. cit.* 230.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 22 (1890); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 279 (1982).

Shrub to 1.5 m high. Branches divaricate, often spinescent. Leaves opposite or subopposite, ovate to deltoid or hastiform, mealy all over with discrete saucer-shaped or spherical vesicular hairs; lamina 5–20 mm long, obtuse to rounded; petiole c. ½ length of lamina. Inflorescence a panicle or reduced to a spike. Perianth densely mealy outside. Male flowers globular, 0.5–1 mm diam.; filaments united into a glabrous saucer-shaped disc. Female flowers globular to turbinate, c. 1 mm high, eventually spreading beneath fruit and 2.5–3 mm diam., becoming hard and pale red; staminodes c. 0.3 mm long, united into a glabrous or sparsely hairy disc. Berry depressed-globular, pink or red. Seed c. 1 mm diam.; testa prominently reticulate. *Spiny Saltbush*, *Berry Saltbush*.

Found from south-eastern W.A. through central Australia. Map 242.

W.A.: c. 5 km S of Reid, T. E. H. Aplin 1677 (PERTH). N.T.: Hale River plot, T. S. Henshall 930 (NT). S.A.: Tallaringa Well, T. R. N. Lothian 2689 (AD). Qld: Noonduo, S. T. Blake 10543 (BRI). N.S.W.: Woorandara Stn, E. M. Canning 3808 (CBG). Vic.: c. 8 km NNW of Kerang, H. I. Aston 559 (MEL).

This is an extremely variable species in both flower and leaf morphology. Some populations contain plants with bisexual flowers and some have plants strongly smelling of trimethylamine (bad fish).

10. *Rhagodia eremaea* Paul G. Wilson, *Nuytsia* 4: 232 (1983)

T: Rudall River W.A., 19 May 1971, A. S. George 10676; holo: PERTH; iso: CANB, K, MEL, NSW.

Rounded shrub to 2 m. Leaves alternate, ovate to elliptic; lamina 0.5–1.5 cm long, glabrescent above, mealy below with minute irregularly-shaped hairs; petiole c. ½ length of lamina. Inflorescence spicate to paniculate with the flowers uninterrupted or (in N areas) a slender spike with disjunct glomerules. Perianth densely mealy. Male flowers caducous; perianth globular, c. 1.5 mm diam.; filaments united into a thick saucer-shaped disc, pubescent within. Female flower: perianth eventually hard and spreading beneath fruit, red above; staminodes present in terminal flower, absent in the others. Seed c. 1.3 mm diam.; testa reticulate.

Found from north-western W.A. eastwards into central Australia. Map 243.

W.A.: Lorna Glen Stn, S. Hill 25 (PERTH). N.T.: Ayers Rock, G. Chippendale (NT 663). S.A.: 96 km W of Mabel Creek Homestead, T. R. N. Lothian 3778 (AD).

11. Rhagodia parabolica R. Br., *Prodr.* 408 (1810)

T: Bay XII (Spencers Gulf), [S.A.], Mar. 1802, *R. Brown*; holotype: BM.

R. reclinata Cunn. ex Moq. in DC., *Prodr.* 13(2): 51 (1849); *R. parabolica* var. *reclinata* (Cunn. ex Moq.) Domin, *Biblioth. Bot.* 89: 62 (1921). T: Liverpool Plains, N.S.W., May 1825, *A. Cunningham* 7; holotype: K.

Rounded shrub to 2 m. Leaves mostly opposite; lamina thin, very broadly elliptic to broadly or very broadly ovate, rarely obtusely hastate, acute to rounded at apex, apiculate; lamina 1.5–4 cm long, truncate to cuneate at base and passing into slender petiole half to as long as lamina, minutely mealy, becoming reddish brown with age. Inflorescence a broad pyramidal panicle 5–8 cm long. Perianth mealy, c. 1 mm diam. Male flowers: filaments united into a cupular disc densely woolly on margin. Female flower: staminodes in terminal flowers united into a cupular disc densely woolly within, in lateral flowers reduced or absent. Seed c. 1.8 mm diam.; testa with faint radial ribbing.

Found in south-eastern Qld, north-eastern N.S.W., southern Vic., southern S.A. and central Australia, growing principally on rocky hillsides and creek banks. Map 244.

N.T.: c. 0.8 km W of Ooline Rockhole, *D. J. Nelson* 1964 (MEL). S.A.: Koondoolka, *J. Z. Weber* 3053 (AD). Qld: Ooline, *S. T. Blake* 10930 (BRI). N.S.W.: Mt Hope, *G. M. Cunningham* & *J. Milthorpe* 2511 (NSW). Vic.: head of Coomadai Creek, 7 May 1944, *J. H. Willis* (MEL).

6. SCLEROBLITUM

Scleroblitum Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 495 (1934); from the Greek *scleros* (hard) and *blitum* (a related genus of Chenopodiaceae).

Chenopodium sect. *Atriplicina* Aellen, *Verh. Naturf. Ges. Basel* 41: 99 (1931). T: *Chenopodium atriplicinum* (F. Muell.) F. Muell.

Type: *Scleroblitum atriplicinum* (F. Muell.) Ulbr.

Slightly succulent, sparsely mealy herbs with numerous simple stems arising from rootstock. Leaves alternate, simple, flat, the basal ones forming a rosette. Flowers in compact clusters in axils of basal and cauline leaves; terminal flower bisexual, the others female. Tepals 4, free. Stamen 0 or 1. Stigmas 2. Pericarp thick and hard. Seed erect; embryo inverted horseshoe-shaped (around apex of seed); perisperm copious, central.

A monotypic genus endemic in Australia.

P. G. Wilson, *Scleroblitum*, *Nuytsia* 4: 197–199 (1983).

In this genus the pericarp is thick and hard while the testa is thin, a situation different from that found in *Chenopodium* and *Dysphania* in both of which the pericarp is membranous and the testa crustaceous.

Scleroblitum atriplicinum (F. Muell.) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 496 (1934)

Blitum atriplicinum F. Muell., *Trans. & Proc. Victorian Inst. Advancem. Sci.* for 1854–55: 133 (1855); *Chenopodium atriplicinum* (F. Muell.) F. Muell., *Fragm.* 7: 11 (1869). T: Cudnaka, S.A., Oct. 1850, *F. Mueller*; lecto: MEL, *vide* P. G. Wilson, *Nuytsia* 4: 197 (1983).

Euxolus enervis F. Muell., *Fragm.* 1: 140 (1859); *Amaranthus enervis* (F. Muell.) F. Muell. ex Benth., *Fl. Austral.* 5: 216 (1870). T: plains near the Darling and Murray Rivers, *J. Dallachy*; holotype: MEL.

Amaranthus tenuis Benth., *Fl. Austral.* 5: 216 (1870). T: 'Lower Darling River, [N.S.W.], Herb. F. Mueller'; iso: MEL.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 30 (1890) as *Chenopodium atriplicinum*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 280 (1982).

Somewhat succulent herb with prominent taproot. Stems prostrate or ascending. Leaves very sparsely mealy when young. Basal leaves hastate-acuminate, the lamina c. 3 cm long; petiole slender, 3–8 cm long with broad clasping base; cauline leaves becoming elliptic

and sessile upwards. Flowers shortly pedicellate. Tepals erect, imbricate, ovate, acute, c. 1.5 mm long, glumaceous. Stamen 0 or 1. Ovary glabrous. Fruiting perianth cartilaginous; tepals acuminate, c. 2.5 mm long, with keeled and sigmoid base. Utricle erect, lenticular; pericarp hard and thick. Seed erect, filling utricule and fused to pericarp; testa membranous. Mature fruit shed with surrounding perianth. *Purple Goosefoot*.

Found from southern Qld to north-western Vic. and eastern S.A., in heavy, periodically waterlogged soils. Map 245.

S.A.: c. 50 km N of Overland Corner, *D. E. Symon 3681* (ADW). Qld: Berbera, *C. T. White 12231* (BRD). N.S.W.: Pinipara Ck, *S. Jacobs 1003* (NSW). Vic.: Lake Hindmarsh, Oct. 1899, *C. Walter* (NSW).

7. MONOLEPIS

Monolepis Schrader, *Index Semin. Hort. Goett.* 1830: 4 (1830); from the Greek *mono* (one) and *lepis* (scale), referring to the solitary tepal.

Type: *M. trifida* (Trevir.) Schrader

Small glabrous or mealy annual herbs. Leaves alternate, flattened, entire or lobed. Flowers small, in axillary clusters, bisexual or female. Terminal flower of cluster: tepals 3, delicate; stamens 2; stigmas 2, slender. Lateral flowers: tepal 1; stamen 1. Utricle orbicular; pericarp hard; epicarp membranous, the mesocarp white-crystalline, endocarp crustaceous. Seed erect; testa thin; embryo almost annular, curved around apex of seed; radicle inferior; perisperm copious, central.

A genus of c. 6 species in America and Asia. One species adventive in Australia.

****Monolepis spathulata*** A. Gray, *Proc. Amer. Acad. Arts* 7: 389 (1868)

T: from North America; *n.v.*

Annual with several decumbent stems to 15 cm long. Leaves narrowly obovate, obtuse, c. 10 mm long, sparsely mealy. Flowers in compact axillary clusters. Tepals spathulate, c. 0.5 mm long. Utricle orbicular, c. 0.5 mm high.

Found in northern S.A., presumably near salt lakes; native to North America. Map 246.

S.A.: Fish Hole, c. 32 km S of Oodnadatta, *E. H. Ising 3998* (AD, NSW).

This species shows strong resemblances in its ovary and fruit to the genus *Scleroblitum*.

Trib. II. CAMPHOROSMEAE

Trib. *Camphorosmeae* Endl., *Gen. Pl.* 294 (1837).

Type: *Camphorosma* L.

Flowers axillary, solitary or paired. Perianth usually enlarged, hardened, and bearing appendages at fruiting stage. Ovary superior; stigmas papillose all over. Fruit not operculate. Testa usually membranous; embryo curved to annular; perisperm copious.

The Australian genera in this tribe are to some extent artificial, being based mainly on the more readily observable of the external characters of the fruiting perianth. These characters are extremely plastic and in many cases seemingly similar structures in different taxa would appear to have evolved independently. For this reason, these structures, while valuable in discriminating species, do not necessarily provide a basis for a natural circumscription of genera. Since a thorough study is required before this can be done the groupings of A.J.Scott, *Bot. J. Linn. Soc.* 75: 357–374 (1978) have been left largely unaltered.

8. CYCLOLOMA

Cycloloma Moq., *Chenop. Monogr. Enum.* 17 (1840); from the Greek *cyclos* (circle) and *loma* (a border), referring to the winged perianth.

Type: *C. platyphyllum* (Michaux) Moq. = *C. atriplicifolium* (Sprengel) J. Coulter

Erect annual herb. Leaves alternate, flat, dentate. Flowers bisexual or female, arranged in an open panicle. Perianth 5-lobed. Stamens 5; disc absent. Stigmas 2 or 3. Fruiting perianth chartaceous developing a broad horizontal annual wing. Utricle depressed-globose; pericarp membranous. Seed lenticular; testa crustaceous; embryo annular; perisperm central, copious.

A monotypic genus native to North America, adventive in Australia.

****Cycloloma atriplicifolium*** (Sprengel) J. Coulter, *Mem. Torrey Bot. Club* 5: 143 (1894)

Salsola atriplicifolia Sprengel, *Bot. Gart. Univ. Halle Nachtr.* 1: 35 (1801). T: not designated; *n.v.*

Erect herb c. 60 cm high. Branches sparsely woolly. Leaves sessile or shortly petiolate, ovate to oblong, 2–8 cm long, prominently sinuate-dentate. Inflorescence paniculate. Fruiting perianth depressed, crustaceous; wing annular, pale hyaline, irregularly toothed, c. 5 mm diam.

Found near Ouyen in north-western Vic. Map 247.

Vic.: Walpeup, 11 Apr. 1955, *J. Healy* (MEL).

9. BASSIA

Bassia All., *Mélanges Philos. Math. Soc. Roy. Turin* 3: 177, t. 4, fig. 2 (1766); named after Ferdinando Bassi (1710–1774), Italian naturalist and curator of the botanical garden at Bologna.

Type: *B. muricata* (L.) Asch.

Kochia Roth, *J. Bot. (Schrader)* for 1800, 1: 307 (1801); *Willemetia* Maerklin, *J. Bot. (Schrader)* for 1800, 1: 329 (1801 or 1802); *Echinopsilon* Moq., *Ann. Sci. Nat. Bot. sér.* 2, 2: 127 (1834); *Chenolea* sect. *Echinopsilon* (Moq.) J. D. Hook. in Benth. & J. D. Hook., *Gen. Pl.* 3: 60 (1880); *Bassia* sect. *Echinopsilon* (Moq.) Volkens, *Nat. Pflanzenfam.* 3(1a): 70 (1893); *Bassia* sect. *Kochia* (Roth) Kuntze in Post & Kuntze, *Lex. Gen. Phan.* 61 (1902); *Bassia* sect. *Willemetia* (Maerklin) Kuntze, *op. cit.* 62 (1902). T: *Kochia arenaria* (Maerklin) Roth

Annual or perennial herbs. Leaves alternate, small, linear to oblong, entire, somewhat fleshy. Flowers bisexual, small, sessile, solitary or clustered in axils of leaves or bracts forming a spicate inflorescence. Perianth cup-shaped, 5-lobed. Stamens 5. Style short with 2 stigmas. Fruiting perianth accrescent, chartaceous, smooth or with up to 5 horizontal spines or wings developing on back of lobes. Pericarp membranous. Seed usually horizontal; embryo annular; perisperm copious, central.

A genus of about 30 species in the Northern Hemisphere and Africa. One species introduced into Australia.

****Bassia hyssopifolia*** (Pallas) Kuntze, *Revis. Gen. Pl.* 2: 547 (1891)

Salsola hyssopifolia Pallas, *Reise Russ. Reich.* 1: 491 (1771). T: from Russia; *n.v.*

Erect annual to 1 m high. Branches slender with thin cottony indumentum when young. Leaves linear to oblanceolate, 5–10 mm long, sparsely cottony or glabrous. Flowers in axillary clusters of 2 or 3. Fruiting perianth depressed-spherical, pilose, 5-lobed, with 5 uncinately incurved spines arising from base of lobes. Seed horizontal.



Figure 29. *Rhagodia baccata*.
Photograph — B. R. Maslin.



Figure 30. *Dysphania kalpari*.
Photograph — R. W. Purdie.



Figure 31. *Maireana carnosus*.
Photograph — M. Fagg.



Figure 32. *Maireana erioclada*.
Photograph — A. S. George.

Native to eastern Europe and Asia. Occurs in a small area of north-western Vic. Map 248.

Vic.: Red Cliffs, A. C. Beaglehole 3218 (MEL); Mildura, Mar. 1979, J. H. Browne (MEL).

Bassia scoparia (L.) A. J. Scott is found as an occasional escape. It may be readily distinguished from *B. hyssopifolia* (with which it freely hybridises) by the presence of horizontal wings instead of spines on the fruiting perianth. It is a native of Europe and Asia and is grown as a garden plant in Australia.

10. MAIREANA

Maireana Moq., *Chenop. Monogr. Enum.* 95 (1840); *Kochia* sect. *Maireana* (Moq.) F. Muell., *Fragm.* 7: 12 (1869); *Bassia* sect. *Maireana* (Moq.) Volken, *Nat. Pflanzenfam.* 3(la): 70 (1893), not as to description; named after the French naturalist Charles Lemaire (1800–1871).

Type: *M. tomentosa* Moq.

Enchylaena sect. *Heterochlamys* F. Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 76 (1858); *Kochia* sect. *Duriala* R. Anderson, *Proc. Linn. Soc. New South Wales* 51: 383 (1926) *nom. inval.*; *Duriala* Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 537 (1934). T: *Enchylaena villosa* F. Muell.

Kochia sect. *Austrokochia* Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 535 (1934). T: not designated.

Bassia sect. *Spinossissimae* Ising, *Trans. Roy. Soc. S. Australia* 88: 75 (1964). T: *B. luehmannii* F. Muell.

[*Kochia auct. plur. non* Roth: R. Brown, *Prodr.* 409 (1810); G. Bentham, *Fl. Austral.* 5: 183 (1870); J. Black, *Fl. S. Australia* 2nd edn, 2: 309 (1948); J. H. Willis, *Handb. Pl. Victoria* 2: 102 (1972)]

Herbaceous to woody perennials or small shrubs, glabrous or pubescent. Leaves alternate or opposite, often succulent. Flowers bisexual, dioecious, or polygamodioecious, axillary, solitary or paired, sessile, rarely minutely bibracteolate. Perianth tube flat to cup-shaped, greatly expanding in fruit; lobes 5, usually deeply divided opposite radicle, the division sometimes extending down the tube (radicular split). Stamens 5, glabrous, exserted. Stigmas 2 or 3, slender. Fruiting perianth spongy, leathery, crustaceous or woody; tube saucer-shaped to globular, developing a horizontal papery or rarely woody wing or 5 separate wings which grow from base of each lobe; in some species accessory wings formed at base or side of tube; perianth lobes usually horizontal and obscuring utricle, rarely erect, occasionally developing erect appendages or emergences. Utricle discoid to globular; pericarp membranous to crustaceous; style weak or firm or becoming massive and hemispherical to conical. Seed horizontal; embryo circular to horseshoe-shaped; radicle enclosed to centrifugal; perisperm copious, central.

A genus of 57 species endemic in mainland Australia; rare in tropical areas. Some are important pasture species.

G. Bentham, *Kochia*, *Fl. Austral.* 5: 183–189 (1870); P. G. Wilson, A taxonomic revision of the genus *Maireana* (Chenopodiaceae), *Nuytsia* 2: 2–83 (1975).

The fruiting perianth is here sometimes called the 'fruit'; that portion of it which lies above and within the horizontal wings is called the 'upper perianth', that portion below the wings the 'tube' irrespective of its shape. The split or ridge which in some species occurs opposite the radicle is termed the radicular split or ridge.

This key is for use with specimens in fruit; although several species are dioecious, it is not practicable to prepare a separate key to male plants, or to non-fruiting female or hermaphrodite plants.

The wing (or wings) of the fruiting perianth may sometimes fail to develop. This apterous condition is particularly common in *M. microphylla*; it is also found in *M. brevifolia*.

- 1 Fruit with 5 horizontal wings surrounding upper perianth
- 2 Fruit with erect processes arising from upper perianth **10. M. lobiflora**
- 2: Fruit without erect processes
- 3 Leaves slender, glabrous, spurred at base; wings pubescent with curled hairs **2. M. cheelii**
- 3: Leaves various; wings hairy or glabrous
- 4 Leaves silky; fruit densely silky-lanate, c. 10 mm diam. **1. M. eriantha**
- 4: Leaves and fruit not as above
- 5 Flowers in pairs (tube of fruit flat or very shallow)
- 6 Wings glabrous or almost so
- 7 Wings each deeply divided, pungent, woody **3. M. luehmannii**
- 7: Wings neither deeply divided nor pungent **4. M. amoena**
- 6: Wings densely woolly **5. M. scleroptera**
- 5: Flowers solitary (wings glabrous)
- 8 Wings thin, obovate to fan-shaped
- 9 Wings equal and horizontal; leaves alternate; flowers bisexual
- 10 Leaves slender, mostly 2–4 mm long, not attenuate at base, often hairy (wing simple if present) **46. M. microphylla**
- 10: Leaves attenuate at base, glabrous
- 11 Leaves obovoid to terete, 1–5 mm long; flowers without bracteoles **6. M. brevifolia**
- 11: Leaves on older branches slender-fusiform, to 15 mm long; flowers minutely bracteolate **7. M. diffusa**
- 9: Two of the five wings smaller and sub-erect; leaves often opposite; plants usually dioecious **8. M. oppositifolia**
- 8: Wings small, imbricate, lunate, incurved or inflated on margins; slender perennial to 0.3 m high **9. M. enchylaenoides**
- 1: Fruit with a single wing surrounding upper perianth; accessory wings on tube or upper perianth may also be present
- 12 Fruit under 5 mm diam., densely silky-pilose; tube almost flat and continuous with narrow wing (small perennials)
- 13 Upper surface of fruit with an erect cup-shaped outgrowth **14. M. coronata**
- 13: Fruit without such an outgrowth
- 14 Fruit 2.5–4 mm diam., the upper surface with a pentagonal-shaped ridge **13. M. pentagona**
- 14: Fruit c. 4 mm diam., the upper surface with 5 narrow radial ridges extending from near centre to edge of wing **12. M. ciliata**
- 12: Fruit including wing mostly over 5 mm diam. or if smaller not silky-pilose
- 15 Fruit enveloped in long dense wool
- 16 Fruit shortly pedicellate, the tube turbinate; flowers in vertical rows in dense spike **16. M. eriosphaera**
- 16: Fruit sessile, the tube broadly hemispherical; flowers spirally arranged in dense spike **17. M. carnosa**
- 15: Fruit not enveloped in long wool
- 17 Fruit glabrous with large rounded soft spongy tube; upper perianth flat

CHENOPODIACEAE

Maireana

- 18 Branches with a pale fawn indumentum of dendritic hairs; leaves very slender, glaucous; horizontal wing not decurrent on tube **29. M. campanulata**
- 18: Branches with a white woolly indumentum of simple hairs; leaves fleshy, narrowly terete or fusiform; horizontal wing attached to tube by a short decurrent wing **28. M. spongiocarpa**
- 17: Fruit not with above characters combined
- 19 Tube of fruit with an expanded fleshy base; wing a narrow rim **18. M. marginata**
- 19: Tube not expanded at base or the wing obvious
- 20 Vertical wings 3–5, rarely 1, on tube or above horizontal wing
- 21 Fruit small, thin-walled, with 5 vertical radial wings above horizontal wing **15. M. dichoptera**
- 21: Fruit thick-walled, the vertical wing or wings on tube
- 22 Plant glabrous or almost so **31. M. triptera**
- 22: Plant hairy, at least on branches
- 23 Fruit with a basal horizontal wing, in addition to normal wing; leaves pubescent **30. M. polypterygia**
- 23: Fruit without a basal wing; leaves glabrous or pubescent
- 24 Leaves villous; perianth lobes erect and longer than tube **34. M. schistocarpa**
- 24: Leaves glabrous; perianth lobes not erect
- 25 Vertical wings running length of tube and united at apex with horizontal wing; perianth lobes prominently woolly-ciliate **32. M. erioclada**
- 25: Vertical wings often present only towards base of tube; perianth lobes arched and prominently tomentose **33. M. pentatropis**
- 20: No vertical wings on tube,
- 26 Horizontal wing present at base of tube similar in size and additional to normal wing **30. M. polypterygia**
- 26: No horizontal wing at base of tube which may however be expanded and hollow
- 27 Vertical processes present on upper perianth
- 28 Processes of numerous fine needle-like emergences **36. M. melanocoma**
- 28: Processes 4–6, thick or subulate
- 29 Leaves very small and condensed into glomerules along branches **39. M. glomerifolia**
- 29: Leaves well-developed
- 30 Fruit woolly all over; leaves acute, silky **11. M. lanosa**
- 30: Fruit glabrous or almost so; leaves not silky
- 31 Leaves sparsely pubescent, succulent, usually rounded at apex (divaricately branched sub-shrub) **40. M. atkinsiana**
- 31: Leaves glabrous, narrow, acute; branches erect **41. M. prosthocochaeta**
- 27: No vertical processes above wing
- 32 Plant glabrous (apart from axillary tufts of wool); slender lax plants
- 33 Upper perianth convex; wing of mature fruit 8–15 mm diam.
- 34 Leaves narrowly fusiform, basally attached; fruit to 15 mm diam., dark-coloured when dry **42. M. thesioides**
- 34: Leaves semiterete, shortly spurred at base; fruit c. 8 mm diam., straw-coloured when dry **56. M. aphylla**
- 33: Upper perianth flat; wing 10 mm or less in diam.

- 35 Leaves slender-fusiform on flowering branches; flowers minutely bracteolate **43. *M. suaedifolia***
- 35: Leaves terete; flowers ebracteolate
- 36 Leaves not fleshy; stem sparsely hairy with short straight appressed hairs **46. *M. microphylla***
- 36: Leaves fleshy; stem sparsely hairy with short woolly hairs **44. *M. decalvans***
- 32: Plant variously hairy
- 37 Leaves opposite; tube patelliform or flat
- 38 Leaves narrowed at base; wing mostly 15–23 mm diam. **38. *M. platycarpa***
- 38: Leaves sessile by a broad base, the apex recurved; wing c. 6 mm diam. **37. *M. cannonii***
- 37: Leaves all or mostly scattered
- 39 Style hard and prominently protruding in fruit; tube patelliform or flat **38. *M. platycarpa***
- 39: Not as above (usually only stigmas exerted)
- 40 Wing of fruit glabrous
- 41 Upper perianth flat or slightly concave or convex
- 42 Tube of fruit abruptly narrowed at base into a prominent terete stipe usually 2–3 mm long
- 43 Upper perianth convex, open in centre to expose utricle **56. *M. aphylla***
- 43: Upper perianth flat or slightly sunken, completely covering utricle
- 44 Hairs on leaves dendritic (i.e. with short lateral branches); stipe of fruit papillose, solid **57. *M. stipitata***
- 44: Hairs on leaves simple; stipe smooth, hollow **55. *M. appressa***
- 42: Tube not narrowed into a prominent terete stipe
- 45 Tube expanded into a hollow spongy base (perennial herb) **19. *M. excavata***
- 45: Tube not or scarcely expanded at base
- 46 Wing of fruit with a radial (radicular) slit
- 47 Leaves, branches, and flowers closely tomentose with branched hairs; leaves obovoid; tube and convex upper perianth of fruit pubescent **26. *M. astrotricha***
- 47: Leaves and branches with simple hairs or glabrous
- 48 Fruit large, the wing c. 15 mm diam. or more; tube thick-walled, turbinate
- 49 Upper perianth flat, glabrous except woolly margin to lobes **22. *M. georgei***
- 49: Upper perianth convex, pubescent
- 50 Wing to 15 mm diam.; leaves linear to narrowly terete, acute, 10–20 mm long **23. *M. convexa***
- 50: Wing to 25 mm diam.; leaves oblong-obcuneate, very thick, c. 20 mm long **25. *M. murrayana***

CHENOPODIACEAE

Maireana

- 48:** Fruit with wing 5–14 mm diam., the tube not thick-walled
- 51** Tube of fruit pubescent; upper perianth flat; leaves obovoid, fleshy **27. *M. sedifolia***
- 51:** Tube of fruit glabrous; leaves various
- 52** Leaves flattened, linear to obovate
- 53** Leaves linear, appressed-villous; upper perianth glabrous; wing with radial anastomosing veins **51. *M. villosa***
- 53:** Leaves narrowly to broadly obovate, pubescent with curled hairs; upper perianth pubescent; wing without obvious nervation **52. *M. planifolia***
- 52:** Leaves terete, semiterete, or obovoid
- 54** Fruit produced into a short terete hollow stipe at base, straw-coloured when dry
- 55** Open divaricately-branched shrub; branches striate and often spinescent; upper perianth convex and open in centre **56. *M. aphylla***
- 55:** Branches ascending, neither spinescent nor striate; upper perianth flat or sunken and completely covering utricule **55. *M. appressa***
- 54:** Fruit without a stipe-like base
- 56** Upper perianth with a convex disc, open in centre, wing not prominently crenulate
- 57** Stem striate; leaves sessile, woolly to glabrescent **56. *M. aphylla***
- 57:** Stem not obviously striate, leaves narrowed at base, glabrous **45. *M. rohrlachii***
- 56** Upper perianth flat, concave, or if convex then closed in centre
- 58** Upper perianth tomentose; wing with fine but obvious radiating nerves **54. *M. radiata***
- 58:** Fruit glabrous or sparsely villous
- 59** Branches tomentose at least on young parts, rarely glabrous; flowers not in dense spikes
- 60** Leaves tomentose
- 61** Fruit straw-coloured when dry and with a short hollow stipe **55. *M. appressa***
- 61:** Fruit almost black when dry, no stipe present **53. *M. melanocarpa***
- 60:** Leaves glabrous or sparsely villous; fruit brown when dry
- 62** Upper perianth closed in centre; tube firm **47. *M. microcarpa***
- 62:** Upper perianth open in centre (exposing utricule); tube weak
- 63** Wing 11–16 mm diam., often undulate **45. *M. rohrlachii***

- 63:** Wing c. 8 mm diam., flat **44. M. decalvans**
- 59:** Branches sparsely strigose or sparsely villous (or somewhat woolly when very young); leaves slender, 2–4 mm long; wing of fruit crenulate; flowers in dense spikes **46. M. microphylla**
- 46:** Wing of fruit continuous i.e. without a radial slit; leaves semiterete
- 64** Fruit large, the wing c. 15 mm diam.; tube turbinate, smooth **24. M. turbinata**
- 64:** Fruit small, the wing 11 mm or less in diam.; tube hemispherical to cupular
- 65** Leaves 2–5 mm long, appressed on younger branches; wing 4–6 mm diam. **48. M. ovata**
- 65:** Leaves over 5 mm long, spreading; wing usually 8–10 mm diam.
- 66** Upper perianth pubescent **50. M. integra**
- 66:** Upper perianth glabrous or almost so except ciliate lobes **49. M. tomentosa**
- 41:** Upper perianth columnar in form with large erect lobes
- 67** Leaves 2–6 mm long, shortly pubescent; no vertical wings on tube **35. M. pyramidata**
- 67:** Leaves 5–12 mm long, appressed-villous; tube with a narrow vertical wing **34. M. schistocarpa**
- 40:** Wing of fruit pubescent above
- 68** Upper perianth erect and columnar **34. M. schistocarpa**
- 68:** Upper perianth not erect
- 69** Wing up to 10 mm diam.
- 70** Perianth tube thin-walled, the base expanded into a hollow stipe; leaves semiterete, c. 10 mm long **20. M. trichoptera**
- 70:** Perianth tube with a hard boss-like base; leaves elliptic to narrowly obovate, mostly 7–12 mm long **21. M. humillima**
- 69:** Wing 15–25 mm diam., the tube turbinate, base not expanded; leaves very thick and fleshy, c. 20 mm long **25. M. murrayana**

1. *Maireana eriantha* (F. Muell.) Paul G. Wilson, *Nuytsia* 2: 19 (1975)

Kochia eriantha F. Muell., *Rep. Pl. Babbage's Exped.* 20 (1858); *Kochia villosa* var. *eriantha* (F. Muell.) C. Moore & E. Betche, *Handb. Fl. New South Wales* 110 (1893). T: Elizabeth Creek, S.A., *Babbage's Expedition*; lecto: MEL, *vide* P. G. Wilson, *loc. cit.*

?*Kochia concava* Ising, *Trans. Roy. Soc. S. Australia* 78: 112 (1955). T: Evelyn Downs, S.A., 3 Sept. 1952, *E. H. Ising 3561*; holo AD.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 57 (1890) as *Kochia eriantha*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 268, 271 fig. 47(11) (1982).

Shrub to 0.5 m high, predominantly dioecious. Branchlets tomentose, the older ones scarred with persistent leaf-bases. Leaves alternate or opposite, fleshy, very narrowly oblong, acute, obtusely trigonous in T.S., 10–30 mm long, 1.5–3 mm wide, densely silky. Flowers solitary or paired, in leafy spikes. Fruiting perianth silky-woolly forming a soft ball c. 10 mm diam.; tube broadly turbinate to cup-shaped, c. 3 mm high, with thin weak walls; wing leathery, horizontal, deeply and irregularly divided into 5 lobes; upper perianth deeply lobed, covering ovary. Fig. 33A.

Occurs in eastern S.A. north of Port Augusta and in adjacent areas in Qld and N.S.W., principally on rocky plains and hills. Map 249.

S.A.: De Rose Hill Stn, *T. R. N. Lothian* 853 (AD). Qld: 8 km E of Warri bate, 6 June 1955, *L. A. S. Johnson & E. F. Constable* (NSW). N.S.W.: Fowlers Gap, Aug. 1955, *N. Allison* (AD).

This species is very variable in the form taken by the wing of the fruiting perianth; it may be almost entire, irregularly lobed, or divided into 5 nearly equal lobes. When the fruits are paired they appear to be united and break away as one from the plant.

The type of *Kochia concava* may represent a deformed state of *Maireana eriantha* but this cannot be established from the available material.

2. *Maireana cheelii* (R. Anderson) Paul G. Wilson, *Nuytsia* 2: 20 (1975)

Kochia cheelii R. Anderson, *Proc. Linn. Soc. New South Wales* 59: 270 (1934). T: Zara, N.S.W., Dec. 1913, *E. Officer*; iso: NSW.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 266, 271 fig. 47(6) (1982).

Small erect caespitose perennial with woody stock and swollen tap-root. Branches slender, closely woolly when young. Leaves alternate, fleshy, slender, semiterete, c. 6 mm long, glabrous, very shortly spurred at base. Flowers solitary or paired, bisexual. Fruiting perianth wheel-shaped, cartilaginous to woody, somewhat woolly above, 5–6 mm diam.; tube convex but depressed in centre, 2 mm diam., strongly 10-ribbed, with a solid boss-like base; wings 5, fan-shaped, cartilaginous, horizontally radiating; upper perianth flat; radicular slit continuing down tube as a more prominent rib. Fig. 33B.

Occurs in south-western Qld and near the N.S.W.–Vic. border between Bendigo and Hay, in heavy soil. Map 250.

Qld: Nockatunga, *S. T. Blake* 11875 (BRI). N.S.W.: 48 km N of Deniliquin, *W. E. Mulham* 392 (NSW). Vic.: 32 km N of Bendigo, 29 Mar. 1947, *D. Henderson* (NSW).

3. *Maireana luehmannii* (F. Muell.) Paul G. Wilson, *Nuytsia* 2: 20 (1975)

Bassia luehmannii F. Muell., *Victorian Naturalist* 7: 47 (1890); *Austrobassia luehmannii* (F. Muell.) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 532 (1934). T: Finke River, N.T., 1886, *W. F. Schwarz*; iso: MEL.

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 70 (1891) as *Bassia luehmannii*.

Woody divaricately branched perennial to 40 cm. Branchlets woolly when young. Leaves alternate, fleshy, obovoid, c. 5 mm long, shortly sericeous, narrowed to a petiole-like base. Flowers paired, bisexual. Fruiting perianth flattened, appressed to axis; attachment broad and flat; tube short, convex, 10-ribbed; wings 5, woody, 2–3 mm long, often irregularly curved, each ± divided into 2 or more spiny lobes; upper perianth flat. Fig. 33C.

Occurs in east-central W.A., southern N.T. and northern S.A., around salt lakes. Map 251.

W.A.: Marillana Stn, *J. S. Beard* 4507 (PERTH). N.T.: Lake Neale, *P. K. Latz* 4209 (NT). S.A.: Dalhousie Springs, *D. E. Symon* 3271 (ADW).

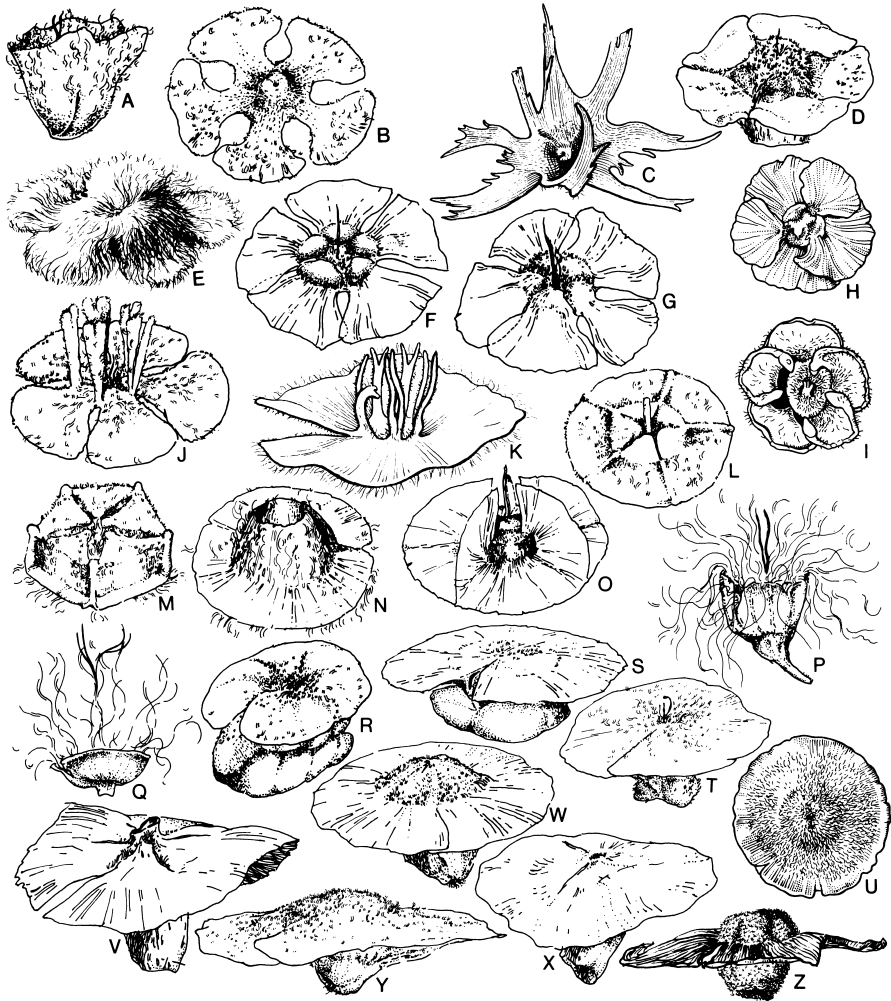


Figure 33. *Maireana* fruits. **A**, *M. eriantha* $\times 3.5$ (J. Weber 1447, AD). **B**, *M. cheelii* $\times 4$ (32 km N of Bendigo, Vic., D. Henderson, NSW). **C**, *M. luehmannii* $\times 8$. **D**, *M. amoena* $\times 6$ (P. Wilson 6479, PERTH). **E**, *M. scleroptera* $\times 6$. **F**, *M. brevifolia* $\times 4.5$ (Lake Grace, W.A., T. Aplin, PERTH). **G**, *M. diffusa* $\times 5$ (P. Wilson 6420, PERTH). **H**, *M. oppositifolia* $\times 4$ (Israelite Bay, W.A., P. Wilson, PERTH). **I**, *M. enchylaenoides* $\times 4$ (B. Whitehead 2, PERTH). **J**, *M. lobiflora* $\times 3$ (Arkaringa Ck, S.A., R. Helms, AD). **K**, *M. lanosa* $\times 4$. **L**, *M. ciliata* $\times 7$ (Mt Lyndhurst, S.A., M. Koch 122, MEL). **M**, *M. pentagona* $\times 5$ (Wimmera, Vic., J. Eckert, MEL). **N**, *M. coronata* $\times 5.5$ (Evelyn Downs, S.A., E. Ising, AD). **O**, *M. dichoptera* $\times 4.5$ (Tambo, Qld, E. Schneider, MEL). **P**, *M. eriosphaera* $\times 4.5$ (P. Wilson 10564, PERTH). **Q**, *M. carnosa* $\times 5$ (A. Ashby 2597, PERTH). **R**, *M. marginata* $\times 6$ (P. Wilson 7086, PERTH). **S**, *M. excavata* $\times 4$ (R. Wallace 186, MEL). **T**, *M. trichoptera* $\times 3$ (A. George 4151, PERTH). **U**, *M. humillima* $\times 2.5$ (W. Watts $\times 1028$, MEL). **V**, *M. georgei* $\times 4$ (K. Newbey 1544, PERTH). **W**, *M. convexa* $\times 2.5$ (F. Sharr 2731, PERTH). **X**, *M. turbinata* $\times 2.5$ (P. Wilson 7595, PERTH). **Y**, *M. murrayana* $\times 2.5$ (D. Wilcox 164, PERTH). **Z**, *M. astrotricha* $\times 2$. **H**, **I**, **U** drawn by M. Menadue. **C**, **E**, **K**, **Z** reproduced by permission from J. Jessop (ed.), *Fl. Centr. Australia* fig. 83 (1981). Others reproduced by permission from *Nuytsia* 2(1): figs 2–10 (1975). Some vouchers not recorded.

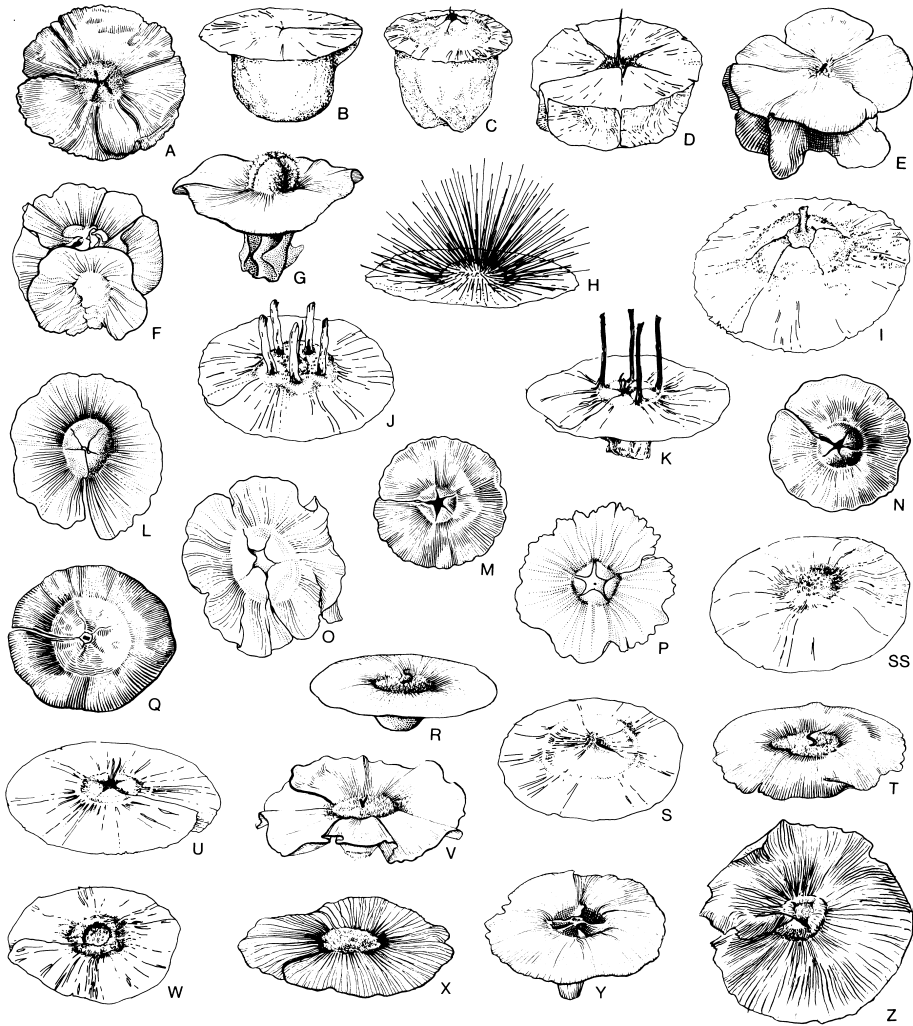


Figure 34. *Maireana* fruits. **A**, *M. sedifolia* $\times 2.5$. **B**, *M. spongiocarpa* $\times 1.5$ (N. Lothian 4595, AD). **C**, *M. campanulata* $\times 2$ (R. Kuchel 1085, PERTH). **D**, *M. polypterygia* $\times 2.5$ (A. George 1250, PERTH). **E**, *M. triptera* $\times 3.5$. **F**, *M. erioclada* $\times 1.5$ (A. George 8501, PERTH). **G**, *M. pentatropis* $\times 2.5$. **H**, *M. melanocoma* $\times 2.5$ (A. George 999, PERTH). **I**, *M. platycarpa* $\times 1.5$ (Edah, W.A., C. Malcolm, PERTH). **J**, *M. glomerifolia* $\times 2.5$ (P. Wilson 8826, PERTH). **K**, *M. prosthocochaeta* $\times 1.5$ (Mt Phillips Stn, R. O'Farrell, PERTH). **L**, *M. thesioides* $\times 2$ (R. O'Farrell 31, PERTH). **M**, *M. suaedifolia* $\times 2.5$ (N. of Renmark, S.A., J. Cleland, AD). **N**, *M. decalvans* $\times 2$ (B. Whitehead 2, PERTH). **O**, *M. rohrlachii* $\times 1.5$ (Goyder, S.A., H. Cooper, AD). **P**, *M. microphylla* $\times 3.5$ (W. Barton 258, MEL). **Q**, *M. microcarpa* $\times 4.5$. **R**, *M. ovata* $\times 5$. **S-SS**, *M. tomentosa*. **S**, subsp. *tomentosa* $\times 4$ (P. Wilson $\times 10486$, PERTH); **SS**, subsp. *urceolata* $\times 4.5$ (Beltana, S.A., J. Cleland, AD). **T**, *M. integra* $\times 2.5$. **U**, *M. villosa* $\times 3$. **V**, *M. planifolia* $\times 3$. **W**, *M. melanocarpa* $\times 4.5$ (between Flinders Ra. & Lake Torrens, S.A., P. Richards, MEL). **X**, *M. radiata* $\times 6$. **Y**, *M. appressa* $\times 2.5$. **Z**, *M. aphylla* $\times 3.5$. **F**, **L**, **M-P** drawn by M. Menadue. **A**, **E**, **G**, **Q**, **R**, **T**, **V**, **X-Z** reproduced by permission from J. Jessop (ed.), *Fl. Centr. Australia* fig. 83 (1981). Others reproduced by permission from *Nuytsia* 2(1): figs 2-10 (1975). Some vouchers not recorded.

4. Maireana amoena (Diels) Paul G. Wilson, *Nuytsia* 2: 21 (1975)

Kochia amoena Diels, *Bot. Jahrb. Syst.* 35: 183 (1904). T: near Bullabulling, W.A., Oct., *L. Diels* 5200; holo: B, now destroyed.

Small brittle shrub to 40 cm high. Branchlets woolly when young. Leaves fleshy, globular to ovoid or terete, 5–15 mm long, glabrous to sericeous. Flowers paired, bisexual. Fruiting perianth glabrescent, woolly or pilose; base angular, truncate; tube short, hemispherical, woody, rarely spongy; wings 5, horizontal, oblong to fan-shaped, usually 1.5–3 mm long, rarely smaller, papery to coriaceous or spongy, rarely almost absent; upper perianth coriaceous to spongy, usually with 5 radial ridges. Fig. 33D.

Widespread in W.A. from the latitude of Carnarvon S to Norseman, usually on sandy rises around salt lakes. Map 252.

W.A.: Dundas Rocks, *A. C. Beauglehole* 13210 (CANB, NSW, PERTH); 11 km E of Carnegie Homestead, *A. S. George* 5521 (PERTH).

5. Maireana scleroptera (J. Black) Paul G. Wilson, *Nuytsia* 2: 21 (1975)

Kochia scleroptera J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 46: 568 (1922). T: Alberga River, N.T., June 1913, *Miss Staer*; lecto: AD, *vide* P. G. Wilson, *loc. cit.*

Prostrate to erect perennial to 30 cm high with a woody base. Branches slender, woolly. Leaves alternate, narrowly oblong to narrowly obovate, usually 5–10 mm long, silky to almost glabrous. Flowers bisexual, paired, densely woolly. Fruiting perianth cartilaginous to woody, woolly all over; tube convex, 10-ribbed, c. 2 mm diam.; wings 5, horizontal, cartilaginous, broadly oblong, flat, crenulate on margin, 1–2 mm long; upper perianth open in centre, thick and hard, forming a discoid rim. Fig. 33E.

Found in central Australia usually in sandy loam. Map 253.

W.A.: Wingelina, *A. S. George* 8762 (PERTH). N.T.: c. 10 km S of Alice Springs, *D. J. Nelson* 1707 (NT). S.A.: c. 58 km SE of Everard Park Stn, *D. E. Symon* 2706 (ADW).

6. Maireana brevifolia (R. Br.) Paul G. Wilson, *Nuytsia* 2: 22 (1975)

Kochia brevifolia R. Br., *Prodr.* 409 (1810); *Salsola brachyphylla* Sprengel, *Syst. Veg.* 1: 924 (1824).

T: Bay XI, south coast, [S.A.], 7 Mar. 1802, *R. Brown*; holo: BM.

Suaeda tamariscina Lindley in T. Mitch., *J. Exped. Trop. Australia* 239 (1848); *Enchylaena tamariscina* (Lindley) Druce, *Bot. Soc. Exch. Club Brit. Isles* Suppl. 2: 621 (1917); *Kochia tamariscina* (Lindley) J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 47: 368 (1923). T: locality unknown, 18 July 1846, *T. L. Mitchell* 196; holo: CGE; iso: AD, MEL.

Kochia thymifolia Lindley in T. Mitch., *J. Exped. Trop. Australia* 56 (1848). T: Mara Creek, N.S.W., 12 Feb. 1846, *T. L. Mitchell*; holo: CGE.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 43 (1890) as *Kochia brevifolia*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 266, 271 fig. 47(4) (1982).

Shrub to 1 m high. Branches slender, striate, sparsely woolly. Leaves alternate, obovoid to narrowly fusiform, 2–5 mm long, fleshy, narrowed into a short petiole, glabrous. Flowers bisexual, solitary, ebracteolate, glabrous except woolly-ciliate lobes. Fruiting perianth glabrous; tube shallowly hemispherical, thin-walled, c. 2 mm diam.; wings 5, horizontal, thin, fan-shaped, 2–3 mm long, with delicate brown venation when dry; perianth lobes thick and fleshy, sharply demarcated from wings. *Small-leaf Bluebush*, *Eastern Cotton Bush*. Fig. 33F.

Found in all mainland States, mostly S of 26°S lat., in light to heavy sometimes somewhat saline soil. An early coloniser of disturbed lands. Map 254.

W.A.: c. 14 km S of Pingrup, *J. S. Beard* 3174 (PERTH). N.T.: Hermannsburg, *G. F. Mill* 64 (MEL). S.A.: Cape Jervis, *D. Hunt* 2820 (AD). N.S.W.: Macquarie Marshes, *K. Pajmans* 3412 (CANB).

7. *Maireana diffusa* Paul G. Wilson, *Nuytsia* 2: 23 (1975)

T: 1 km W of Dukin, W.A., 13 Mar. 1968, *P. G. Wilson 6461*; holotype: PERTH; isotypes: AD, CANB, K, MEL, NSW.

Erect shrub to 1 m. Branches slender, striate, sparsely woolly when young. Leaves alternate, obovoid and c. 3 mm long on short lateral branches, narrowly fusiform and up to 15 mm long on the erect branches, sparsely pubescent to glabrous, narrowed into a short flattened petiole. Flowers bisexual, solitary, glabrous, subtended by a pair of bracteoles c. 0.7 mm long. Fruiting perianth glabrous; tube convex, thin-walled, c. 2 mm diam.; wings 5, horizontal, thin, fan-shaped, c. 2 mm long, with delicate brown venation when dry; perianth lobes thickened but not fleshy, continuous with wings. Fig. 33G.

Found in south-western W.A. between Dalwallinu and Merredin, in saline soil. Map 255.

W.A.: c. 3 km W of Kununoppin, Dec. 1965, *C. V. Malcolm* (PERTH).

8. *Maireana oppositifolia* (F. Muell.) Paul G. Wilson, *Nuytsia* 2: 23 (1975)

Kochia oppositifolia F. Muell., *Trans. & Proc. Victorian Inst. Advancem. Sci.* 1: 134 (1855). T: Spencer Gulf, S.A., 1851, *F. Mueller*; holotype: MEL.

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 42 (1890) as *Kochia oppositifolia*.

Compact shrub to 1 m high, usually dioecious. Branches finely woolly when young. Leaves opposite (alternate and in compact glomerules in inland variant), sessile, spurred, narrowly ovate, to 4 mm long (deltoid and c. 1 mm long when clustered), obtusely trigonous in T.S., shortly sericeous to almost glabrous. Flowers solitary. Fruiting perianth glabrous except lobes; tube broadly obconical to convex, 1.5–2 mm diam., thin-walled; wings 5, thin, fan-shaped, prominently veined, spreading unevenly (the smaller two sub-erect), c. 7 mm diam. Fig. 33H.

Found along the south coast of W.A. and S.A. on mud flats, also around inland salt lakes in western Vic. and southern W.A. Map 256.

W.A.: 31 km S of Mundrabilla Stn, *C. Malcolm 655* (PERTH). S.A.: Price, *B. Copley 3039* (AD). Vic.: Mildura 25 Jan. 1937, *W. Zimmer* (MEL).

The variant found in inland area of W.A. has divaricate branches with small alternate leaves clustered into compact glomerules. In fruit characters it is identical with the coastal variant with erect branches and opposite leaves.

9. *Maireana enchylaenoides* (F. Muell.) Paul G. Wilson, *Nuytsia* 2: 24 (1975)

Enchylaena villosa F. Muell., *Trans. & Proc., Philos. Inst. Victoria* 2: 76 (1858); *Chenolea enchylaenoides* F. Muell., *Fragm.* 10: 92 (1876) *nom. illeg.*; *Bassia enchylaenoides* F. Muell., *Syst. Census Austral. Pl.* 30 (1882) non *B. villosa* Wallich ex Don (1837); *Kochia crassiloba* R. Anderson, *Proc. Linn. Soc. New South Wales* 51: 383 (1926) *nom. illeg.*; *Chenolea villosa* (F. Muell.) Ewart, *Fl. Victoria* 458 (1931); *Duriala villosa* (F. Muell.) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 537 (1934); [*Duriala crassiloba* Ulbr. ex N. Beadle, *Stud. Fl. N.E. New South Wales* pt. 2: 199 (1972) *nom. inval.*]. T: 'In loamy plains near Adelaide [S.A.] and in Bacchus Marsh [Vic.]', *F. Mueller*; syn: MEL.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 84 (1891) as *Bassia enchylaenoides*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 267, 271 fig. 47(10) (1982).

Perennial herb to 20 cm high. Branches decumbent to erect, slender, sparsely puberulous to villous, arising from a woody rootstock. Leaves alternate, narrowly oblong-elliptic, mostly 4–10 mm long, sparsely pubescent to villous. Flowers solitary, bisexual, sometimes subtended by a pair of small triangular bracteoles. Fruiting perianth sparsely puberulous, drying black; tube slightly convex, thin-walled, c. 3 mm diam.; wings 5, only slightly exceeding tube, c. 4 mm diam., coriaceous, each broadly lunate and unevenly imbricate, the margins sometimes incurved and somewhat inflated. Fig. 33 I.

Found in southern Qld, N.S.W., Vic., south-eastern S.A. and south-western W.A., generally in woodland on loamy soil. Map 257.

W.A.: Fitzgerald River Valley, *A. S. George 10012* (PERTH). S.A.: Moolooloo Stn, Oct. 1920, *B. Beck* (AD). Qld: Gilruth Plains, *G. H. Allen 442* (CANB). N.S.W.: Dubbo, *E. Betche 103* (MEL). Vic.: Goulburn Valley, *J. H. Willis 10* (MEL).

10. *Maireana lobiflora* (F. Muell. ex Benth.) Paul G. Wilson, *Nuytsia* 2: 25 (1975)

Kochia lobiflora F. Muell. ex Benth., *Fl. Austral.* 5: 184 (1870). T: Darling River, N.S.W., Victorian Exploring Expedition, 1 Nov. 1860, *H. Beckler*; iso: MEL.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 45 (1890) as *Kochia lobiflora*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 270, 271 fig. 47(18) (1982).

Decumbent perennial herb with woody rootstock, or small shrub to 50 cm high. Branches shortly woolly. Leaves alternate, linear to very narrowly elliptic, mostly 7–15 mm long. Flowers solitary, bisexual. Fruiting perianth leathery to crustaceous, woolly; tube slightly convex; wing horizontal, of 5 spatulate to fan-shaped lobes (sometimes contiguous), in all to 10 mm diam.; upper perianth with 4+2 erect processes alternating with the perianth lobes, the contiguous pair placed either side of radicular slit; processes narrowly spatulate to clavate, to 4 mm long, frequently expanded or lacerated at apex or deeply bilobed. Fig. 33J.

Found from the southern half of W.A. eastwards to western N.S.W. and Vic. Map 258.

W.A.: c. 22 km E of Carnegie Homestead, *A. S. George 5522* (PERTH). S.A.: Yudnapinna, *F. M. Hilton 681* (AD). N.S.W.: 24 km WSW of Broken Hill, *J. C. De Nardi 308* (NSW). Vic.: c. 5 km S of Chinkapook, *N. Macfarlane 792* (PERTH).

The southern variant found from the Nullarbor Plain eastwards to Victoria is a decumbent perennial with small densely woolly fruits; the more northern variant is a small erect shrub.

11. *Maireana lanosa* (Lindley) Paul G. Wilson, *Nuytsia* 2: 26 (1975)

Kochia lanosa Lindley in T. Mitch., *J. Exped. Trop. Australia* 88 (1848). T: Narran Swamp, N.S.W., 8 Mar. 1846, *T. L. Mitchell 39*; holo: CGE.

Kochia lanosa var. *minor* Benth., *Fl. Austral.* 5: 184 (1870). T: Murchison R., W.A., *A. Oldfield*; iso: MEL 36144.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 46 (1890) as *Kochia lanosa*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 271 fig. 47(17) (1982).

Small divaricately-branched shrub to 50 cm high. Branches woolly. Leaves alternate, elliptic to narrowly obovate, c. 4 mm long in upper (fruiting) branches, 10–20 mm long in lower branches, silky pubescent. Flowers solitary, bisexual, densely woolly. Fruiting perianth sparsely woolly, leathery to crustaceous; tube slightly convex; wing simple, horizontal, 7–12 mm diam. with a single radial (radicular) slit; upper perianth with 4+2 erect processes alternating with the perianth lobes, the contiguous pair placed either side of the radicular slit, the processes linear to subulate, 3–4 mm long. Fig. 33K.

Found from north-western W.A. to south-western Qld and central N.S.W. in sandy and loamy soils. Map 259.

W.A.: c. 53 km S of Learmonth, *A. S. George 6536* (PERTH). N.T.: Finke R., *F. Kempe 194* (MEL). S.A.: Nilpena, 2 May 1891, *R. Helms* (AD). Qld: Yappunga, near Thargomindah, Apr. 1885, *Spencer* (MEL).

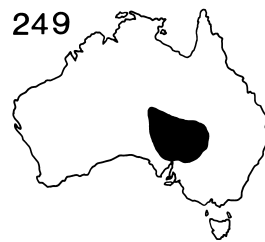
This species appears to intergrade with *M. lobiflora* in north-western W.A.

12. *Maireana ciliata* (F. Muell.) Paul G. Wilson, *Nuytsia* 2: 27 (1975)

Kochia ciliata F. Muell., *Rep. Pl. Babbage's Exped.* 20 (1858). T: 'Wonnomulla, Emu Springs, between Stuart's Creek and Margaret Creek', S.A., *Babbage's Expedition*; holo: MEL 42008.

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 266, 271 fig. 47(7) (1982).

Decumbent to erect perennial with woody base and slender taproot, to 10 cm high. Branches slender, woolly. Leaves alternate, narrowly oblong, c. 10 mm long, silky.



241. *Rhagodia drummondii*
 244. *Rhagodia parabolica*
 247. *Cycloloma atriplicifolium*
 250. *Maireana cheelii*
 253. *Maireana scleroptera*

242. *Rhagodia spinescens*
 245. *Scleroblitum atriplicinum*
 248. *Bassia hyssopifolia*
 251. *Maireana luehmannii*
 254. *Maireana brevifolia*

243. *Rhagodia eremaea*
 246. *Monolepis spathulata*
 249. *Maireana eriantha*
 252. *Maireana amoena*
 255. *Maireana diffusa*

Flowers solitary, bisexual, densely villous, often congested into leafy spikes. Fruiting perianth lenticular, pentagonal in outline, c. 3 mm diam., horny, silky-villous all over; lower surface convex in centre, otherwise flat and wing-like with 5 prominent radiating intertepaline ribs extending to angles of wing. *Fissure Weed*. Fig. 33L.

Found in central and north-eastern S.A. and far western N.S.W. Map 260.

S.A.: 34 km E of Dalhousie Springs, *T. R. N. Lothian* 1931 (AD); 16 km E of Mundy Creek, *D. E. Symon* 5594B (ADW). N.S.W.: Fowlers Gap Stn, 29 Aug. 1952, *E. G. Cuthbertson* (NSW); 45 km SSE of Milparinka, *J. C. De Nardi* 816 (NSW).

13. *Maireana pentagona* (R. Anderson) Paul G. Wilson, *Nuytsia* 2: 27 (1975)

Kochia pentagona R. Anderson, *Proc. Linn. Soc. New South Wales* 51: 385 (1926); *Chenolea pentagona* (R. Anderson) Ewart, *Fl. Victoria* 458 (1931). T: Trangie, N.S.W., 16 Oct. 1924, *A. Morris* 1288; holotype: NSW; iso: ADW.

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 271 fig. 47(22), 272 (1982).

Prostrate to decumbent perennial with a small woody base and a long fleshy taproot, c. 10 cm high. Branches woolly. Leaves alternate, linear, mostly 7–12 mm long, appressed-villous. Fruiting perianth woolly-villous, discoid, pentagonal in outline, 2.5–4 mm diam. (without indumentum), cartilaginous to crustaceous; lower surface convex, continuous with the narrow horizontal rim (wing) which is sometimes divided into 5 short truncate lobes; upper surface raised into a thick hard pentagonal ridge or platform formed from the convex bases of the perianth lobes, the centre sunken. *Hairy Bluebush*. Fig. 33M.

Found in southern N.S.W., western Vic. and south-eastern S.A., also N of Carnarvon in W.A., generally in heavy soil. Map 261.

W.A.: 120 km N of Carnarvon, *J. S. Beard* 3511 (PERTH). S.A.: Loveday, 22 Aug. 1937, *E. H. Ising* (AD). N.S.W.: 88 km N of Deniliquin, *T. M. Whaité* 1722 (NSW). Vic.: Wyperfeld National Park, *A. C. Beaglehole* 29464 (MEL, PERTH).

14. *Maireana coronata* (J. Black) Paul G. Wilson, *Nuytsia* 2: 28 (1975)

Kochia coronata J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 41: 43 (1917). T: Cootanoorina Creek, S.A., 7 May 1891, *R. Helms*; holotype: AD; iso: MEL.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 58 (excluding left-hand fig. 7) (1890) as *Kochia ciliata*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 266, 271 fig. 47(8) (1982).

Decumbent to erect perennial with woody base and slender taproot, c. 15 cm high. Branches woolly. Leaves alternate, linear, 7–20 mm long, appressed-villous or silky. Flowers solitary, bisexual, densely silky-villous, often in congested leafy spikes. Fruiting perianth like an inverted academic hat ('mortar-board'), horny, silky-villous; base flat and continuous with a narrow circular wing, c. 4 mm diam.; upper surface with a cup-shaped outgrowth (corona) to 2.5 mm high; radicular slit extending through corona to notched margin of wing. Fig. 33N.

Found in central and eastern Australia from the vicinity of Alice Springs E to the Great Dividing Range and as far south as Dubbo, N.S.W., usually in heavy soil. Map 262.

N.T.: Charlotte Waters, *G. Chippendale* 1330 (NT). S.A.: Evelyn Downs, 23 Sept. 1955, *E. H. Ising* (AD). Qld: Charleville, *S. T. Blake* 5345 (NSW). N.S.W.: Pilliga, *H. M. R. Rupp* 16 (NSW).

Very similar in appearance to *M. ciliata* (F. Muell.) Paul G. Wilson and *M. pentagona* (R. Anderson) Paul G. Wilson but readily distinguished by the 'mortar-board' fruit.

15. *Maireana dichoptera* (F. Muell.) Paul G. Wilson, *Nuytsia* 2: 28 (1975)

Kochia dichoptera F. Muell., *Fragm.* 8: 37 (1873). T: Bowen Downs, Qld, *C. W. Birch*; holo: MEL.

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 41 (1890) as *Kochia dichoptera*.

Erect perennial to 20 cm high with woody base. Branches slender, woolly. Leaves alternate, linear, 7–25 mm long, appressed-villous. Flowers solitary or paired, bisexual, shortly tomentose. Fruiting perianth thin-walled, sparsely pilosulose, straw-coloured when dry, with 6 delicate radially-positioned vertical wings on top of a horizontal wing; tube flat, 2.5 mm diam., 6-veined; horizontal wing simple, circular, c. 7 mm diam., continuous with tube; vertical wings 4+2 on upper side of perianth, intertepaline (the contiguous pair placed either side of the radicular slit) attached to horizontal wing and to arched upper perianth, c. 3.5 mm high; upper perianth forming a convex crustaceous ring with short inflexed membranous lobes. Fig. 33 O.

Found in central and southern Qld. Map 263.

Qld: Tambo, Barcoo, 1870, *E. Schneider* (MEL); Roma, *S. T. Blake 13297* (BRI).

16. *Maireana eriosphaera* Paul G. Wilson, *Nuytsia* 2: 29 (1975)

T: upper Rudall River area, 22°35'S, 122°10'E, W.A., 16 Aug. 1971, *P. G. Wilson 10564*; holo: PERTH; iso: CANB, K, NSW.

Erect loosely branched perennial to 30 cm high, woody towards base. Branches woolly. Leaves alternate, linear to narrowly oblong, acute, to 10 mm long, silky. Flowers solitary, bisexual, densely silky-villous, in vertical rows in dense terminal spikes 2–10 cm long. Fruiting perianth on a slender pedicel 0.5–1 mm long, densely covered with long silky wool forming a soft ball c. 10 mm diam.; tube thin, hemispherical to turbinate, 1.5–2.5 mm high; margin of tube thickened and undulate or of 5 short rounded erect divisions (wing lobes), continuous with tube or sometimes these forming a very narrow horizontal wing; upper perianth of 5 acuminate lobes c. 1 mm long, inflexed or eventually raised by dense indumentum arising from pericarp and overflowing tube. Fig. 33P.

Found in arid areas of W.A. from the Rudall River S to Norseman, in clay, at the base of breakaways and near margins of salt lakes. Map 264.

W.A.: 80 km S of Coolgardie, *A. C. Beaglehole 13251* (PERTH); Menzies, *D. W. D. Campbell 549* (PERTH).

Very similar to *M. carnosa* in which the flowers are spirally arranged in the spike.

17. *Maireana carnosa* (Moq.) Paul G. Wilson, *Nuytsia* 2: 30 (1975)

Echinopsilon carnosus Moq. in DC., *Prodr.* 13(2): 136 (1849); *Chenolea carnosa* (Moq.) Benth., *Fl. Austral.*, 5: 190 (1870); *Bassia carnosa* (Moq.) F. Muell., *Syst. Census Austral. Pl.* 30 (1882); *Kochia carnosa* (Moq.) R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 353 (1923). T: near the Swan River, W.A., *J. Drummond 126* [?246, *fide* P. G. Wilson, *loc. cit.*]; ?iso (*Drummond 246*): K, MEL.

Bassia lanuginosa C. White, *Queensland Agric. J.* ser. 2, 15: 216 (1921). T: 26 miles (c. 42 km) E of the junction of the Mayne and Diamantina Rivers, Qld, *F. Pether*; iso: MEL, NSW.

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 83 (1891) as *Bassia carnosa*.

Erect perennial to 30 cm high, woody at base. Branches woolly. Leaves fleshy, alternate, rarely opposite, narrowly to broadly oblong, acute, to 10 mm long, the floral leaves often broader than stem leaves, silky to woolly or almost glabrous. Flowers solitary, bisexual, spirally arranged in dense leafy spikes, densely covered in long floccose wool. Fruiting perianth sessile, enveloped in a thick mass of wool to 8 mm diam.; tube shallowly hemispherical, 2–3 mm diam., crustaceous; wing circular, horizontal, 0.5 mm wide, with a single radial (radicular) slit; upper perianth flat or slightly inflexed in centre, crustaceous. *Cottony Bluebush*. Fig. 33Q.

Found in south-eastern Qld, northern S.A. and temperate and subtropical regions of the arid areas of W.A.; usually in heavy soil, often around salt lakes. Map 265.

W.A.: Lake Seabrook, *K. Newbey* 5876 (PERTH); Nullagine, *H. Demarz* 8407 (PERTH). S.A.: 48 km W of Oodnadatta, *R. A. Perry* 5542 (CANB).

18. *Maireana marginata* (Benth.) Paul G. Wilson, *Nuytsia* 2: 30 (1975)

Enchylaena marginata Benth., *Fl. Austral.* 5: 182 (1870). T: Swan River, W.A., *J. Drummond 1st. coll.*; holotype: K.

?*Enchylaena micrantha* Benth., *Fl. Austral.* 5: 181 (1870); *Bassia micrantha* (Benth.) F. Muell., *Syst. Census Austral. Pl.* 30 (1882). T: Western Australia, *J. Drummond* 4: 253; holotype: K; isotype: MEL, both specimens vegetative.

Kochia massonii Ewart, *Proc. Roy. Soc. Victoria* ser. 2, 20: 82 (1907). T: Cowcowing, W.A., Sept. 1904, *M. Koch s.n.*; holotype: MEL.

Prostrate to decumbent perennial with a woody stock. Branches slender, somewhat woolly when young. Leaves alternate, linear to narrowly oblong, 5–10 mm long, fleshy, villous. Flowers solitary, bisexual, subtended by a pair of deltoid bracteoles c. 1 mm long. Fruiting perianth when fresh depressed barrel-shaped, constricted in middle, c. 3 mm high, 4–5 mm diam. at apex, fleshy, flat above and below, papillose on sides and puberulous above; tube bulging in lower half, smooth in upper half with 10 rounded ribs (when dry the lower half forms an expanded slightly spongy base, the upper half becomes broadly turbinate and thin-walled); wing a very narrow horizontal extension to the flat upper perianth. Fig. 33R.

Found in south-western W.A. from Morawa SE to Ravensthorpe, in heavy loam of eucalypt woodlands. Map 266.

W.A.: Morawa, July 1903, *C. Andrews* (PERTH); Meckering, *P. G. Wilson* 11668 (PERTH).

19. *Maireana excavata* (J. Black) Paul G. Wilson, *Nuytsia* 2: 31 (1975)

Kochia excavata J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 47: 368 (1923). T: Spalding, S.A., 4 Nov. 1920, *J. M. Black*; holotype: AD; isotype: NSW.

Kochia villosa var. *humilis* Benth., *Fl. Austral.* 5: 187 (1870); *K. tomentosa* var. *humilis* (Benth.) J. Black, *Fl. S. Australia* 197 (1924) not as to description. T: 'desert country of Victoria and adjoining portion of N.S. Wales'; synonym: *J. Dallachy*, MEL 2114; Darling River, MEL 42137; Skipton, *W. Whan*, MEL 43929.

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 271 fig. 47(31), 275 (1982).

Decumbent perennial with stout taproot. Branches loosely woolly when young. Leaves alternate, narrowly oblong-elliptic to elliptic, 7–12 mm long, tawny appressed-villous. Flowers solitary, bisexual, with or without a pair of narrowly-oblong bracteoles c. 1.5 mm long. Fruiting perianth fleshy when fresh, depressed barrel-shaped, constricted in middle, c. 3 mm high, flat above, glabrous; tube when dry with upper half very broadly turbinate to convex, 10-ribbed, thin-walled, the lower half expanded into a spongy hollow base enclosing the cushion-shaped receptacle; wing thin, horizontal, circular, entire, c. 10 mm diam., faintly nerved and with a single radial (radicular) slit; upper perianth flat, glabrous except woolly-ciliate margin to perianth lobes. *Bottle Bluebush*. Fig. 33S.

Found in south-eastern S.A., southern N.S.W. near Wagga Wagga, and western Vic., in heavy soil. Map 267.

S.A.: Wilpena Pound, *D. E. Symon* 1419 (ADW). N.S.W.: 48 km SW of Darlington Point, *D. L. Henderson* 501 (NSW). Vic.: Rainbow, *T. S. Hart* 4 (MEL).

This species is similar in habit to *M. humillima* and the two are often found growing together. *Maireana humillima* may be recognised by its cup-shaped perianth tube and woolly upper surface of the fruit.

20. *Maireana trichoptera* (J. Black) Paul G. Wilson, *Nuytsia* 2: 31 (1975)

Kochia excavata var. *trichoptera* J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 47: 368 (1923). T: Wattaker Stn (=Wartaka), S.A., 16 Sept. 1912, *S. A. White*; lectotype: AD, *vide* P. G. Wilson, *loc. cit.*

Kochia villosa var. *lasioptera* F. Muell., *Fragm.* 7: 12 (1869). T: Goginga Glen (= Scrope Range),



Figure 35. *Maireana georgei*. A, habit $\times 0.7$. B, terminal leaves $\times 4$. C, flower $\times 12$. D, flower with perianth removed $\times 12$. E, L.S. ovary $\times 12$. F–H, fruiting perianth $\times 2.5$; F, from side; G, from above; H, L.S. I, seed $\times 5$; (P. Wilson 9900, PERTH).

N.S.W., 17 June 1861, *H. Beckler*; lecto: MEL, *vide* P. G. Wilson, *loc. cit.*

?*Chenolea dallachyana* Benth., *Fl. Austral.* 5: 191 (1870); *Bassia dallachyana* (Benth.) F. Muell., *Syst. Census Austral. Pl.* 30 (1882). T: Murray River, *J. Dallachy*; holo: K; iso: MEL.

Erect perennial to 50 cm high, woody at base. Branches woolly. Leaves fleshy, semiterete, 5–10 mm long, 1.5–2 mm wide, appressed-pubescent. Flowers solitary, bisexual, often spicate. Fruiting perianth pubescent all over or only on upper surface, often red when fresh; tube (when fresh) c. 4 mm high, medially constricted, the lower half expanded into an excentric fleshy hollow stipe enclosing the receptacle, upper half shortly turbinate (when dry the lower half shrivels and becomes firm or spongy, the upper half becomes shallowly convex and papery); wing simple horizontal, thin, reticulately veined, c. 10 mm diam. with a single radial slit; upper perianth flat, pubescent. Fig. 33T.

Widespread in western N.S.W., western Vic., S.A., temperate W.A. and southern portion of N.T. Map 268.

W.A.: Caiguna, A. S. *George 8656* (PERTH). N.T.: Mt Riddock Stn, P. K. *Latz 3165* (NT). S.A.: Brachina Gorge, J. Z. *Weber 2592* (AD). N.S.W.: Fowlers Gap Experimental Station, J. *Carter* (NSW121618). Vic.: 5 km N of Red Cliffs, 13 Oct. 1972, T. *Henshall* (AD).

The type of *Chenolea dallachyana* is without fruits and cannot be identified with certainty; it is certainly not conspecific with *Eriochiton sclerolaenoides* as has been suggested by R. H. Anderson, *Proc. Linn. Soc. New South Wales* 48: 327 (1923) and E. H. Ining, *Trans. Roy. Soc. S. Australia* 88: 72 (1964).

21. *Maireana humillima* (F. Muell.) Paul G. Wilson, *Nuytsia* 2: 32 (1975)

Kochia humillima F. Muell., *Fragm.* 9: 168 (1875). T: by the Murray, Murrumbidgee, Campaspe and Edward rivers, F. *Mueller*; syn: 'Campaspe' (MEL, NSW); 'Edwards' (AD, MEL).

Illustrations: F. *Mueller*, *Iconogr. Austral. Salsolac. Pl.* t. 56 (1890) as *Kochia humillima*; G. M. *Cunningham et al.*, *Pl. W. New South Wales* 269, 271 fig. 47(15) (1982).

Decumbent perennial with a woody base. Branches woolly. Leaves alternate, narrowly elliptic to obovate, acute, 7–12 mm long, rarely longer, tawny appressed-villous. Flowers solitary, bisexual, subtended by a pair of narrowly ovate bracteoles c. 1.5 mm long. Fruiting perianth woolly on upper side of wing, otherwise glabrous, dark brown when dry; tube cup-shaped, 1.5–2 mm high, hard, faintly ribbed or smooth with a rounded base; wing simple, circular, rigid but thin, horizontal, c. 12 mm diam.; faintly veined with a radial (radicular) slit; upper perianth flat, woolly. Fig. 33U.

Found from central N.S.W. to southern Vic., usually in heavy soil. Map 269.

N.S.W.: c. 11 km SW of Lockhart, 21 Oct. 1964, E. F. *Constable* (NSW); c. 64 km SW of Brewarrina, 5 Sept. 1958, J. *Thompson* (NSW). Vic.: Daylesford, R. *Wallace 185* (MEL); Kaneira, Oct. 1917, W. W. *Watts* (MEL).

22. *Maireana georgei* (Diels) Paul G. Wilson, *Nuytsia* 2: 33 (1975)

Kochia georgei Diels, *Bot. Jahrb. Syst.* 35: 184 (1904). T: Murrin Murrin, W.A., F. *J. George*; iso: MEL.

Kochia stowardii S. Moore, *J. Linn. Soc. Bot.* 45: 189 (1920). T: Nungarin, W.A., F. *Stoward 793*; holo: BM.

Illustrations: G. M. *Cunningham et al.*, *Pl. W. New South Wales* 269, 271 fig. 47(14) (1982).

Compact rounded shrub to 50 cm high. Branches closely woolly. Leaves alternate, slender, semiterete, 8–15 mm long, rarely longer, fleshy, sparsely to densely silky or almost glabrous. Flowers solitary, bisexual. Fruiting perianth glabrous except woolly margin to lobes; tube turbinate, somewhat laterally compressed, very thick-walled, upper half fleshy on outside when fresh and becoming wrinkled on drying, the base solid and rounded, c. 6 mm high and wide (at apex); wing horizontal, 15–20 mm diam., thin, faintly veined, with a single radial (radicular) slit; upper perianth flat, style massive, hemispherical, hard, included within perianth. Figs 33V, 35.

Widespread in Australia but absent from the wetter southern and northern regions and east of the Great Dividing Range. Map 270.

W.A.: Mt Magnet, *J. W. Green 1607* (PERTH). N.T.: c. 13 km N of Tennant Creek, *R. A. Perry 552* (NT). S.A.: Hans Heysen Range, *E. N. S. Jackson 1817* (AD). Qld: c. 26 km NE of Duchess Township, *R. A. Perry 4026* (CANB). N.S.W.: 16 km E of Boorongie Homestead, *J. C. De Nardi 882* (NSW).

A very variable species which hybridises with *Enchylaena tomentosa* R. Br. It may be readily distinguished from *M. turbinata* (with which it has been confused) by the wrinkled tube of the fruit (not smooth all over) and the radial split in the wing (not entire); it may be distinguished from *M. convexa* by the flat, glabrous, upper perianth.

23. *Maireana convexa* Paul G. Wilson, *Nuytsia* 2: 34 (1975)

T: 19 km E of Leonora, W.A., 26 Aug. 1968, *P. G. Wilson 7269*; holotype: PERTH; isotype: CANB, K, NSW.

Open, divaricately branched shrub 1–2 m high. Branchlets closely woolly. Leaves alternate, semiterete, 10–20 mm long, c. 1.5 mm wide, fleshy, somewhat silky. Flowers solitary, bisexual. Fruiting perianth; tube broadly turbinate, c. 3 mm high and 5 mm wide at apex, smooth, the base rounded, wall thick and hard; wing horizontal, papery, c. 15 mm diam., faintly veined, with a single radial (radicular) slit; upper perianth convex hard, closely woolly. Style massive, hard and conical, included within perianth. *Mulga Bluebush*. Fig. 33W.

Found in Western Australia between latitudes 25° and 30°. Usually grows in non-saline soils in mulga (*Acacia aneura*) communities. Map 271.

W.A.: Wondinong Stn, *A. M. Ashby 2615* (BRI, PERTH); c. 11 km SW of Cue, *J. S. Beard 6604* (PERTH).

24. *Maireana turbinata* Paul G. Wilson, *Nuytsia* 2: 34 (1975)

T: 80 km S of Rawlinna, W.A., 3 Sept. 1968, *P. G. Wilson 7673*; holotype: PERTH; isotype: CANB, K, MEL, NSW.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 271 fig. 47(33) (1982).

Divaricately branched shrub 30–60 cm high. Branchlets closely woolly. Leaves alternate, subterete, 5–7 mm long, appressed-villous, fleshy. Flowers solitary, bisexual. Fruiting perianth glabrous, golden brown when mature; tube turbinate, attenuate at the solid base, crustaceous, smooth and glossy; wing papery, horizontal, 14–20 mm diam., with no radial slit, very faintly veined; upper perianth flat. Style massive, solid and conical, sparsely woolly, included within perianth. Fig. 33X.

Found in central Qld, western N.S.W., north-western Vic. and W to south-eastern W.A. Map 272.

W.A.: c. 3 km S of Reid, *T. E. H. Aplin 1666* (PERTH). S.A.: Titree Well, 7 km E of Oraparinna Homestead, *J. Z. Weber 2445* (AD, PERTH). Qld: Bowen Downs, 1873, *C. Birch* (MEL). N.S.W.: Corona, *M. Collins 12* (NSW). Vic.: Kulkyn State Forest, *H. I. Aston 166* (MEL).

This species hybridises with *Enchylaena tomentosa* R. Br. to produce a shrub with fleshy fruits that have a short erect wing.

25. *Maireana murrayana* (Ewart & B. Rees) Paul G. Wilson, *Nuytsia* 2: 35 (1975)

Kochia murrayana Ewart & B. Rees, *Proc. Roy. Soc. Victoria* ser. 2, 22: 16 (1909). T: Mt Narryer, Murchison River, W.A., 10 Nov. 1908, *I. Tyson*; holotype: MEL; isotype: PERTH.

Shrub c. 0.3 m high, closely woolly on branches and leaves. Branches stout, bearing protuberances left by fallen leaves. Leaves alternate, thick and fleshy, narrowly oblong to obcuneate, c. 20 mm long, 4 mm wide, convex below, rounded at apex. Flowers solitary, bisexual, globose and densely woolly. Fruiting perianth large; attachment broad, c. 2 mm diam.; tube turbinate, 3–4 mm high, smooth, glabrous, with thick woody walls; wing

simple, horizontal, thin, c. 20 mm diam., sparsely woolly above, with a single radial (radicular) slit; upper perianth slightly convex, thick, densely woolly. Style base hard and turbinate, included, the upper portion slender, exerted and deciduous. Fig. 33Y.

Known from only a few collections made in W.A. between the Upper Gascoyne and Murchison Rivers, on dissected sandstone. Map 273.

W.A.: Dairy Creek Stn, *D. G. Wilcox 164* (PERTH).

26. *Maireana astrotricha* (L. Johnson) Paul G. Wilson, *Nuytsia* 2: 35 (1975)

Kochia astrotricha L. Johnson, *Contr. New South Wales Natl. Herb.* 1: 343 (1951). T: Silverton, N.S.W., 24 Aug. 1939, *I. M. Pidgeon & J. W. Vickery*; holotype: NSW.

Kochia sedifolia var. *stellulata* J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 39: 828 (1915). T: 90 miles (144 km) W of Todmorden Stn, between Moorilyanna Native Well and Everard Range, S.A., *S. A. White*; syn: *n.v.*

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 266, 271 fig. 47(3) (1982).

Rounded divaricately branched shrub to 1 m high, closely covered on branches and leaves with a dendritic tomentum. Leaves alternate, fleshy, narrowly to broadly obovoid with attenuate base, 5–10 mm long. Flowers solitary, polygamo-dioecious, the male hemispherical and the female globose, densely tomentose, minutely bibracteolate. Fruiting perianth tomentose except the glabrous wing; tube turbinate, c. 3 mm high, thick-walled and smooth; wing simple, papery, horizontal, c. 15–20 mm diam., pale to dark brown when dry, with a single radial (radicular) slit; upper perianth convex, thick. *Low Bluebush*. Fig. 33Z.

Found in western N.S.W., central S.A. and the southern portion of N.T., usually in well-drained gravelly soil in open situations. Map 274.

N.T.: c. 50 km N of Alice Springs, *D. J. Nelson 2133* (NT). S.A.: 18 km N of Mernmerna Ruins, *A. E. Orchard 502* (AD). N.S.W.: Fowlers Gap, *S. Jacobs 2195* (NSW).

Maireana astrotricha is readily distinguished from *M. sedifolia*, with which it has been confused, by its dendritic hairs.

27. *Maireana sedifolia* (F. Muell.) Paul G. Wilson, *Nuytsia* 2: 36 (1975)

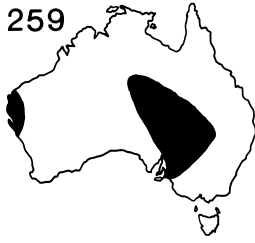
Kochia sedifolia F. Muell., *Trans. & Proc. Victorian Inst. Advancem. Sci.* 1: 134 (1855). T: Wentworth, Darling River, N.S.W., *Mrs Ford 12*; lectotype: MEL, *fide* L. A. S. Johnson, *Contr. New South Wales Natl. Herb.* 1: 344 (1951); isotype: NSW.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 54 (1890) as *Kochia sedifolia*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 264, 271 fig. 47(28) (1982).

Compact divaricately branched shrub c. 1 m high covered with a close bluish-grey woolly tomentum, dioecious. Leaves alternate, fleshy, narrowly obovoid, 4–8 mm long, rounded at apex, slightly narrowed at base. Flowers in pairs but usually only one maturing, closely woolly, the male hemispherical, the female globular. Fruiting perianth straw-coloured or pale brown when dry; tube hemispherical to turbinate, c. 2 mm high and 2–3 mm wide at apex, firm but thin-walled except thick base, sparsely woolly; wing simple, horizontal, papery, c. 10 mm diam., glabrous with fine radial venation and a single radial (radicular) slit; upper perianth flat, closely woolly. Style short, thick, woolly. *Pearl Bluebush*. Fig. 34A.

Found in south-western N.S.W. and north-western Vic., S.A., southern N.T. and south-eastern W.A., often in calcareous soil. Map 275.

W.A.: 104 km E of Kalgoorlie, *K. M. Allan 267* (PERTH). N.T.: Carmichael Crag area, George Gill Range, *G. Chippendale* (NT 10369). S.A.: S of Lake Acraman, *D. E. Symon 8181d* (ADW). N.S.W.: Fowlers Gap, *S. Jacobs 2272* (NSW). Vic.: 41 km S of Manangatang, *A. C. Beauglehole 55545* (MEL).



- 256. *Maireana oppositifolia*
- 259. *Maireana lanosa*
- 262. *Maireana coronata*
- 265. *Maireana carnososa*
- 268. *Maireana trichoptera*

- 257. *Maireana enchylaenoides*
- 260. *Maireana ciliata*
- 263. *Maireana dichoptera*
- 266. *Maireana marginata*
- 269. *Maireana humillima*

- 258. *Maireana lobiflora*
- 261. *Maireana pentagona*
- 264. *Maireana eriosphaera*
- 267. *Maireana excavata*
- 270. *Maireana georgei*

28. Maireana spongiocarpa (F. Muell.) Paul G. Wilson, *Nuytsia* 2: 37 (1975)

Kochia spongiocarpa F. Muell., *Victorian Naturalist* 3: 92 (1886). T: Carlaroo, N.S.W., 1886, J. Cotter; lecto: MEL 44100, *fide* P. G. Wilson, *loc. cit.*

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 51 (1890) as *Kochia spongiocarpa*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 271 fig. 47(29) (1982).

Small shrub to 30 cm high. Branches thin, densely woolly with smooth curled hairs. Leaves well-spaced, alternate, fleshy, narrowly-terete or fusiform, acute, 8–15 mm long, glabrous, dark green. Flowers solitary, bisexual, glabrous except woolly margin of perianth lobes. Fruiting perianth glabrous, dark brown when dry; tube spongy, swollen and subglobose, c. 8 mm high and wide, easily crushed; wing simple, horizontal, entire, 12–15 mm diam., thin, shortly decurrent opposite radicle as a fused double vertical membrane on tube; upper perianth flat. Fig. 34B.

Found in central Australia from the southern half of N.T. south and east to western N.S.W.; usually on open plains and denuded areas. Map 276.

N.T.: c. 43 km E of Bagots Creek, G. Chippendale (NT3588). S.A.: Coober Pedy, A. C. Beauglehole 20131 (AD, PERTH). N.S.W.: Barrier Range, 1889, Mrs Irvine (MEL, PERTH).

29. Maireana campanulata Paul G. Wilson, *Nuytsia* 2: 37 (1975)

T: 3 miles (c. 5 km) W of Santa Teresa Mission, N.T., 17 Aug. 1956, M. Lazarides 5734; holo: NSW; iso: MEL, PERTH.

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 266, 271 fig. 47(5) (1982).

Small shrub to 60 mm high. Branchlets with a thin tomentum of pale fawn curled shortly branched hairs. Leaves terete, slender, acute, 8–15 mm long, fleshy, glaucous, glabrous. Flowers solitary, bisexual, glabrous. Fruiting perianth glabrous; tube cup-shaped, c. 6 mm high and wide, spongy; wing thin, horizontal, entire, very narrow, c. 10 mm diam., with no radial slit. Fig. 34C.

Found in central Australia from southern half of N.T., to northern S.A. and south-western Qld, principally on rocky slopes and in other well-drained situations. Map 277.

N.T.: Curtin Springs Stn, T. S. Henshall 730 (NT). S.A.: Oraparinna National Park, J. Z. Weber 2601 (AD). Qld: S of Selwyn, C. H. Gittens 695b (NSW).

This species may be distinguished from *M. spongiocarpa* by the glaucous and more slender leaves, the very thin pale brown stem indumentum of dendritic hairs and the smaller fruit which lacks a vertical wing on the tube.

30. Maireana polypterygia (Diels) Paul G. Wilson, *Nuytsia* 2: 38 (1975)

Kochia polypterygia Diels, *Bot. Jahrb. Syst.* 35: 183 (1904). T: Gascoyne River near Carnarvon, W.A., L. Diels 3711 (B, destroyed).

Shrub c. 70 cm high, usually dioecious. Branchlets closely woolly. Leaves alternate, semiterete to spatulate, rounded below, 8–15 mm long, appressed-pubescent. Flowers solitary, glabrous. Fruiting perianth glabrous; tube cup-shaped, 2.5–4 mm high, weakly crustaceous (somewhat fleshy when fresh), with a horizontal wing at base and apex and several imperfectly developed vertical wings, all wings papery and faintly veined; apical horizontal wing circular, 7–17 mm diam., usually with a single radial (radicular) slit; basal horizontal wing slightly smaller than apical; vertical wings up to 4+2, the contiguous pair decurrent from the radicular slit. *Many-winged Bluebush*. Fig. 34D.

Found in north-western W.A. between Exmouth Gulf and Shark Bay. Map 278.

W.A.: Dairy Creek Stn, R. O'Farrell 51846 (PERTH); 21 km E of Carnarvon, P. G. Wilson 8381 (PERTH).

31. Maireana triptera (Benth.) Paul G. Wilson, *Nuytsia* 2: 38 (1975)

Kochia triptera Benth., *Fl. Austral.* 5: 185 (1870). T: 'N.S. Wales, Darling river, Victoria Expedition; Mount Murchison, Giles.'; syn: between Yuin and Murchison River, *E. Giles* (MEL).

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 50 (1890); as *Kochia triptera*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 271 fig. 47(32), 275 (1982).

Compact bluish green shrub to 50 cm high, glabrous except pubescence in leaf axils. Leaves alternate, dense, slender and subterete, acute, c. 10 mm long. Flowers solitary, usually bisexual. Fruiting perianth glabrous, glossy, dark brown to black when dry, often crowded along branches; tube turbinate, crustaceous, hard and solid in lower half; wings papery, in two series; vertical wings 5 (or with 1 or 2 undeveloped), alternate to perianth lobes, running length of tube and fusing with horizontal wing; horizontal wing at apex of tube, flat, entire, c. 8 mm diam., without a radial slit but sulcate opposite radicle; upper perianth flat. *Three-wing Bluebush*. Fig. 34E.

Widespread in the drier areas of W.A. south of 20°S lat. and eastwards to western districts of Qld, N.S.W. and Vic.; found in heavy slightly saline soil. Map 279.

W.A.: c. 13 km S of Menzies, *A. S. George 2708* (PERTH). N.T.: Jessie Gap area, *J. R. Maconochie 1053* (NT). S.A.: Emu, *G. Brooks 22* (AD). Qld: Mt Isa, May 1952, *M. Morris* (BRI). Vic.: 25 km W of Manangatang, *A. C. Beauglehole* (MEL).

32. Maireana erioclada (Benth.) Paul G. Wilson, *Nuytsia* 2: 39 (1975)

Kochia triptera var. *erioclada* Benth., *Fl. Austral.* 5: 185 (1870); *Kochia erioclada* (Benth.) Gauba, *Victorian Naturalist* 65: 163 (1948). T: Western Australia, *J. Drummond 432*; lecto: MEL 42072, *vide* E. Gauba, *loc. cit.*

Illustrations: G. M. Cunningham *et al.*; *Pl. W. New South Wales* 268, 271 fig. 47(12) (1982).

Shrub to 60 cm high. Branches closely white-woolly. Leaves alternate, fleshy, narrowly obovoid to clavate, to 10 mm long, glabrous, apex rounded. Flowers solitary, bisexual, glabrous except woolly-ciliate lobes. Fruiting perianth glabrous; tube narrowly funnel-shaped, solid in lower half, c. 5 mm high, with 5 vertical semicircular wings that are attached to horizontal wing and to the tube throughout its length; horizontal wing at apex of tube, simple, c. 12 mm diam., radially sulcate at attachment to vertical wings and with a single radial (radicular) slit; upper perianth convex, glabrous apart from ciliate margin to lobes. Fig. 34F.

Found from southern W.A. eastwards to western N.S.W. and Vic.; a frequent invader of disturbed areas alongside roads. Map 280.

W.A.: 16 km E of Norseman, *T. E. H. Aplin 1818* (PERTH). S.A.: 1.5 km N of Inkerman, *B. Copley 521* (AD). N.S.W.: Balranald, 31 Aug. 1962, *M. E. Phillips* (CBG). Vic.: Bolton, *N. Macfarlane 8* (PERTH).

33. Maireana pentatropis (Tate) Paul G. Wilson, *Nuytsia* 2: 39 (1975)

Kochia pentatropis Tate, *Trans. & Proc. Roy. Soc. S. Australia* 7: 67 (1885). T: Aroona Range, Lake Torrens, S.A., *R. Tate*; lecto: MEL 43977, *vide* E. Gauba, *Victorian Naturalist* 66: 13 (1949).

Kochia ostenfeldii Paulsen, *Dansk Bot. Ark.* 2(8): 60 (1918). T: Kalgoolie, W.A., Oct. 1914, *C. H. Ostenfeld 324, 326*; syn: PERTH (coll. no. 324).

Kochia decipiens Gauba, *Victorian Naturalist* 65: 165 (1948). T: Loveday, Vic., 15 Nov. 1942, *E. Gauba*; holo: MEL.

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 271 fig. 47(23), 272 (1982).

Shrub to 60 cm high. Branches ascending, closely white-woolly and pilose in leaf axils. Leaves subterete, c. 10 mm long, fleshy, glabrous. Flowers solitary, bisexual; perianth lobes densely woolly-villous towards margin. Fruiting perianth glabrous except densely woolly margin to lobes; tube turbinate, c. 4 mm high, solid in lower half, crustaceous, with 3-5 fan-shaped vertical wings usually restricted to lower half of tube; horizontal

wing circular, flat, to 12 mm diam., with a single radial (radicular) slit; upper perianth convex or arched. Fig. 34G.

Found in central and south-eastern W.A., southern N.T., S.A. and western N.S.W. and Vic., frequently in calcareous soil. Map 281.

W.A.: Widgiemooltha, C. A. Gardner 9531 (PERTH). N.T.: Lake Amadeus, T. S. Henshall 742 (NT, PERTH). S.A.: Dalhousie Springs, D. E. Symon 9313 (ADW, PERTH). N.S.W.: 36 km ENE of White Cliffs, J. C. De Nardi 894 (NSW). Vic.: 4 km SW of Sunset Tank, M. G. Corrick 6614 (MEL).

This species may be distinguished from *M. erioclada* (Benth.) Paul G. Wilson by the raised woolly upper perianth of the fruit and by the short vertical wings which do not reach the horizontal wing. The axillary tufts of long hairs are also distinctive.

34. *Maireana schistocarpa* Paul G. Wilson, *Nuytsia* 2: 40 (1975)

T: 12 miles (c. 19 km) W of Huckitta Stn, N.T., 9 Sept. 1957, *M. Lazarides* 5940; holo: NSW; iso: PERTH.

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 271 fig. 47(26), 274 (1982).

Divaricately-branched shrub to 1 m high. Branchlets densely tomentose. Leaves terete, slender, acute, fleshy, 5–12 mm long, sparsely appressed-villous with simple hairs. Flowers solitary, rarely paired, bisexual, densely tomentose. Fruiting perianth soft and easily crushed, sparsely pilose except wing, straw-coloured when dry; tube broadly turbinate, c. 2 mm high with a vertical slit opposite radicle extending halfway down; wing horizontal, simple, papery, 12–15 mm diam., very faintly veined, with a single radial (radicular) slit from whose margins the wing passes down the tube as two membranes one either side of slit.

Found in central Australia in south-western Qld, north-western N.S.W., south-eastern N.T. and north-eastern S.A. Map 282.

N.T.: Mt Riddock Stn, P. K. Latz 3160 (NT). S.A.: Yudnapinna, Aug. 1955, F. M. Milton (AD). Qld: Dynevor Lakes, 24 Sept. 1963, M. E. Phillips (NSW). N.S.W.: c. 58 km W of Wilcannia, 20 Sept. 1949, D. McFarlane (NSW).

35. *Maireana pyramidata* (Benth.) Paul G. Wilson, *Nuytsia* 2: 41 (1975)

Kochia pyramidata Benth., *Fl. Austral.* 5: 186 (1870). T: Lachlan river, N.S.W., A. Cunningham; syn: *n.v.*; sand hills near the Darling, Beckler; syn: *n.v.*; Murray desert, *Herb. F. Mueller*; syn: MEL.

Kochia lobostoma F. Muell., *Victorian Naturalist* 3: 92 (1886); *K. pyramidata* var. *lobostoma* (F. Muell.) C. Moore & E. Betche, *Handb. Fl. New South Wales* 110 (1893). T: between the Lachlan and Darling Rivers, N.S.W., J. Bruckner; holo: MEL.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 49 (1890) as *Kochia pyramidata*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 271 fig. 47(24), 273 (1982).

Divaricately-branched shrub c. 1 m high. Branchlets woolly, sometimes sparsely. Leaves alternate, spreading, subterete, acute, 2–6 mm long, shortly appressed-pubescent (consisting of dendritic woolly and scattered coarse smooth hairs). Flowers mostly unisexual, shortly woolly. Fruiting perianth pale brown to black when dry; tube flat to shortly turbinate, thin-walled and readily crushed, sparsely puberulous; wing papery, horizontal, simple, 12 mm diam., rarely larger, entire or with a single radial slit; upper perianth erect, pyramidal, 2–4 mm high, puberulous. *Shrubby Bluebush*, *Sago Bush*.

Found in inland W.A. and eastwards through S.A. to western N.S.W. and north-western Vic., in somewhat saline soil. Map 283.

W.A.: 22 km SW of Zanthus, K. Newbey 8247 (PERTH). S.A.: 8 km E of Frome Down Stn, J. Weber 2049 (AD). N.S.W.: Fowlers Gap, S. Jacobs 2311 (NSW). Vic.: Lake Cullulleraine, A. C. Beaglehole 39489 (MEL).

36. Maireana melanocoma (F. Muell.) Paul G. Wilson, *Nuytsia* 2: 42 (1975)

Kochia melanocoma F. Muell., *Fragm.* 12: 14 (1882). T: Gascoyne River, W.A., 1882, *J. Forrest*; holotype: MEL. Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 48 (1890) as *Kochia melanocoma*.

Weak diffuse shrub to 50 cm high, glabrous except woolly in leaf axils. Branches slender, striate. Leaves subterete to narrowly fusiform, 10–20 mm long, acute. Flowers solitary but clustered in terminal spike-like groups, bisexual, glabrous. Fruiting perianth glabrous, pale green to gold or pale red when fresh, black when dry; tube convex, smooth, thick-walled with a thick hard base; wing horizontal, simple, 12–16 mm diam., without a radial slit; upper perianth prominently convex, hard, covered with numerous erect hair-like processes up to 6 mm long. Fig. 34H.

Found in the drier NW of W.A., usually on rocky hillsides. Map 284.

W.A.: Rocklea Stn, *J. Beard* 4529 (PERTH); c. 67 km N of Mundiwindi, A. S. *George* 999 (PERTH).

This species may be readily recognised when in fruit by the hair-like processes which arise from the upper perianth.

37. Maireana cannonii (J. Black) Paul G. Wilson, *Nuytsia* 2: 42 (1975)

Kochia cannonii J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 43: 29 (1919). T: Leigh Creek, S.A., 12 Aug. 1918, *W. A. Cannon*; lectotype: AD, *vide* P. G. Wilson, *loc. cit.*; isotype: MEL.

Small much-branched shrub. Branchlets closely woolly. Leaves opposite, sessile, semiterete, 5–6 mm long; with short silky indumentum, base shortly spurred, apex recurved. Flowers solitary, bisexual, densely pubescent above, glabrous below; attachment broad and flat; tube shortly hemispherical, c. 2.5 mm diam., crustaceous; wing simple, circular, horizontal, thin, c. 6 mm diam., with a single radial (radicular) slit; upper perianth slightly convex. Style hard, exserted.

Found between Port Pirie and Leigh Creek, S.A. Map 285.

S.A.: Telowie, 22 Sept. 1906, *J. M. Black* (AD); 7 km S of Port Augusta, 3 Nov. 1936, *E. H. Ising* (AD).

38. Maireana platycarpa Paul G. Wilson, *Nuytsia* 2: 42 (1975)

T: 80 km N of Laverton, W.A., 27 Aug. 1968, *P. G. Wilson* 7326; holotype: PERTH; isotype: CANB, K.

Brittle, much-branched shrub to 60 cm high. Branches woolly. Leaves usually opposite, linear to semi-terete or boat-shaped, obtuse to acute, 7–12 mm long, sessile, silky. Flowers solitary, bisexual, densely woolly. Fruiting perianth very depressed, pale gold when dry; tube flat or slightly convex, 4–6 mm diam., crustaceous or cartilaginous, glabrous; wing continuous with tube, simple, flat or somewhat recurved around stem usually 15–23 mm diam., thin, entire, with a single radial (radicular) slit, sparsely woolly above; upper perianth convex, ±woolly. Style terete, hard, prominently exserted. Fig. 34 I.

Found in W.A. from Carnarvon south-east to Norseman, usually in saline areas but also recorded from rocky hillsides. Map 286.

W.A.: Gwalia, Nov. 1903, *W. V. Fitzgerald* (NSW); between Jiggalong and Rabbit Proof Fence, *R. D. Royce* 1558 (PERTH).

The variant of *M. platycarpa* found towards the south-eastern area of its distribution is more slender and has much smaller fruits (c. 10 mm diam.) than the typical variant.

39. Maireana glomerifolia (F. Muell. & Tate) Paul G. Wilson, *Nuytsia* 2: 43 (1975)

Kochia glomerifolia F. Muell. & Tate, *Trans. & Proc. Roy. Soc. S. Australia* 16: 345 (1896). T: Mt Narryer, W.A., 1893, *I. Tyson*; lectotype: MEL 43916, *vide* P. G. Wilson, *loc. cit.*

Rigid, open, divaricately-branched shrub to 60 cm high. Branches brittle, woolly, covered with compact glomerules of leaves. Leaves sessile, fleshy and woolly, those towards apex

of elongating branches alternate appressed and deltoid, c. 1.5 mm long, elsewhere minute and in dense glomerules. Flowers solitary but arranged in short terminal spikes, polygamodioecious, woolly. Fruiting perianth thin-walled, pink to red when mature; tube convex, glabrous; wing simple, rarely divided into 5 lobes, horizontal, thin, slightly crenulate, to 15 mm diam., with a single radial (radicular) slit, woolly above; upper perianth convex, deeply 5-lobed, 2 of the lobes with a pair of erect narrowly oblong processes 3–4 mm long, one lobe with a single process, the other two lobes without processes. *Ball-leaf Bluebush*. Fig. 34J.

Found in the dry inland areas of W.A. S of 26°S lat., usually in saline or subsaline areas. Map 287.

W.A.: Bulong, *B. Severne 8745* (PERTH); 32 km N of Diemal Homestead, *P. G. Wilson 8840* (PERTH).

This species is readily recognised by the compact woolly glomerules of leaves along the branches. The wing of the fruiting perianth is usually simple but in one specimen from Yelma Stn (*H. R. Toelken 6130*, AD) it consists of five separate lobes.

40. *Maireana atkinsiana* (W. Fitzg.) Paul G. Wilson, *Nuytsia* 2: 44 (1975)

Kochia atkinsiana W. Fitzg., *J. W. Austral. Nat. Hist. Soc.* 1: 31 (May 1904). T: Nannine, W.A., Sept. 1903, *W. V. Fitzgerald*; lecto: NSW, *vide* P. G. Wilson, *loc. cit.*

Rigid, brittle, intricately-branched shrub to 60 cm high, dioecious. Branchlets sparsely woolly. Leaves alternate, well-spaced or clustered on dwarf shoots, narrowly to broadly obovoid, 5–10 mm long, fleshy, sparsely appressed-pubescent. Flowers in pairs, closely woolly. Fruiting perianth thin-walled, pink to red when mature; tube convex, 10-ribbed, glabrous; wing simple, horizontal, thin, slightly crenulate, without a radial slit, to 18 mm diam. glabrous; upper perianth convex, sparsely woolly, deeply 5-lobed, 2 of the lobes with a pair of erect narrowly oblong processes, c. 6 mm high, 1 lobe with a single process, the other 2 lobes without processes.

Found in W.A. from Shark Bay south to Watheroo and east to Laverton, usually near salt lakes. Map 288.

W.A.: between Morgan and Laverton, *C. A. Gardner 2442* (PERTH); 24 km SW of Nannine, *N. H. Speck 735* (PERTH).

41. *Maireana prosthocochaeta* (F. Muell.) Paul G. Wilson, *Nuytsia* 2: 44 (1975)

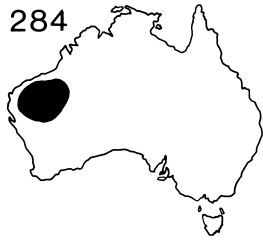
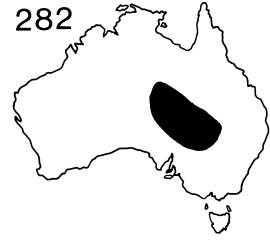
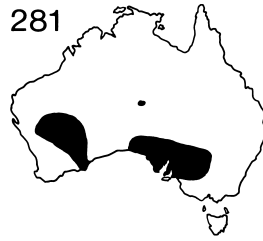
Kochia prosthocochaeta F. Muell., *Fragm.* 12: 14 (1882). T: Gascoyne River, W.A., *J. Forrest n.v.*; between Yuin and Murchison River, W.A., *E. Giles*; syn: MEL.

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 47 (1890) as *Kochia prosthocochaeta*.

Open densely-leaved shrub to 60 cm high, glabrous. Branches erect, somewhat fleshy, the older portions with prominent persistent leaf-bases. Leaves alternate, fleshy, semiterete, to 40 mm long, 2–3 mm wide, acute, erect (reflexed with age), bright green. Flowers solitary, bisexual, minutely bibracteolate, glabrous, crowded towards branch apices. Fruiting perianth dark brown when dry, glabrous; attachment broad and flat, 2–3 mm diam.; tube turbinate, c. 5 mm high and 4 mm wide (at apex), crustaceous except thick base; wing simple, horizontal, c. 15 mm diam., the radicular split reaching only part way to tube; upper perianth flat, 5-lobed, with 4 erect linear processes at base of and alternate to lobes (no process opposite radicle). Fig. 34K.

Found in north-western W.A. from Cue north to the Gascoyne River. Map 289.

W.A.: Bulloo Downs Stn, *J. V. Blockley 773* (PERTH); Mt Phillips Stn, 24 Sept. 1971, *R. O'Farrell* (PERTH).



271. *Maireana convexa*
 274. *Maireana astrotricha*
 277. *Maireana campanulata*
 280. *Maireana erioclada*
 283. *Maireana pyramidata*

272. *Maireana turbinata*
 275. *Maireana sedifolia*
 278. *Maireana polypterygia*
 281. *Maireana pentatropis*
 284. *Maireana melanocoma*

273. *Maireana murrayana*
 276. *Maireana spongiocarpa*
 279. *Maireana triptera*
 282. *Maireana schistocarpa*
 285. *Maireana cannonii*

42. Maireana thesioides (C. Gardner) Paul G. Wilson, *Nuytsia* 2: 45 (1975)

Kochia thesioides C. Gardner, *J. Roy. Soc. Western Australia* 27: 172 (1942). T: between Meekatharra and Laverton, W.A., July 1931, C. A. Gardner 232; lecto: PERTH, *vide* P. G. Wilson, *loc. cit.*

Weak straggly shrub c. 1 m high, glabrous except axillary tufts of wool. Branches slender, striate, often drooping. Leaves alternate, narrowly fusiform, fleshy, 5–15 mm long, narrowed at base with a distinct petiole. Flowers solitary, bisexual, glabrous except woolly margin to lobes. Fruiting perianth glabrous; tube turbinate, c. 3 mm high, crustaceous; wing thin, simple, horizontal, 10–15 mm diam., with a single radial (radicular) slit; upper perianth convex. *Mulga Bluebush*. Fig. 34L.

Found in central W.A. from Koorda north to the Hamersley Range and east to Menzies. Map 290.

W.A.: Leonora, C. A. Gardner 2112 (PERTH); 60 km N of Mt Vernon Homestead, A. A. Mitchell 238 (PERTH).

43. Maireana suaedifolia (Paul G. Wilson) Paul G. Wilson, *Nuytsia* 2: 45 (1975)

Kochia suaedifolia Paul G. Wilson in H. Eichler, *Suppl. J. M. Black's Fl. S. Australia 2nd edn*, 122 (1965). T: Ooldea Soak, S.A., 27 Apr. 1951, J. B. Cleland; holotype: AD.

Weak spreading dark bluish green shrub c. 0.5 m high, glabrous except axillary tufts of wool. Branches slender, striate, glaucous. Leaves alternate, well-spaced, fleshy, narrowed at base, those of fruiting branchlets fusiform and c. 5 mm long, on main branches slender-terete and up to 25 mm long. Flowers solitary, bisexual, glabrous, minutely bibracteolate at base. Fruiting perianth glabrous, pink when fresh; tube shortly hemispherical, c. 3 mm diam., faintly costate, thin-walled; wing thin, horizontal, simple with a single radial (radicular) slit, 8–12 mm diam.; upper perianth flat. *Lax Bluebush*. Fig. 34M.

Found in the southern areas of W.A. and S.A. on sand dunes around salt lakes and on alluvial plains. Map 291.

W.A.: E of Babakin, 27 Apr. 1965, C. V. Malcolm (PERTH); Kumarl, L. A. Horbury 67 (PERTH). S.A.: 48 km NW of Cowell, 6 Nov. 1936, J. B. Cleland (AD).

44. Maireana decalvans (Gand.) Paul G. Wilson, *Nuytsia* 2: 46 (1975)

Enchylaena decalvans Gand., *Bull. Soc. Bot. France* 66: 224 (1919). T: Wimmera, Vic., F. M. Reader; holotype: LY.

Kochia villosa var. *tenuifolia* F. Muell. ex Benth., *Fl. Austral.* 5: 187 (1870) as to lectotype; *K. tomentosa* var. *tenuifolia* (Benth.) J. Black, *Fl. S. Australia* 197 (1924). T: Box forest before Canal, L. Leichhardt; lecto: MEL 489543, *vide* P. G. Wilson, *loc. cit.*

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 266, 271 fig. 47(9) (1982).

Tufted to bushy shrub to 50 cm high. Branches slender, striate, sparsely woolly or glabrous, often woolly in leaf axils. Leaves alternate, slender and terete to narrowly fusiform, 5–8 mm long, fleshy, glabrous. Flowers solitary, bisexual, glabrous. Fruiting perianth glabrous; tube shallowly hemispherical, c. 3 mm diam., thin-walled; wing thin, horizontal, simple, c. 8 mm diam., with fine pale brown anastomosing veins when dry, entire except a single radial (radicular) slit; upper perianth flat with somewhat fleshy lobes. *Black Cotton-bush*. Fig. 34N.

Found from southern Qld to north-western Vic. and south-eastern S.A., usually in heavy seasonally waterlogged soil; sometimes an early invader of cleared land. Map 292.

S.A.: Patawalonga Ck, Adelaide, D. Kraehenbuehl 286 (AD). Qld: Wallumbilla, May 1916, C. T. White (AD). N.S.W.: 34 km NE of Goodooga, J. C. De Nardi 397 (NSW). Vic.: 8 km SSW of Kerang, A. C. Beauglehole 55675 (MEL).

45. *Maireana rohrlachii* (Paul G. Wilson) Paul G. Wilson, *Nuytsia* 2: 46 (1975)

Kochia rohrlachii Paul G. Wilson in H. Eichler, *Suppl. J.M. Black's Fl. S. Australia 2nd edn*, 123 (1965). T: Buckleboo, Eyre Peninsula, S.A., 14 Mar. 1959, *K. D. Rohrlach* 270; holo: AD.

Intricately branched shrub to 1 m high. Branches slender, closely woolly. Leaves alternate, obovoid to narrowly fusiform, 3–8 mm long, fleshy, glabrous. Flowers solitary, bisexual, glabrous. Fruiting perianth glabrous, pale brown when dry; tube broadly turbinate to hemispherical, to 2 mm high and 3 mm diam. at apex, thin-walled and readily crushed; wing simple, horizontal or undulate, thin, 12–16 mm diam., radially veined, with a single radial (radicular) slit; upper perianth flat, thin. Fig. 34 O.

Found from northern Eyre Peninsula, S.A., E to western Vic. usually growing in loamy soils. Map 293.

S.A.: between Snowtown and Brinkworth, *B. Copley* 900 (AD); South Hummocks, 24 Feb. 1964, *H. M. Cooper* (AD). Vic.: Flood plain of Avoca River just N of Quambatook, 13 Mar. 1971, *N. Macfarlane* (PERTH).

46. *Maireana microphylla* (Moq.) Paul G. Wilson, *Nuytsia* 2: 47 (1975)

Enchylaena microphylla Moq. in DC., *Prodr.* 13(2): 128 (1849); *Kochia microphylla* (Moq.) F. Muell., *Fragm.* 8: 148 (1874). T: 'In Nova-Hollandia (*h. Hook.!*)'; holo: P.

?*Enchylaena tomentosa* var. *leptophylla* Benth., *Fl. Austral.* 5: 182 (1870). T: near Gainsford, Qld, *Bowman*; iso: MEL.

?*Kochia tomentosa* f. *tenuis* Domin, *Biblioth. Bot.* 89: 68 (1921). T: 'Bei Barcaldine und auf der Dividing Range bei Jericho (*Domin III.* 1910)'; *n.v.*

[*Kochia tamariscina* auct. non (Lindley) J. Black: N. C. W. Beadle, O. D. Evans & R. C. Carolin, *Fl. Sydney Region* 191 (1972).]

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 271 fig. 47(20), 272 (1982).

Divaricately branched shrub to 1 m high. Branches slender, attenuate, sparsely strigose or appressed-pubescent to glabrous. Leaves alternate, subterete, mostly 2–4 mm long, glabrous to sparsely strigose or villous. Flowers solitary forming dense leafy spikes, bisexual. Fruiting perianth glabrous or sparsely villous above, dark brown when dry; tube shallowly hemispherical, 1.5–2 mm diam.; wing (when present) horizontal, simple (sometimes shortly lobed opposite tepals), c. 7 mm diam., thin, crenulate on margin, with a single radial (radicular) slit; upper perianth slightly convex. Fig. 34P.

Found in south-eastern Qld and eastern N.S.W. Map 294.

Qld: Copperfield, 1871, *E. Bowman* (MEL); Morven, *S. T. Blake* 5655 (NSW). N.S.W.: c. 1.6 km W of Boppy Mt, *G. M. Cunningham* 880 (NSW); c. 10 km SSE of Muswellbrook, *R. Story* 7115 (NSW).

A rather variable species which requires further study. The wing of the perianth does not always develop and the plant then resembles a species of *Enchylaena*.

47. *Maireana microcarpa* (Benth.) Paul G. Wilson, *Nuytsia* 2: 48 (1975)

Kochia villosa var. *microcarpa* Benth., *Fl. Austral.* 5: 187 (1870); *Kochia microcarpa* (Benth.) Paul G. Wilson in H. Eichler, *Suppl. to J. M. Black's Fl. S. Australia 2nd edn*, 123 (1965). T: Nangawera to Yellowintchi, 29 Dec. 1860, *Victorian Exploring Expedition*; syn: MEL, NSW; between the Darling and Lachlan Rivers, *Burkitt*; syn: MEL.

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 270, 271 fig. 47(19) (1982).

Weak shrub c. 40 cm high. Branches slender, loosely white-woolly when young. Leaves alternate, sub-terete to obovoid, mostly 3–5 mm long, fleshy, glabrous. Flowers solitary, bisexual, glabrous. Fruiting perianth glabrous, dark brown on wing, rarely pale; tube shortly cup-shaped, 1.5 mm high, 2 mm diam., costate, crustaceous; wing simple, horizontal, firm, 5–6 mm diam., rarely wider, with a single radial (radicular) slit, the margin usually recurved; upper perianth flat or concave, obscuring ovary. Fig. 34Q.

Found in western N.S.W., northern S.A., southern N.T., and south-western Qld, usually on clay pans. Map 295.

N.T.: c. 3 km W of New Andado Homestead, A. C. *Beaglehole* 28020 (ADW, NT). S.A.: 6 km S of Ilbunga, T. R. N. *Lothian* 4640 (AD). Qld: 120 km N of Quilpie, S. L. *Everist* 5720 (K). N.S.W.: Fowlers Gap, S. *Jacobs* 2182 (NSW).

48. *Maireana ovata* (Ising) Paul G. Wilson, *Nuytsia* 2: 48 (1975)

Kochia ovata Ising, *Trans. Roy. Soc. S. Australia* 378: 112 (1955). T: Evelyn Downs, S.A., 10 Oct. 1952, E. H. Ising 3563; holotype: AD.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 271 fig. 47(21) (1982).

Small densely branched shrub to 30 cm. Branches densely woolly. Leaves small, alternate, sessile, erect or appressed, narrowly ovate to broadly triangular, 2–5 mm long, loosely woolly. Flowers solitary, bisexual. Fruiting perianth small, pale gold when dry, glabrous except woolly upper perianth; tube hemispherical, 1 mm high, 1.5 mm diam., woody, smooth except radicular ridge; wing simple, entire, with no radicular slit, horizontal, usually 4–6 mm diam., translucent; upper perianth woody, shortly woolly. Fig. 34R.

Found in central Australia from southern N.T. to north-eastern S.A. and north-western N.S.W., on sandy rises and eroded slopes of stony hills. Map 296.

N.T.: New Crown Stn, Beddome Range, T. S. *Henshall* 1543 (NT). S.A.: Mt Norwest Stn, R. Hill 71 (AD). N.S.W.: 20 km N of Teurika Homestead, D. F. *Blaxell* 633 (PERTH).

49. *Maireana tomentosa* Moq., *Chenop. Monogr. Enum.* 96 (1840)

T: Shark Bay, W.A., C. *Gaudichaud* 68; iso: BM, MEL, PERTH.

Open shrub to 1 m high. Branches woolly. Leaves alternate, semiterete, mostly 5–8 mm long, 1 mm wide, fleshy, woolly-villous. Flowers solitary, bisexual. Fruiting perianth glabrous; tube hemispherical or cup-shaped, 1–1.5 mm high, 1.5–2.5 mm diam. at apex, smooth, crustaceous or woody; wing simple, horizontal, mostly 8–11 mm diam., without a radial slit, brown to straw-coloured when dry, with indistinct nervation; upper perianth flat or raised to form a hard annular disc, woolly-ciliate but otherwise glabrous.

Widespread in W.A. south of 20°S lat., in southern N.T., northern S.A. and north-western N.S.W. There are two subspecies.

Fruiting perianth with the tube hemispherical, crustaceous, dull or glossy

49a. subsp. *tomentosa*

Fruiting perianth with the tube cup-shaped, woody and glossy

49b. subsp. *urceolata*

49a. *Maireana tomentosa* Moq. subsp. ***tomentosa***

Kochia tomentosa F. Muell. var. *enchylaenoides* J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 47: 368 (1923); *Kochia enchylaenoides* (J. Black) J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 51: 379 (1927); [*Chenolea blackii* Ewart, *Fl. Victoria* 462 (1931) *nom. inval.*] T: Yellow Cliff near Charlotte Waters, N.T., 15 July 1921, S. A. *White*; holotype: AD.

Leaves obtuse to acuminate, moderately woolly. Fruiting perianth; tube hemispherical, 1 mm high, crustaceous. Fig. 34S.

Found in W.A. and southern N.T. Map 297.

W.A.: c. 14 km N of Learmonth, A. S. *George* 1303 (PERTH); 40 km W of Mininer Homestead, A. A. *Mitchell* 434 (PERTH). N.T.: Lake Neale, P. K. *Latz* 4241 (NT).

This subspecies has several variants which occupy distinct soil types.

49b. *Maireana tomentosa* subsp. *urceolata* Paul G. Wilson, *Nuytsia* 2: 49 (1975)

T: Evelyn Downs, S.A., 3 Sept. 1955, *E. H. Ising* 3990; holo: AD.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 271 fig. 47(30) (1982).

Leaves rounded at apex, loosely woolly. Fruiting perianth; tube cup-shaped, often constricted at apex, 1.5 mm high, woody, glossy. Fig. 34SS.

Found in north-western N.S.W. and north-eastern S.A. Map 298.

S.A.: Mt Lyndhurst, *M. Koch* 1906 (NSW); Leigh Creek, *T. R. N. Lothian* 2038 (AD). N.S.W.: Umberumberka, *A. Morris* 722 (NSW).

50. *Maireana integra* (Paul G. Wilson) Paul G. Wilson, *Nuytsia* 2: 50 (1975)

Kochia integra Paul G. Wilson in H. Eichler, *Suppl. to J. M. Black's Fl. S. Australia 2nd edn*, 122 (1965).

T: Giles, Rawlinson Range, W.A., 2 Aug. 1962, *R. H. Kuchel* 180; holo: AD.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 271 fig. 47(6) (1982).

Shrub to 1 m high. Branches woolly. Leaves alternate, semiterete, 5–14 mm long, 1 mm wide, obtuse, woolly. Flowers solitary, bisexual. Fruiting perianth pale to dark brown when dry; tube hemispherical, 1 mm high, 2.5 mm wide at apex, faintly costate, crustaceous, glabrous; wing simple, without a radial slit, horizontal, c. 10 mm diam., glabrous; upper perianth flat, pubescent. Fig. 34T.

Found from western N.S.W. westwards through S.A. and southern N.T. into south-central W.A. Map 299.

W.A.: 29 km E of Warburton (Mission), *A. S. George* 8724 (PERTH). N.T.: New Crown Stn, *T. S. Henshall* 1513 (NT). S.A.: 6 km NW of Curnamona Homestead, *A. E. Orchard* 286 (AD). N.S.W.: Byrnedale Stn, *J. C. De Nardi* 692 (NSW).

In western N.S.W. and south-western Qld there are plants intermediate in morphology between *M. integra* and *M. villosa*; it is possible that these are hybrids between the two species.

51. *Maireana villosa* (Lindley) Paul G. Wilson, *Nuytsia* 2: 51 (1975)

Kochia villosa Lindley in T. Mitch., *J. Exped. Trop. Australia* 91 (1848); *Kochia tomentosa* var. *lindleyana* Domin, *Biblioth. Bot.* 89: 68 (1921). T: 15 miles (24 km) N of the ford of the Darling R., N.S.W., 6 Mar. 1846, *T. L. Mitchell*; holo: CGE.

[? *Kochia pubescens* auct. non Moq.: Moq. in DC., *Prodr.* 13(2): 131 (1849) as to Australian collection cited.]

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 53 (1890) as *Kochia villosa*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 271 fig. 47(34), 276 (1982).

Open shrub to 0.5 m high. Branches slender, minutely to loosely woolly. Leaves alternate, flattened, linear to very narrowly oblong or narrowly obovate, acute, 5–12 mm long, appressed-villous. Flowers solitary or paired, bisexual, glabrous except ciliate lobes. Fruiting perianth brown when dry; tube broadly turbinate, faintly costate, c. 1 mm high, thin-walled and readily crushed; wing simple, horizontal (infolded when young), papery, with a single radial (radicular) slit, 7–10 mm diam., with dark brown anastomosing veins when dry; upper perianth flat, glabrous or sparsely pilose. Fig. 34U.

Widespread in the arid areas of all mainland States except Victoria. Map 300.

W.A.: 67 km N of Mundiwindi, *A. S. George* 973 (PERTH). N.T.: Yuendumu Settlement, *J. R. Maconochie* 907 (NT). S.A.: 35 km W of Everard Park Homestead, *D. J. Whibley* 1148 (AD). Qld: S of Selwyn, *C. H. Gittens* 683 (NSW). N.S.W.: Cobar, *G. M. Cunningham* 877 (NSW).

This species is variable, particularly in the amount and texture of the indumentum. Plants intermediate in character between *M. villosa* and *M. planifolia* are found over much of the range of the former species, and may represent a distinct taxon.

52. *Maireana planifolia* (F. Muell.) Paul G. Wilson, *Nuytsia* 2: 52 (1975)

Kochia planifolia F. Muell., *Fragm.* 1: 213 (1859). T: between Geraldine mine and Port Gregory, W.A., A. Oldfield; holotype: MEL.

Kochia tomentosa var. *platyphylla* Ising, *Trans. & Proc. Roy. Soc. S. Australia* 57: 185 (1933). T: Snake Gully near Pedirka, S.A., 1 Sept. 1932, E. H. Ising 2839; holotype: AD.

Openly-branched shrub to 1 m high. Branches slender, closely woolly. Leaves alternate, flattened, narrowly obovate to obovate, obtuse, mostly 8–15 mm long, sparsely to densely appressed-pubescent. Flowers solitary or paired (normally only one maturing), bisexual. Fruiting perianth straw-coloured to pale brown when dry; tube broadly turbinate, smooth or faintly ribbed, thin-walled, glabrous; wing horizontal (never infolded when young), simple with a single radial (radicular) slit, 10–14 mm diam., translucent; upper perianth flat, shortly woolly all over. *Low Bluebush*. Fig. 34V.

Found in W.A. between 22° and 31°S lat., in southern N.T. and northern S.A., on the rocky slopes of hills, in sand, and in mulga scrub. Map 301.

W.A.: Upper Rudall River area, P. G. Wilson 10319 (PERTH). N.T.: Mt Olga, D. Nelson 79 (MEL). S.A.: Mt Morris, H. Eichler 17373 (AD).

53. *Maireana melanocarpa* Paul G. Wilson, *Nuytsia* 2: 52 (1975)

T: Mt Lyndhurst, S.A., 9 Apr. 1955, F. M. Hilton 1335; holotype: ADW.

Much-branched shrub c. 50 cm high. Branches woolly. Leaves alternate, spreading, semiterete, 3–5 mm long, c. 1 mm wide, woolly, rounded at apex. Flowers solitary, bisexual, glabrous except woolly-ciliate margin to lobes. Fruiting perianth dark brown to black when dry, glabrous; tube shortly hemispherical, 1 mm high, 2 mm diam., faintly costate, firmly crustaceous; wing simple, horizontal, to 6 mm diam., with prominent dark brown venation and a single radial (radicular) slit; upper perianth thickened and convex around margin, thin and sunken in centre. Fig. 34W.

Occurs between Beltana and Lake Watherstone near Leigh Creek W of the north Flinders Range, S.A.; grows on sandy rises around salt lakes. Map 302.

S.A.: c. 22 km E of Lyndhurst, J. Carrick (AD); Beltana, J. G. O. Tepper 227a (AD).

54. *Maireana radiata* (Paul G. Wilson) Paul G. Wilson, *Nuytsia* 2: 53 (1975)

Kochia radiata Paul G. Wilson in H. Eichler, *Suppl. to J. M. Black's Fl. S. Australia 2nd edn*, 124 (1965). T: 20 km N of Ceduna, S.A., 9 Sept. 1960, P. G. Wilson 1510; holotype: AD.

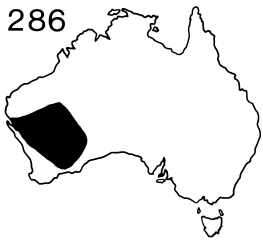
Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 271 fig. 47(25) (1982).

Densely-branched shrub c. 0.3 m high. Branches closely woolly, the hairs at first white, later dark brown. Leaves alternate, erect, fleshy, narrowly ovate to semiterete, 2–4 mm long, somewhat woolly. Flowers solitary, bisexual, glabrous below and woolly above. Fruiting perianth glabrous except the densely woolly upper perianth; tube hemispherical, to 1 mm high and 1.5 mm diam., brittle or almost woody, faintly ribbed; wing simple, horizontal, papery, 4–6 mm diam., when dry translucent between the fine dark-brown radial veins, with a single radial (radicular) slit; upper perianth slightly convex, densely woolly. Fig. 34X.

Found in southern Australia from Ravensthorpe in W.A. east to north-western Vic. and south-western N.S.W.; generally in sandy loam, slightly saline or alkaline. Map 303.

W.A.: W of Jerdacuttup River bridge, E. M. Bennett 2980 (PERTH). S.A.: 13 km W of Blanchetown, J. Z. Weber 3590 (AD). N.S.W.: 21.4 km SE of Corinya Homestead, J. C. De Nardi 618 (NSW). Vic.: 17.6 km W of Sunset Tankon Merrinee road, P. S. Short 1197 (MEL).

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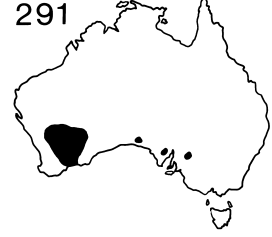
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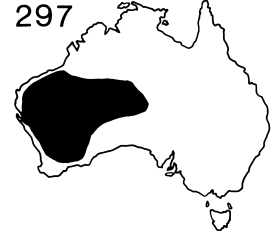
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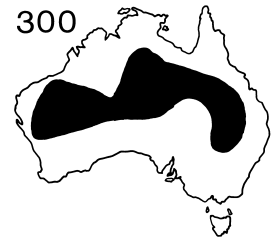
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286. *Maireana platycarpa*

289. *Maireana prosthecochaeta*

292. *Maireana decalvans*

295. *Maireana microcarpa*

298. *Maireana tomentosa*
subsp. *urceolata*

287. *Maireana glomerifolia*

290. *Maireana thesioides*

293. *Maireana rohrlachii*

296. *Maireana ovata*

299. *Maireana integra*

288. *Maireana atkinsiana*

291. *Maireana suaedifolia*

294. *Maireana microphylla*

297. *Maireana tomentosa*
subsp. *tomentosa*

300. *Maireana villosa*

55. *Maireana appressa* Paul G. Wilson, *Nuytsia* 2: 54 (1975), in error as comb. nov. instead of nom. nov.

Kochia appressa Benth., *Fl. Austral.* 5: 188 (1870) *nom. illeg.* (superfluous); *Kochia tomentosa* var. *appressa* J. Black, *Fl. S. Australia* 197 (1924). T: Lake Tyrell, *Herb. F. Mueller*; lecto: MEL 44117, *fide* P. G. Wilson, *loc. cit.*

Kochia tomentosa F. Muell., *Rep. Pl. Babbage's Exped.* 20 (1859). T: Margareth Creek, *Babbage Expedition*; lecto: MEL 44118, *fide* P. G. Wilson, *loc. cit.*

[*Kochia brownii* F. Muell., *Rep. Pl. Babbage's Exped.* 20 (1859) *p.p.*, *nom. inval.*]

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 265, 271 fig. 47(2) (1982).

Intricately-branched shrub 10–60 cm high, loosely white-woolly all over. Leaves alternate, suberect (if small) to spreading, narrowly deltoid to narrowly oblong, mostly 2–5 mm long. Flowers solitary, bisexual, glabrous. Fruiting perianth glabrous or rarely the upper perianth pubescent, straw-coloured when dry; attachment excentric on a hollow stipe to 1 mm long produced from base of tube; tube turbinate, 1–2 mm high, thin-walled and readily crushed; wing simple, c. 10 mm diam., papery, faintly nerved, with a radial (radicular) slit; upper perianth usually sunken, covering ovary, with 5 ridges extending radially between lobes. Fig. 34Y.

Widespread in the drier areas of the southern half of Australia in all mainland States, usually on sandy saline or gypseous soils. Map 304.

W.A.: Lake Seabrook, *P. G. Wilson 6157* (PERTH). N.T.: Lake Neale, *P. K. Latz 4252* (NT). S.A.: Lake Gairdner, *J. Z. Weber 3324* (AD). Qld: Dynevor Lakes, *S. T. Blake 11747* (BRI). N.S.W.: 72 km from Pooncarie on road to Top Hut, *J. C. De Nardi 1046* (NSW). Vic.: Raak Salt Plains, *A. C. Beaughlehole 40580* (PERTH).

56. *Maireana aphylla* (R. Br.) Paul G. Wilson, *Nuytsia* 2: 54 (1975)

Kochia aphylla R. Br., *Prodr.* 409 (1810); *Salsola aphylla* (R. Br.) Sprengel, *Syst. Veg.* 1: 925 (1824); *Kochia villosa* var. *aphylla* (R. Br.) C. Moore & E. Betche, *Handb. Fl. New South Wales* 110 (1893). T: Inlet XII (Spencers Gulf), [S.A.], 10 Mar. 1802, *R. Brown*; holo: BM.

[*Kochia brownii* F. Muell., *Rep. Pl. Babbage's Exped.* 20 (1859) *p.p.*, *nom. inval.*]

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 55 (1890) as *Kochia aphylla*; G. M. Cunningham *et al.*, *Pl. of W. New South Wales* 264, 271 fig. 47(1) (1982).

Divaricately-branched shrub to 2 m high, often spinescent, predominantly dioecious. Leaves small, alternate, slender and subterete, mostly 1–4 mm long, sparsely to densely woolly, very shortly spurred at base, frequently caducous. Flowers solitary, occasionally with 2 minute bracteoles. Fruiting perianth straw-coloured when dry, glabrous except sparsely woolly upper perianth; base small, sometimes tumid or produced into a very short hollow stipe; tube hemispherical to turbinate, 1–2 mm high; wing simple, horizontal, c. 8 mm diam., papery, faintly to prominently veined, with a single radial (radicular) slit; upper perianth thick forming a circular convex disc open in centre, sparsely woolly. *Cotton Bush*. Fig. 34Z.

Found west of the Great Dividing Range in N.S.W. and southern Qld, also in north-western Vic., eastern S.A., southern N.T., and in the Carnarvon–Wiluna area of W.A.; usually occurs in seasonally waterlogged clay soil. Map 305.

W.A.: Mount Sandiman Stn, *R. O'Farrell 21* (PERTH). N.T.: Jay Creek, Macdonnell Range, *A. S. George 5050* (PERTH). S.A.: 37 km N of Mirra Mitta Bore, *N. N. Donner 5085* (AD). Qld: Charleville, *S. T. Blake 5343* (NSW). N.S.W.: Fowlers Gap, *S. Jacobs 2083* (NSW). Vic.: Mildura, *H. B. Williamson 1450* (MEL).

This species sometimes has woolly galls caused by insect attack; hence the common name.

57. *Maireana stipitata* Paul G. Wilson, *Nuytsia* 2: 55 (1975).

T: 315 km N of Geraldton on road to Carnarvon, W.A., 9 Aug. 1966, A. M. Ashby 1882; holo: AD; iso: PERTH.

Divaricately-branched shrub to 1 m high. Branches white-woolly. Leaves alternate, fleshy, semiterete, 6–10 mm long, obtuse, sparsely tomentose with shortly dendritic hairs. Flowers solitary, unisexual or bisexual, dorsiventrally compressed. Fruiting perianth somewhat dorsiventrally compressed, pale brown; tube very short, broadly turbinate 0.5–1 mm high, thin-walled, densely papillose, produced at base into a prominent terete very thick-walled stipe, 1.5–3 mm long; wing simple, papery, undulate, 10–14 mm diam., finely nerved, glabrous, with a single radial (radicular) slit; upper perianth obscuring ovary, pubescent in centre or all over, bordered by a ring of raised papillose tissue.

Occurs in the Shark Bay region and the Dampier Archipelago, W.A., growing in sub-saline areas. Map 306.

W.A.: near Carrarang Stn, T. E. H. Aplin 3443 (PERTH); 38.5 km W of Overlander Roadhouse towards Denham, B. R. Maslin 3658a (PERTH).

11. ENCHYLAENA

Enchylaena R. Br., *Prodr.* 407 (1810); from the Greek *enchylos* (succulent) and *chlaina* (cloak), alluding to the succulent fruiting perianth.

Type: *E. tomentosa* R. Br.

Small shrubs. Branches slender, striate. Leaves alternate, simple, entire, fleshy, sessile or almost so. Flowers solitary, axillary, sessile, ebracteolate, bisexual. Perianth cup-shaped, 5-lobed with a deep radicular split, glabrous or pubescent. Stamens 5. Fruiting perianth globular or depressed-globular, succulent with cartilaginous to woody inner layer, vertically split opposite radicle (the succulent margins overlapping); lobes short, succulent, obscuring ovary; wing (if present) forming a shallow undulate cup around apex of perianth and split opposite radicle. Pericarp crustaceous above, membranous below. Seed horizontal; testa membranous; embryo annular; perisperm central; radicle centrifugal.

A genus of two species endemic in Australia.

G. Bentham, *Enchylaena*, *Fl. Austral.* 5: 180–183 (1870).

Fruiting perianth ± globular, pubescent; wing prominent, cup-like, c. 1 mm high

2. *E. lanata*

Fruiting perianth depressed, glabrous except for lobes; wing inconspicuous or absent.

1. *E. tomentosa*

1. *Enchylaena tomentosa* R. Br., *Prodr.* 408 (1810)

T: Bay IV (Petrel Bay, Isle St. Francis), [S.A.] 3 Feb. 1802, R. Brown; *n.v.*

E. paradoxa R. Br., *loc. cit.* (1810) T: Bay of Inlets, [Qld], 1770, J. Banks; *n.v.*

E. pubescens Moq. in DC., *Prodr.* 13(2): 128 (1849). T: sub-tropical New Holland, 2 Apr. 1846, T. L. Mitchell 53; lecto: K, *vide* P. G. Wilson, *Fl. Australia* 4: 326 (1984).

E. patens Gand., *Bull. Soc. Bot. France* 66: 224 (1919). T: Mt Lyndhurst, S.A., Oct. 1899 and May 1900, M. Koch 120; syn: LY.

E. brevifolia Gand., *loc. cit.* (1919). T: Cobar, N.S.W., July 1903, J. L. Boorman; holo: LY.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 85 (1891); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 264 (1982).

Lax shrub c. 1 m high, densely woolly with short curled hairs to shortly villous or glabrous, sometimes glaucous. Leaves slender, terete or fusiform, 7–20 mm long. Perianth tube glabrous; lobes glabrous or pubescent, woolly-ciliate. Fruiting perianth depressed-globular, c. 5 mm diam., green, yellow, or red, drying black; apex flat or deeply sunken in

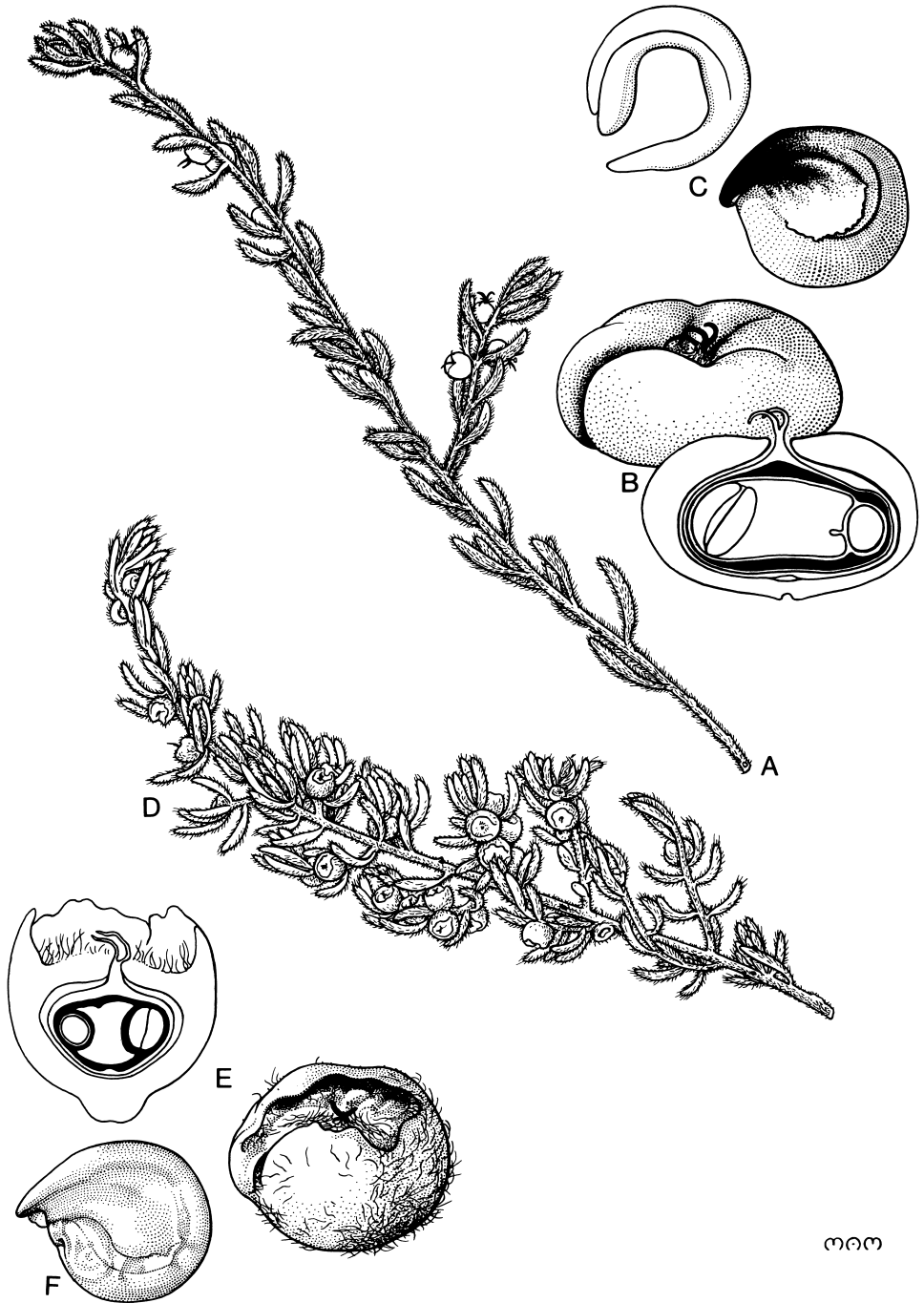


Figure 36. *Enchylaena*. **A–C**, *E. tomentosa* var. *tomentosa*. **A**, habit $\times 0.7$; **B**, fruiting perianth, entire and L.S. $\times 5$; **C**, seed and embryo $\times 5$ (**A–C**, P. Wilson 8763, PERTH). **D–F**, *E. lanata*. **D**, habit $\times 0.7$; **E**, fruiting perianth, entire and L.S. $\times 7$; **F**, seed $\times 8$ (**D–F**, P. Wilson 3980, PERTH).

centre, glabrous or woolly; wing absent or represented by an incurved undulate corona up to 1 mm high. *Ruby Saltbush*, *Barrier Saltbush*.

Widespread in mainland Australia; naturalised in New Caledonia. Occurs principally in slightly saline soil.

An extremely variable species both in indumentum and in shape of the fruiting perianth. However, the apparent total gradation between the variants makes formal infraspecific classification unworkable. var. *glabra* is the most readily recognised of the variants. Hybridisation occurs between *E. tomentosa* and *Maireana georgei* in W.A., and between *E. tomentosa* and *M. turbinata* in S.A. and Vic.

Leaves villous; branches tomentose

1a. var. tomentosa

Leaves and branches glabrous or minutely and sparsely appressed-villous

1b. var. glabra

1a. *Enchylaena tomentosa* R. Br. var. *tomentosa*

E. tomentosa var. *villosa* Benth., *Fl. Austral.* 5: 182 (1870). T: near Cudnaka, S.A., Oct. 1851, *F. Mueller*; holo: MEL.

Branches decumbent to erect with a thin woolly indumentum. Leaves villous. Fruiting perianth depressed-globular, flat to deeply sunken in centre; wing absent or coronate and incurved; lobes glabrous (but minutely ciliate) to pubescent. Fig. 36A–C.

Widely distributed in all mainland States. Map 307.

W.A.: 172 km E of Balladonia, *A. E. Orchard 1752* (PERTH). N.T.: Ayers Rock National Park, *R. Buckley 1390* (CANB). S.A.: 16 km N of Long Plains, *E. N. S. Jackson 1683* (AD). Qld: Poepel Corner, *D. E. Boyland 247* (BRI). Vic.: Hattah Lakes National Park, *A. C. Beaglehole 19809* (MEL).

1b. *Enchylaena tomentosa* var. *glabra* Benth., *Fl. Austral.* 5: 182 (1870)

T: Brisbane River, July 1855, *F. Mueller*; lecto: MEL, *fide* P. G. Wilson, *Fl. Australia* 4: 326 (1984).

Branches and leaves very sparsely and minutely appressed villous to glabrous, glaucous. Fruit flat or slightly sunken in centre; lobes glabrous apart from ciliate margins.

Widespread from the Kimberley, W.A. to the E coast of Qld and N.S.W. and south to north-western Vic. Map 308.

W.A.: Mt House, *W. V. Fitzgerald 965* (PERTH). N.T.: 48 km SSE of Brunette Downs Stn, *R. A. Perry 1601* (CANB). Qld: near Bundaberg, *L. S. Smith 481* (BRI). N.S.W.: Point Perpendicular, Nov. 1944, *J. D. McCornish* (NSW).

2. *Enchylaena lanata* Paul G. Wilson, *Fl. Australia* 4: 326 (1984)

T: 5 km E of Karonie, W.A., *P. G. Wilson 7596*; holo: PERTH.

Rounded shrub to 60 cm high. Branches closely woolly. Leaves slender, fusiform but flattened above, c. 10 mm long, villous. Perianth densely pubescent. Fruiting perianth globular to cup-shaped, c. 5 mm diam., pubescent, extending upwards as short (c. 1 mm high) corona (wing). Fig. 36D–F.

Found in inland south-western Australia principally on heavy slightly saline soils. Map 309.

W.A.: Billyacatting Hill, *B. G. Muir 451* (PERTH); 24 km S of Tammin, *R. D. Royce 9400* (PERTH).

12. ROYCEA

Roycea C. Gardner, *J. Roy. Soc. Western Australia* 32: 77 (1948); named after the Australian botanist R. D. Royce (1914–).

Type: *R. pycnophylloides* C. Gardner

Shrubs or perennial herbs, woolly or silky-pubescent when young. Leaves small, opposite or alternate, often fasciculate, entire, sessile, often spurred at base. Flowers inconspicuous, solitary, axillary, sessile, ebracteate, unisexual or bisexual. Perianth ovoid, c. 1 mm high, ± divided into 5 imbricate tepals, not enlarging in fruit. Stamens 5; filaments strap-shaped, united into a narrow disc at base. Ovary ovoid, c. 0.5 mm long, densely pubescent; style short, densely pubescent; stigmas 2 or 3, slender. Ovule erect, campylotropous; funicle arising from a cushion-like placenta. Fruit subglobular, 1–3 mm high, surrounded by perianth at base; pericarp thin, crustaceous. Seed horizontal or oblique; testa thin but slightly leathery; embryo circular surrounding a small central perisperm; radicle enclosed.

A genus of 3 species endemic in temperate and subtropical Western Australia.

- | | | |
|----|---|-------------------------------------|
| 1 | Dense mat-forming herbaceous perennial with weak branches | 1. <i>R. pycnophylloides</i> |
| 1: | Erect shrub with rigid woody branches | |
| 2 | Plant to 25 cm high, dioecious | 2. <i>R. spinescens</i> |
| 2: | Plant to 60 cm high; flowers bisexual | 3. <i>R. divaricata</i> |

1. *Roycea pycnophylloides* C. Gardner, *J. Roy. Soc. Western Australia* 32: 78, t. II A–K (1948)

T: near Meckering, W.A., 7 Sept. 1945, C. A. Gardner 7659; holo: PERTH.

Illustrations: C. A. Gardner, *loc. cit.*

Perennial herb forming densely branched, silvery, mat-like growths to 1 m diam., dioecious. Branchlets closely woolly, obscured by the leaves. Leaves alternate, imbricate, narrowly triangular, naviculate and slightly cucullate at the acute apex, fleshy, c. 2 mm long, 1 mm wide, silky when young. Flowers towards apex of branches. Male flowers cup-shaped; tepals thin, ovate, c. 1 mm long, silky outside; anthers exserted; pistillode slender, c. 1 mm long, pubescent. Female flowers suborbicular c. 1 mm long; staminodes absent; stigmas long-exserted c. 4 mm long. Fruit broadly ovoid c. 2 mm high surrounded at base by persistent perianth; pericarp crustaceous. Fig. 37 I–J.

Endemic on the saline sandy flats around the Mortlock River near Meckering in southern W.A. Map 310.

W.A.: Meckering, *R. D. Royce* 8413 (PERTH).

2. *Roycea spinescens* C. Gardner, *J. Roy. Soc. Western Australia* 32: 79, t. II L–S (1948)

T: near Meckering, W.A., 7 Sept. 1945, C. A. Gardner 7659a; holo: PERTH.

Illustrations: C. A. Gardner, *loc. cit.*

Small rigid shrub to 25 cm high forming colonies several metres in diameter, dioecious. Branches spinescent, divaricate, glabrous (pubescent in leaf axils). Leaves opposite (to alternate) in disjunct fascicles, ovate to triangular, 1–4 mm long, carinate, fleshy, glabrous, the larger ones spurred at base. Flowers in upper leaf-axils. Male flowers cup-shaped; tepals obovate, united in lower third, c. 2 mm long, ciliate; anthers exserted; pistillode slender, c. 1 mm long, pubescent. Female flowers globular; tepals sub-orbicular, ± free, c. 1 mm long, thin, ciliate; staminodes absent; ovary pubescent; stigmas c. 3 mm long. Fruit sub-globular, c. 3 mm high surrounded by persistent perianth; pericarp crustaceous. Fig. 37A–H.

Occurs from Morawa south to Merredin, W.A., in saline sand and sandy clay. Map 311.



Figure 37. *Roycea*. **A–H**, *R. spinescens* **A**, habit $\times 1.25$; **B**, branch $\times 2.5$; **C**, leaves $\times 5$; **D**, male flower $\times 10$; **E**, female flower $\times 10$ (**A–E**, M. Menadue 36, PERTH). **F**, fruit $\times 10$; **G**, embryo and seed $\times 10$; **H**, hair cluster $\times 10$ (**F–H**, P. Wilson 10964, PERTH). **I–J**, *R. pycnophylloides*. **I**, habit $\times 1.25$; **J**, branch with female flowers $\times 2.5$ (**I–J**, M. Menadue 37, PERTH).

W.A.: W of Cunderdin, *R. D. Royce 1032* (PERTH); 35 km S of Perenjori, *P. G. Wilson 8248* (PERTH).

3. *Roycea divaricata* Paul G. Wilson, *Fl. Australia* 4: 328 (1984)

T: 11 km N of Koorda, W.A., 13 Mar. 1968, *P. G. Wilson 6465*; holo: PERTH.

Rigid divaricately-branched spinescent shrub to 60 cm high. Branches pubescent when young, soon becoming glabrous and black. Leaves alternate, mostly in small dense globular fascicles on the closely spaced short dwarf branches; leaves on main branches narrowly triangular, c. 2 mm long, appressed, carinate, fleshy, shortly spurred at base, sparsely pubescent when young but eventually glabrous; leaves in fascicles broadly ovate, 0.5–1 mm long. Flowers located in the leafy fascicles, subglobular, bisexual. Tepals free, broadly ovate, slightly fleshy with membranous margin c. 1.5 mm long, sparsely pubescent. Staminal filaments sparsely pubescent towards base. Ovary narrowly ovoid, silky-pubescent c. 1 mm long; styles 2 or 3, 0.5–1 mm long. Fruit depressed-spherical c. 3 mm high, mericarp crustaceous.

Found in southern central W.A. from Yuna east to Laverton and south to Koorda and Southern Cross, in heavy saline soil. Map 312.

W.A.: c. 45 km E of Dalwallinu, *T. E. H. Aplin 2237* (PERTH); 2 km W of Yuna, *C. V. Malcolm 2* (PERTH).

Vegetatively similar to the inland variant of *Maireana oppositifolia* but differs in perianth structure and in the flowers being bisexual; in fruit readily distinguishable.

13. DIDYMANTHUS

Didymanthus Endl. in Endl. & Fenzl, *Nov. Stirp. Dec.* 7 (1839); from the Greek *didymos* (double) and *anthos* (flower), with reference to the paired flowers.

Type: *D. roei* Endl.

Woody perennial. Leaves opposite, small. Flowers bisexual, basally fused in axillary pairs, sessile. Perianth in fruit cylindrical, shortly 5-lobed with 5 spreading wings arising from base of lobes. Stamens 5, shortly exserted. Ovary glabrous; stigmas 2, slender. Pericarp membranous. Seed vertical; testa membranous; embryo horseshoe-shaped with erect radicle; perisperm central.

A monotypic genus endemic in southern W.A.

G. Bentham, *Didymanthus*, *Fl. Austral.* 5: 193 (1870).

Didymanthus roei Endl. in Endl. & Fenzl, *Nov. Stirp. Dec.* 8 (1839)

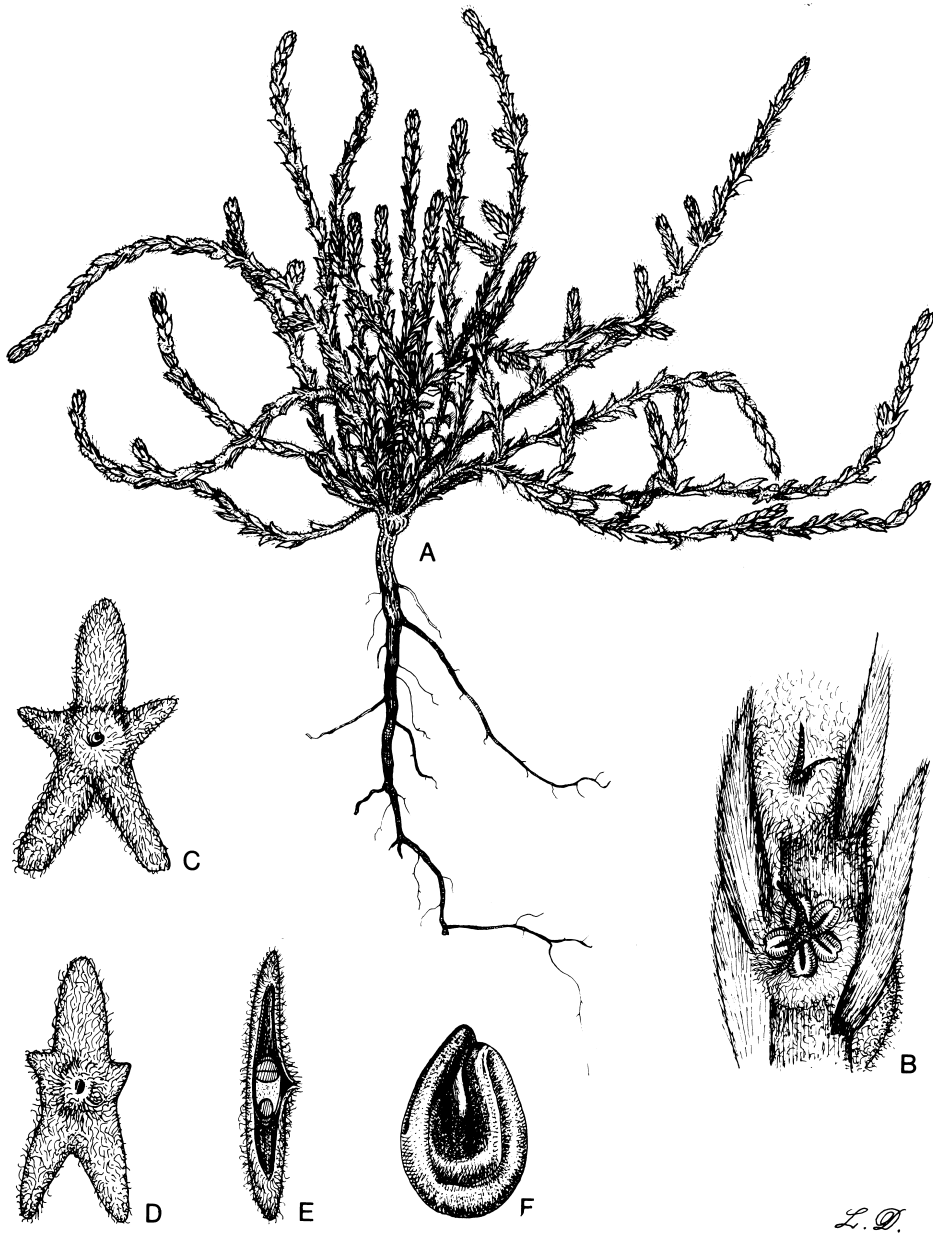
T: Swan River Colony [south-western W.A.], *J. S. Roe; n.v.*

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 60 (1890)

Small woody perennial c. 30 cm high. Branches slender, woolly. Leaves frequently erect, linear, to narrowly oblong, acute, 5–10 mm long, fleshy, sparsely sericeous. Perianth tube cylindrical c. 2.5 mm long, 1.5 mm diam., crustaceous, sparsely pubescent; wings horizontal, imbricate, papery, fan-shaped, in all c. 10 mm diam.

Found in the drier inland south-western portion of W.A., usually around salt lakes. Map 313.

W.A.: c. 46 km W of Balladonia, *T. E. H. Aplin 5863* (PERTH); Cunderdin, *C. A. Gardner 7466* (PERTH).



L.D.

Figure 38. *Malacocera gracilis*. A, habit $\times 0.5$; B, branch with flowers and leaves $\times 6$; C–D, fruiting perianth $\times 5$; E, section of fruiting perianth showing seed position $\times 5$; F, seed $\times 8$ (R. Chinnock 1695, AD). Reproduced from *J. Adelaide Bot. Gard.* 2: 145, fig. 4 (1980), by courtesy of the Director, Adelaide Botanic Gardens.

14. MALACOCERA

Malacocera R. Anderson, *Proc. Linn. Soc. New South Wales* 51: 382 (1926), from the Greek *malakos* (soft) and *ceras* (horn).

Type: *M. tricornis* (Benth.) R. Anderson

Annual or perennial herbs or small shrubs with woolly branches. Leaves alternate, linear or subterete. Flowers axillary solitary or paired, bisexual. Perianth small, globose, woolly, 5-lobed. Stamens 5. Stigmas 2 or 3. Fruiting perianth depressed, not woody, with 3–5 tepaline processes forming a Y, inverted Y, or star-shaped configuration; processes flattened or subcylindrical, woolly, attached to length of perianth tube; radicular slit prominent. Pericarp membranous. Seed horizontal; radicle centrifugal; perisperm abundant, central.

A genus of four species endemic in arid areas of southern Australia.

R. J. Chinnock, The genus *Malacocera* R. H. Anderson (Chenopodiaceae), *J. Adelaide Bot. Gard.* 2: 139–149 (1980).

This account is based on R. J. Chinnock, *loc. cit.*

- | | | |
|----|---|--------------------------------|
| 1 | Flowers paired in leaf axils | |
| 2 | Processes sub-terete over 2 mm long | 1. <i>M. albolanata</i> |
| 2: | Processes narrowly triangular, flattened, c. 1.5 mm long | 2. <i>M. biflora</i> |
| 1: | Flowers solitary in leaf axils | |
| 3 | Stems weak; leaves appressed; 3 major processes of perianth forming an inverted Y configuration | 3. <i>M. gracilis</i> |
| 3: | Stems robust; leaves spreading; 3 (rarely 4) processes of perianth forming a Y configuration | 4. <i>M. tricornis</i> |

1. *Malacocera albolanata* (Ising) Chinnock, *J. Adelaide Bot. Gard.* 2: 141 (1980)

Bassia albolanata Ising, *Trans. Roy. Soc. S. Australia* 88: 95 (1964); *Sclerolaena albolanata* (Ising) A. J. Scott, *Feddes Repert.* 89: 111 (1978). T: between Mungeranie and Cowarie, S.A., 17 Sept. 1956, J. B. Cleland; holo: AD.

Illustration: R. J. Chinnock, *op. cit.* 141, 142.

Shrub to 40 cm high. Branches slender, densely white-woolly. Leaves spreading, narrowly linear or semiterete, 6–18 mm long, densely villous when young, glabrous with age. Flowers paired in leaf axils, densely woolly. Fruiting perianths depressed; processes slender, terete, 2.5–4.5 mm long, 3 major and 2 minor or all of same length, with a Y- or star-shaped configuration, densely white-woolly.

Occurs in north-eastern S.A., south-western Qld, and western N.S.W., in depressions and clay pans. Map 314.

S.A.: Goyders Lagoon, 23 June 1953, S.A. Pastoral Board (AD). Qld: Breadalbane, S. T. Blake 12334 (BRI).

The illustration attributed to *Bassia albolanata* in Ising, *op. cit.* 69, was evidently published in error; it is an unrelated species of *Sclerolaena*.

2. *Malacocera biflora* Ising, *Trans. Roy. Soc. S. Australia* 78: 113 (1955)

T: Evelyn Downs, 90 miles (140 km) SW of Oodnadatta, S.A., 27 Oct. 1953, E. H. Ising 3616; holo: AD; n.v.

Illustration: R. J. Chinnock, *J. Adelaide Bot. Gard.* 2: 142, 144 (1980).

Small shrub to 25 cm high. Branches slender, white-woolly. Leaves slender, semiterete, acuminate, usually 5–12 mm long, white to brown villous. Flowers in pairs in leaf axils, densely woolly. Fruiting perianth very depressed; processes flat, narrowly triangular,

densely woolly, 3 major c. 1.5 mm long forming a Y configuration, 1 or 2 minor ones sometimes also present.

Occurs in the Lake Eyre Basin region of S.A. and southern N.T. Map 315.

N.T.: 8 km SW of Mt Connor, A. C. *Beaglehole* 45719 (PERTH). S.A.: 20 km W of Mt Barry Stn, 12 Sept. 1955, E. H. *Ising* (PERTH).

3. *Malacocera gracilis* Chinnock, *J. Adelaide Bot. Gard.* 2: 144 (1980)

T: W of Nectar Brook, S.A., 5 Sept. 1974, R. J. *Chinnock* 1695; holo: AD n.v.; iso: PERTH.

Erect annual or perennial herb to 25 cm high; rootstock woody. Branches slender, densely white-woolly. Leaves linear, acuminate, white-villous, 2.5–5 mm long, appressed or eventually spreading. Flowers solitary, densely woolly. Fruiting perianth depressed, appressed to branch; processes 3–5, the 3 major narrowly oblong and 2–3 mm long forming an inverted Y configuration, 2 minor ones irregularly shaped and fused with major ones to form a plate-like expansion. Fig. 38.

Recorded from eastern S.A. at Lake Callabonna and north-eastern Eyre Peninsula region, growing on saline clay soils or gypseous mounds. Map 316.

S.A.: Port Augusta, P. *Ollerenshaw* 146 (PERTH).

4. *Malacocera tricornis* (Benth.) R. Anderson, *Proc. Linn. Soc. New South Wales* 51: 382 (1926)

Chenolea tricornis Benth., *Fl. Austral.* 5: 191 (1870); *Bassia tricornis* (Benth.) F. Muell., *Syst. Census Austral. Pl.* 30 (1882). T: Clay flats, Darling River, N.S.W., *Dallachy s.n.*; lecto: MEL, *vide* R. J. *Chinnock, J. Adelaide Bot. Gard.* 2: 146 (1980).

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 63 (1891); R. J. *Chinnock, op. cit.* 147; G. M. *Cunningham et al., Pl. W. New South Wales* 276 (1982).

Erect shrub to 80 cm high. Branches slender, densely white-woolly. Leaves slender, semiterete, acute, 5–15 mm long, spreading, with recurved tips, densely white or pale brown villous. Flowers solitary, woolly. Fruiting perianth densely woolly; processes 3 (rarely 4) subcylindrical, 3.5–6 mm long, forming a Y configuration. *Soft Horns*.

Occurs in inland southern W.A., southern N.T., central and eastern S.A., southern Qld, western N.S.W and far north-western Vic. Map 317.

W.A.: 40 km E of Mt Vettors, 24 Apr. 1975, A. A. *Mitchell* (PERTH). N.T.: c. 3 km E of Victory Downs, Mt Ebenezer, T. S. *Henshall* 1001 (NT). S.A.: Mt Lyndhurst, Sept. 1899, M. *Koch* 214 (PERTH). N.S.W.: 22 km N of Hay, M. A. *Wilson* 33 (PERTH). Vic.: 16 km N of Boorooban, M. D. *Crisp* 1706 (PERTH).

15. NEOBASSIA

Neobassia A. J. Scott, *Feddes Repert.* 89: 117 (1978); from the Latin *neo* (new) and *Bassia*, another genus of the *Chenopodiaceae*.

Type: *N. astrocarpa* (F. Muell.) A. J. Scott

Small shrubs with brittle branches. Leaves alternate, sessile, subterete. Flowers bisexual, solitary in leaf axil. Perianth 5-lobed. Stamens 5. Fruiting perianth cylindrical, crustaceous to woody, with 5 spines arising from base of lobes and \pm united into an apical cup. Pericarp membranous. Seed vertical; testa membranous; embryo U-shaped with erect radicle; perisperm central.

A genus of two species endemic in Australia.

The genus has strong affinities with *Dissocarpus* and differs principally in having the flowers solitary in each leaf axil.

E. H. Ising, The species of *Bassia* All. (Chenopodiaceae) in Australia, *Trans. Roy. Soc. S. Australia* 88: 63–110 (1964).

Fruiting perianth with a truncate base; spines spreading

1. *N. astrocarpa*

Fruiting perianth with an oblique base; spines erect

2. *N. proceriflora*

1. *Neobassia astrocarpa* (F. Muell.) A. J. Scott, *Feddes Repert.* 89: 118 (1978)

Bassia astrocarpa F. Muell., *Fragm.* 12: 12 (1882); [*B. astracantha* F. Muell., *Syst. Census Austral. Pl.* 1: 140 (1882) *orth. var.*]; *Sclerolaena astrocarpa* (F. Muell.) Domin, *Biblioth. Bot.* 89: 70 (1921). T: Nickol Bay, W.A., 1876, *Mrs Crouch*; iso: PERTH.

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 65 (1891) as *Bassia astrocarpa*.

Small shrub with short silky pubescence. Leaves semiterete, 5–15 mm long, c. 1.5 mm diam., often recurved at apex or sigmoid. Perianth shortly silky-pubescent outside, shortly lobed. Ovary glabrous. Fruiting perianth cylindrical, c. 3 mm long, 1 mm diam., crustaceous to thinly woody, truncate or slightly sunken at base, often somewhat expanded at apex; spines slender, half to three-quarters length of tube (if shorter than \pm erect), spreading, shortly united at base by a saucer-shaped rim.

Occurs from the W coast of W.A. (Shark Bay to Broome) eastwards to western N.T., in saline soil. Map 318.

W.A.: Anna Plains Stn, *N. T. Burbidge 1379* (PERTH); Lake Auld, *A. S. George 9126* (PERTH). N.T.: Tanami Sanctuary, *P. K. Latz 4080* (NT).

Ising, *op. cit.* 95 noted that occasionally there are two flowers in the same leaf axil; in these cases the flowers are positioned one above the other, not laterally as in *Dissocarpus*. Probably closely related to *D. biflorus*.

2. *Neobassia proceriflora* (F. Muell.) A. J. Scott, *Feddes Repert.* 89: 118 (1978)

Threlkeldia proceriflora F. Muell., *Fragm.* 8: 38 (1873). T: near the source of the Thomson River, Qld, 1871, *C. W. Birch*; holo: MEL.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 87 (1891) as *Threlkeldia proceriflora*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 2281 (1982) as *Threlkeldia proceriflora*.

Small glabrous or sparsely villous shrub. Leaves slender, 10–20 mm long, 1 mm diam. Fruiting perianth tubular to bluntly ellipsoidal, c. 8 mm long, 2.5 mm diam., glabrous to villous; wall thick, initially succulent outside, later spongy, woody within; base oblique, firmly attached to branch; apex produced into a thin, very shortly 5-spined cup-shaped structure obscuring the small lobes. *Soda Bush*.

Southern N.T. and northern S.A. to eastern N.S.W. and Qld, in heavy soil. Map 319.

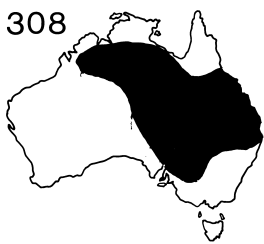
N.T.: Beddome Range, *T. S. Henshall 1514* (NT). S.A.: Mt Dutton area, *A. C. Beauglehole 20845* (PERTH). Qld: 64 km SW of Yarakka, *R. W. Johnson 3063* (BRI). N.S.W.: Warratta Range, *R. A. Perry 5753* (NSW).

16. ERIOCHITON

Eriochiton (R. Anderson) A. J. Scott, *Feddes Repert.* 89: 119 (1978); [F. Muell. *Sec. Gen. Rep.* 15 (1854), *nom. nud.*]; from the Greek *erion* (wool) and *chiton* (covering), alluding to the woolly perianth.

Bassia sect. *Eriochiton* R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 320 (1923). T: *E. sclerolaenoides* (F. Muell.) F. Muell. ex A. J. Scott

Small woolly shrubs. Leaves alternate, sessile, linear, somewhat fleshy. Flowers bisexual, solitary and axillary, exstipulate. Perianth cup-shaped, 5-lobed, fleshy in lower half. Stamens 5, glabrous. Stigmas 2, slender. Fruiting perianth sub-globular, hard, densely woolly, with a radicular split running almost to base, faintly ribbed; appendages in two



301. *Maireana planifolia*

304. *Maireana appressa*

307. *Enchylaena tomentosa*
var. *tomentosa*

310. *Roycea pycnophylloides*

313. *Didymanthus roei*

302. *Maireana melanocarpa*

305. *Maireana aphylla*

308. *Enchylaena tomentosa*
var. *glabra*

311. *Roycea spinescens*

314. *Malacocera albolanata*

303. *Maireana radiata*

306. *Maireana stipitata*

309. *Enchylaena lanata*

312. *Roycea divaricata*

315. *Malacocera biflora*

series: inner appendages 5, erect, oblong, deeply divided, arising from base of perianth lobes; outer appendages 5, spreading, spinescent, arising from base of inner appendages. Pericarp crustaceous above, membranous below. Seed thick, horizontal; testa membranous; embryo circular with centrifugal radicle; perisperm central, copious.

A monotypic genus of central and western temperate Australia.

Eriochiton sclerolaenoides (F. Muell.) F. Muell. ex A. J. Scott, *Feddes Repert.* 89: 119 (1978)

Echinopsilon sclerolaenoides F. Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 75 (1858); *Chenolea sclerolaenoides* (F. Muell.) F. Muell. ex Benth., *Fl. Austral.* 5: 192 (1870); *Bassia sclerolaenoides* (F. Muell.) F. Muell., *Syst. Census Austral. Pl.* 30 (1882); *Bassia eriochiton* Tate, *Handb. Fl. Extratrop. S. Australia* 51, 218 (1890); *Austrobassia sclerolaenoides* (F. Muell.) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 532 (1834); *Maireana sclerolaenoides* (F. Muell.) Paul G. Wilson, *Nuyisia* 2: 18 (1975). T: Cudnaka, S.A., Oct. 1851, *F. Mueller*; lecto: MEL, *fide* E. H. Ising, *Trans. Roy. Soc. S. Australia* 88: 72 (1964).

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 82 (1891) as *Bassia sclerolaenoides*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 274 (1982) as *Maireana sclerolaenoides*.

Rounded shrub c. 20 cm high with woolly branches. Leaves linear, 5–10 mm long, silky-woolly. Fruiting perianth densely silky-woolly, c. 1 mm high and 2 mm wide with the inner appendages c. 3 mm long. Pericarp and base of style villous.

Occurs in temperate W.A. eastwards to western N.S.W. and north-western Victoria on loamy sands in semi-arid areas. Map 320.

W.A.: Leonora, *W. E. Blackall* 363 (PERTH). N.T.: Orange Creek Homestead, *A. S. George* 5097 (PERTH). S.A.: Koonamore, *Hj. Eichler* 12473 (AD). N.S.W.: 30 km NNW of Balranald, *M. D. Crisp* 1753 (CBG). Vic.: 21 km SSE of Manangatang, *A. C. Beaglehole* 55522 (MEL).

17. EREMOPHEA

Eremophea Paul G. Wilson, *Fl. Australia* 4: 326 (1984); from the Greek *eremia* (desert) and *philius* (loving), in reference to the preferred habitat of *E. spinosa*.

Type: *E. aggregata* Paul G. Wilson

Small shrubs, tomentose all over with dendritic or stellate hairs. Leaves alternate, sessile, entire, fleshy, the floral ones often clustered. Flowers solitary or in triads, bisexual. Perianth 5-lobed. Stamens 5. Fruiting perianth woody and becoming embedded in woody branch axis; spines initially 5 arising from base of perianth lobes but in *E. spinosa* fusing irregularly. Seed and radicle erect; perisperm central. Inflorescence persistent.

Two species endemic in Australia.

Flowers in triads; leaves slender, semiterete

1. ***E. aggregata***

Flowers solitary; leaves narrowly obovate to obovate

2. ***E. spinosa***

1. *Eremophea aggregata* Paul G. Wilson, *Fl. Australia* 4: 327 (1984)

T: 1 km W of White Bluff, Yaringa Stn, W.A., *R. J. Cranfield* 2580; holo: PERTH.

Small shrub, densely tomentose all over with dendritic and stellate hairs. Leaves slender, semiterete, 10–20 mm long, spreading. Flowers in 3-flowered axillary cymes congested into globular inflorescences due to the closely aggregated floral leaves. Perianth densely tomentose. Fruiting perianths closely aggregated in groups of 18–30 and partly sunken into swollen branch to form globular inflorescences c. 12 mm diam.; perianth woody, cylindrical, c. 4 mm high; lobes erect; spines 5, erect, arising from base of each lobe. Fig. 39.

Known only from the type area in W.A., between Geraldton and Carnarvon. Map 321.

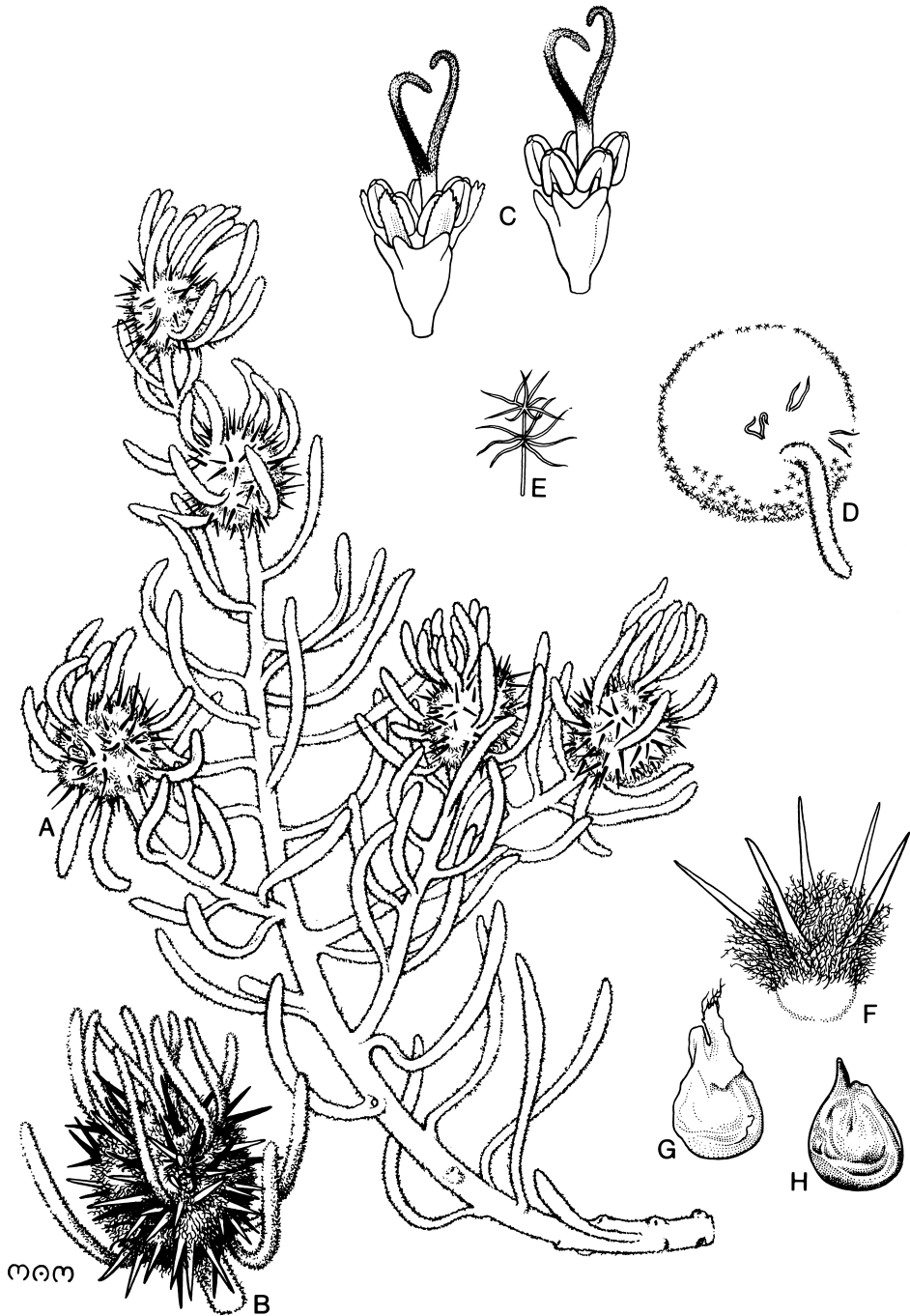


Figure 39. *Eremophea aggregata*. **A**, habit $\times 1$; **B**, cluster of fruiting perianths $\times 2$; **C**, flower with and without tepals, indumentum removed $\times 7$; **D**, 3 flowers in leaf axil $\times 3$; **E**, hair from perianth $\times 20$; **F**, fruiting perianth $\times 5$; **G**, fruit $\times 7$; **H**, seed $\times 7$ (R. Cranfield 2265, PERTH).

W.A.: c. 165 km SSE of Carnarvon on North West Coastal Highway, *A. C. Beaglehole 11781* (PERTH); c. 317 km from Geraldton on North West Coastal Highway, *A. M. Ashby 2198* (PERTH).

2. Eremophea spinosa (Ewart & O. B. Davies) Paul G. Wilson, *Fl. Australia* 4: 327 (1984)

Bassia spinosa Ewart & O. B. Davies, *Fl. Northern Territory* 95 (1917); *Sclerolaena spinosa* (Ewart & O. B. Davies) A. J. Scott, *Feddes Repert.* 89: 114 (1978). T: 90 miles (c. 144 km) NNW of N.T. Survey Camp III (Lander Creek), N.T., 15 June 1911, *G. F. Hill 346*; holotype: MEL; isotype: NT.

Bassia eremaea Ising, *Trans. Roy. Soc. S. Australia* 88: 93 (1964), *nom. illeg.* T: Bundooma, N.T. 27 Feb. 1953, *E. Reichenbach*; holotype: AD.

Illustration: A. J. Ewart & O.B. Davies, *op. cit.* t. 12 figs 1–3 (1917) as *Bassia spinosa*.

Rounded shrub c. 30 cm high. Branches brittle, tomentose with dendritic and stellate hairs. Leaves narrowly obovate to obovate, 10–15 mm long, obtuse, fleshy, tomentose, the floral ones often clustered. Flowers solitary, slightly sunken into branch; perianth cup-shaped, densely tomentose outside. Fruiting perianth urceolate, c. 4 mm long, woody, tomentose, becoming embedded in woody branch axis; lobes membranous, erect; spines arising from beneath perianth lobes but usually coalescing to form a stout adaxial 3-pronged spine 3–6 mm long and a shorter abaxial 2-pronged spine, the fused bases of which become flattened. Fruits irregularly clustered and persistent.

Found in north-western S.A. and southern N.T. westwards to the North West Cape area in W.A. Occurs in Mulga (*Acacia aneura*) scrub, also on calcareous hills and in sandy soil on eroded flats (*vide* G. M. Chippendale, *Trans. Roy. Soc. S. Australia* 83: 199, 1960). Map 322.

W.A.: Barrow Island, *W. H. Butler 142* (PERTH). N.T.: Erldunda Stn, *T. S. Henshall 101* (NT). S.A.: Mann Ranges, *J. B. Cleland* (AD 95914013).

The irregularly-shaped woody masses containing several fruits appear to be the natural form taken by this plant when the floral leaves are clustered (as is usual). They appear not to be galls as stated by G. M. Chippendale (*loc. cit.*) and E. H. Ising (*loc. cit.*).

18. DISSOCARPUS

Dissocarpus F. Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 75 (1858); from the Greek *dissos* (double) and *carpos* (fruit), referring to the paired fruits of the type.

Bassia sect. *Dissocarpus* (F. Muell.) Volkens, *Nat. Pflanzenfam.* 3(1a): 70 (1893). T: *D. biflorus* F. Muell.

Woolly perennials with woody base; hairs simple. Leaves alternate, linear to narrowly obovate, fleshy. Flowers 2 to many per leaf axil, fused together and sessile without individual bracts, bisexual. Perianth cup-shaped, woolly, or villous; lobes 5, erect. Stamens 5. Ovary glabrous; style slender. Fruiting perianths woody, firmly united together in an axillary cluster and deciduous as a whole; spines present or absent, where present arising opposite perianth lobes or from the fused bases of the perianths. Pericarp crustaceous above. Seed horizontal with ascending radicle; perisperm central.

A genus of four species endemic in Australia.

1 Fruiting perianths 2–7 in an axillary cluster, united by their bases; spines apparently absent

1. D. biflorus

1: Fruiting perianths 8–16 forming a hard woolly ball; spines prominent

2 Perianth tube emergent from woody ball-like infructescence; spines irregular, often flattened

4. D. fontinalis

2: Perianth tube sunk into woody infructescence; spines regularly 5, one opposite each perianth lobe



Figure 40. *Dissocarpus*. **A–B**, *D. fontinalis*. **A**, habit $\times 1$; **B**, infructescence $\times 4$ (**A–B**, A. Williams 15, NSW). **C–E**, *D. latifolius*. **C**, habit $\times 0.5$; **D**, flower $\times 7.5$; **E**, infructescence $\times 1.5$ (**C–E**, D. Symon 5781, ADW). **F–I**, *D. biflorus*. **F–H**, var. *biflorus*. **F**, habit $\times 1$; **G**, dissection of flower $\times 12.5$; **H**, pair of fruits $\times 4$ (**F–H**, M. Crisp 1769, PERTH). **I**, var. *cephalocarpus*, infructescence $\times 2.5$ (E. McBarron 15964, NSW).

3 Leaves linear-terete

2. **D. paradoxus**

3: Leaves narrowly obovate, flat

3. **D. latifolius**

1. Dissocarpus biflorus F. Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 75 (1858)

T: 'In the Murray desert, near Eustone', F. Mueller; n.v.

Sclerolaena biflora R. Br., *Prodr.* 1: 410 (1810); *Chenolea biflora* (R. Br.) F. Muell., *Fragm.* 10: 91 (1876); *Bassia biflora* (R. Br.) F. Muell., *Syst. Census Austral. Pl.* 30 (1882). T: Bay IV (St. Francis Is., Nuyts Archipelago), [S.A.], R. Brown; holo: BM.

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 61 (1891) as *Bassia biflora*.

Perennial c. 25 cm high. Branches woolly. Leaves slender, semiterete, 5–10 mm long, woolly. Flowers 2–7, united into a small woolly ball. Fruiting perianths united in lower half into a globular to slightly cylindrical thick-walled woody infructescence 6–10 mm diam. and falling as a whole; base rounded, deeply concave; covered in a woolly or villous indumentum; upper half of perianth cylindrical, c. 3 mm long, including the 5 incurved lobes, woody; spines absent or if present arising from and resembling the perianth lobes. Infructescence freely shed when mature.

Widespread in arid and semi-arid regions of N.T., S.A., Qld, N.S.W. and Vic.

There are 3 varieties

1 Fruiting perianth covered with long villous hairs

1c. var. villosus

1: Fruiting perianth woolly

2 Axillary clusters of 2 or 3 connate flowers

1a. var. biflorus

2: Axillary clusters of 4–7 connate flowers

1b. var. cephalocarpus

1a. Dissocarpus biflorus F. Muell. var. **biflorus**

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(6) (1982) as *Bassia biflorus* var. *biflorus*.

Flowers in clusters of 2 or 3. Connate fruiting perianths divaricate, in all 6–10 mm wide, covered with a thin to loose woolly indumentum; fused portion globular to shortly cylindrical; base rounded, deeply concave. Fig. 40F–H.

Found in southern N.T., eastern and southern S.A., western N.S.W. and far north western Vic., in heavy slightly saline soil. Map 323.

N.T.: c. 54 km N of Alice Springs, G. M. Chippendale (NT 9153). S.A.: near Adelaide, Nov. 1933, J. M. Black (NSW). N.S.W.: 32 km N of Hay, W. E. Mulham 5397 (NSW). Vic.: c. 5 km E of Mildura, T. S. Henshall (NSW 83292).

There is considerable variation in the indumentum of the fruiting perianth and in the shape of the fused portion of the infructescence. In western N.S.W. and N.T. this fused portion sometimes bears a small spine-like process on each side between the florets; these may represent sterile flowers. This variant probably grades into var. *cephalocarpus*.

1b. Dissocarpus biflorus var. **cephalocarpus** (F. Muell.) A. J. Scott, *Feddes Repert.* 89: 118 (1978)

Sclerolaena biflora var. *cephalocarpa* F. Muell., *Fragm.* 8: 38 (1873); *Bassia biflora* var. *cephalocarpa* (F. Muell.) R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 349 (1923). T: between the Barcoo and the Roma, Qld, 1871, C. W. Birch; lecto: MEL 101425, *vide* P. G. Wilson, *Fl. Australia* 4: 325 (1984).

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 249, 253 fig. 46(7) (1982) as *Bassia biflora* var. *cephalocarpa*.

Fruiting perianths in clusters of 4–7, in all c. 10 mm diam., symmetrically arranged, their upper portions emergent from the woody globular fused portion, thinly woolly. Fig. 40 I.

Found from central and southern Qld to northern N.S.W., in clay or heavy soil often somewhat saline. Map 324.

Qld: Biddenham, *S. L. Everist 3786* (BRI). N.S.W.: 6–8 km S of Walgett, *H. Salasoo 3801* (NSW).

In N.S.W. this variety appears to grade westwards into the 3-flowered variant of var. *biflorus*.

1c. *Dissocarpus biflorus* var. *villosus* (Ising) A. J. Scott, *Feddes Repert.* 89: 119 (1978)

Bassia biflora var. *villosa* Ising, *Trans. Roy. Soc. S. Australia* 88: 75 (1964). T: Twins Station, S.A., 24 Feb. 1956, *E. H. Ising*; holotype: AD.

Connate fruiting perianths 2, divaricate, densely covered with villous hairs.

Found in south-central S.A. Map 325.

S.A.: Yudnapinna, 12 Oct. 1939, *H. M. Douglas* (ADW).

2. *Dissocarpus paradoxus* (R. Br.) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 533 (1934).

Sclerolaena paradoxa R. Br., *Prodr.* 410 (1810); *Chenolea paradoxa* (R. Br.) F. Muell., *Fragm.* 10: 91 (1876); *Bassia paradoxa* (R. Br.) F. Muell., *Syst. Census Austral. Pl.* 30 (1882). T: south coast of Australia (St Vincent Gulf), [S.A.], 1802, *R. Brown*; iso MEL.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 62 (excluding upper right fig.) (1891); G. H. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(24), 255 (1982) as *Bassia paradoxa*.

Erect or decumbent, rounded, much-branched shrub to 50 cm high. Branches woolly. Leaves semiterete, slender, 5–15 mm long. Flowers connate in groups of 8–16 in dense woolly glomerules. Inflorescence a persistent densely woolly ball 10–15 mm diam.; fruiting perianths fused in lower 2/3 into a woody spherical mass. Lobes emergent, erect; spines 5, slender, 3–6 mm long, erect or spreading, hard, woolly at first, arising at base of each lobe. *Curious Saltbush*.

Widespread from north-western Vic., western N.S.W. and south-western Qld, westwards to Shark Bay region of W.A., often in clay or on scalded zones, but also in other soils. Map 326.

W.A.: Mileura, *P. G. Wilson 8984* (PERTH). N.T.: Jay Creek Settlement, *R. Winkworth 21* (PERTH). S.A.: Sloanes Bore Out station, *J. Z. Weber 2990* (AD). Qld: near Lochnager, *S. T. Blake 10282* (BRI). N.S.W.: c. 13 km SW of Tilpa, *C. W. E. Moore 5430* (CANB). Vic.: c. 5 km NE of Red Cliffs, *J. Cullimore 16* (MEL).

In this species and in *D. latifolius*, the peduncle penetrates to the centre of the spherical inflorescence which therefore remains firmly attached to the branch.

3. *Dissocarpus latifolius* (J. Black) Paul G. Wilson, *Fl. Australia* 4: 326 (1984)

Bassia paradoxa var. *latifolia* J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 46: 567 (1922); *Dissocarpus paradoxus* var. *latifolius* (J. Black) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 533 (1934). T: Strzelecki Creek, S.A., 29 Sept. 1916, *S. A. White*; holotype: AD.

Rounded perennial similar to *D. paradoxus* but more densely woolly all over. Leaves oblanceolate, c. 20 mm long and 6 mm wide, obtuse, succulent. Fig. 40C–E.

Found in north-eastern S.A. and neighbouring area of Qld and N.S.W. Map 327.

S.A.: Innamincka, *W. S. Reid* (ADW 26269). Qld: Dynevor Lake, *S. L. Everist 7493* (BRI). N.S.W.: Salisbury Downs Stn, *S. Jacobs 3126* (NSW).

4. *Dissocarpus fontinalis* Paul G. Wilson, *Fl. Australia* 4: 326 (1984)

T: Giddi Giddina, S.A., 21 Sept. 1966, *South Australian Pastoral Board*; holotype: AD.

Rounded perennial to 60 cm high. Branches slender, closely woolly. Leaves slender, semiterete c. 10 mm long, woolly. Flowers connate in groups of 8–12 in dense woolly clusters; perianth narrowly cylindrical, the upper third divided into erect narrowly triangular lobes. Inflorescence a persistent woody ball from which emerge the narrowly

cylindrical upper portions of the perianths and between them irregularly-shaped flattened or spine-like emergences to 3 mm long, all covered with a thick floccose indumentum, in all c. 15 mm diam. Figs 40A–B.

Found in north-eastern S.A. and neighbouring areas of Qld and N.S.W.; often occurs near springs. Map 328.

S.A.: Paralana Hot Springs, *R.H. Kuchel 945* (AD). Qld: near Betoota, *D. Davidson 429* (BRI). N.S.W.: Rowena Stn, *A. Williams 15* & *S. Jacobs* (NSW).

19. THRELKELDIA

Threlkeldia R. Br., *Prodr.* 409 (1810), named after Caleb Threlkeld, (1676–1728).

Type: *T. diffusa* R. Br.

Small woody perennials, glabrous except axillary pubescence. Leaves alternate, subterete, fleshy. Flowers axillary, solitary, bisexual. Perianth fleshy, glabrous. Stamens 3–5. Fruiting perianth tubular to urceolate, to 3 mm long, succulent or dry, woody at least within, without spines or wings, glabrous except ciliate lobes. Pericarp thin, brittle above. Seed horizontal to vertical; embryo annular; radicle erect; perisperm central.

A genus of two species endemic in Australia.

G. Bentham, *Threlkeldia*, *Fl. Austral.* 5: 196–198 (1870).

The genus has been variously circumscribed. The two species here recognised do not appear to be particularly closely related; both have close affinities with species of *Sclerolaena*, from which genus they are formally excluded by the absence of spines.

Fruiting perianth ovoid to urceolate, succulent outside; tube extending upwards to cover lobes

1. *T. diffusa*

Fruiting perianth obovoid, laterally compressed, dry; perianth lobes exposed at apex

2. *T. inchoata*

1. *Threlkeldia diffusa* R. Br., *Prodr.* 410 (1810)

T: King George Sound, [W.A.], 4 Jan. 1802, *R. Brown*; *n.v.*

Threlkeldia diffusa var. *latifolia* Benth., *Fl. Austral.* 5: 197 (1870). T: Lucky Bay, [W.A.], Jan. 1802, *R. Brown*; Dirk Hartog Is., W.A., *Milne*; both *n.v.*

Threlkeldia drupata Diels, *Bot. Jahrb. Syst.* 35: 186 (1904). T: Champion Bay, Jan. 1901, *L. Diels 2047*; *n.v.*

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 86 (1891); J.M. Black, *Fl. S. Australia* 2nd edn, 317 (1948).

Much-branched prostrate to erect perennial to 30 cm high, sparsely pilose in leaf axils, otherwise glabrous. Leaves obovoid and c. 5 mm long, to slender and subterete and 20–30 mm long, acute, succulent. Perianth tube succulent, cylindrical, c. 1 mm high, glabrous, the lobes 3, membranous, c. 0.5 mm long, puberulous. Stamens 3. Fruiting perianth ovoid to urceolate, 1.5–2.5 mm high, succulent outside, woody within; tube extending upwards to form a fleshy cup-shaped outgrowth c. 0.5 mm high obscuring and overlapping the perianth lobes and on drying forming 3 (or 4) short intertepaline knobs. Seed horizontal to slightly oblique; radicle erect.

Found from near Broome in W.A. south around the coast to Vic. and Tas., also at scattered inland localities. Principally coastal but also near inland salt lakes. Map 329.

W.A.: Bernier Is., Shark Bay, *R.D. Royce 5974* (PERTH). S.A.: Cookes Plains, *E.T. Kobelt L4* (AD). Vic.: Raak Salt Plains, *A.C. Beaglehole 40593* (MEL). Tas.: George Town, Dec. 1891, *L. Rodway* (HO).

2. Threlkeldia inchoata (J. Black) J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 40: 60 (1916)

Bassia inchoata J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 38: 463 (1924); *Threlkeldia obliqua* J. Black, *op. cit.* 39: 95 (1914) *nom. illeg.* T: between Dalhousie and Blood Creek, S.A., 12 Aug. 1913, S.A. White; *holo*: AD.

Illustration: J.M. Black, *Fl. S. Australia* 2nd edn, fig. 448 (1948).

Rounded much-branched perennial to 30 cm high, minutely pubescent in leaf axils, otherwise glabrous. Leaves terete, slender c. 15 mm long, acute. Perianth glabrous, the tube fleshy, c. 1 mm high; lobes united, membranous, c. 0.5 mm high, undulate, ciliate. Stamens 5. Fruiting perianth obovoid, 3–4 mm long, laterally compressed, hard, c. 5-ribbed, the radicular rib prominent; apex oblique and gibbous over radicle, shallowly rimmed around the central erect membranous perianth lobes, base concave. Seed and radicle erect.

Found in the southern N.T. and northern S.A., usually in slightly saline areas near water. Map 330.

N.T.: New Crown Stn, *T.S. Henshall 1506* (NT). S.A.: Eringa Stn, *E.N.S. Jackson 737* (AD).

20. OSTEOCARPUM

Osteocarpum F. Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 77 (1858); from the Greek *osteon* (bone) and *carpos* (fruit), alluding to the hard fruiting perianth.

Type: *O. salsuginosum* F. Muell.

Babbagia F. Muell., *Rep. Pl. Babbage's Exped.* 21 (1859); *Osteocarpum* sect. *Babbagia* (F. Muell.) Kuntze in Post & Kuntze, *Lex. Gen. Phan.* 407 (1902). T: *B. dipterocharpa* F. Muell.

Erect perennial herbs branching from base, usually glabrous except axillary pubescence. Leaves alternate, succulent, subterete to clavate. Flowers bisexual, solitary, axillary, glabrous except ciliate margin to lobes. Perianth tube somewhat fleshy; upper perianth membranous, 5-lobed. Stamens 5. Fruiting perianth glabrous; tube woody, subglobular, straw-coloured when dry; limb hidden in sunken apex of tube; radicular tubercle prominent, either bare or bearing an erect wing; intertepaline tubercles 0–4, or replaced by vertical wings; style short and hard, pubescent at apex. Seed horizontal with horizontal to ascending or erect radicle.

A genus of 5 species endemic in temperate Australia. Closely related on the one hand to *Threlkeldia* and on the other to some species of *Sclerolaena* (e.g. *S. urceolata*, *S. calcarata*, and *S. anisacanthoides*).

- | | | |
|----|--|---------------------------|
| 1 | Fruiting perianth subglobular, sessile or almost so, without wings | 1. O. salsuginosum |
| 1: | Fruiting perianth stipitate on a hollow base or, if sessile, then with 5 erect wings | |
| 2 | Vertical wings absent | |
| 3 | Base of fruiting perianth swollen, broader than tube; radicular tubercle prominent; intertepaline tubercles 1–4 | 5. O. scleropterum |
| 3: | Base of fruiting perianth cylindrical, equal to tube; radicular tubercle prominent; intertepaline tubercle 1 or none | 2. O. acropterum |
| 2: | Vertical wings present | |
| 4 | Vertical wings 1–3 | |
| 5 | Vertical wings 1 or 2, obovate, not extending downward along tube | |
| 6 | Perianth base broad and swollen; wing solitary; tubercles 1–4 | 5. O. scleropterum |
| 6: | Perianth base cylindrical; wings 2, or if 1 then with a single tubercle | 2. O. acropterum |

5: Vertical wings 2 or 3, semicircular

3. *O. dipterothecum*

4: Vertical wings 5

7 Tube of fruiting perianth sessile

4. *O. pentapterum*

7: Tube expanded into a broad tumid base

5. *O. sclerothecum***1. *Osteocarpum salsuginosum* F. Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 77 (1858)**

Threlkeldia salsuginosa (F. Muell.) Benth., *Fl. Austral.* 5: 197 (1870); *Chenolea salsuginosa* (F. Muell.) F. Muell., *Fragm.* 10: 92 (1876); *Bassia salsuginosa* (F. Muell.) F. Muell., *Syst. Census Austral. Pl.* 30 (1882). T: Cudnaka, Lake Torrens, S.A., *F. Mueller*; lecto: MEL 102303, *vide* Paul G. Wilson, *Fl. Australia* 4: 328 (1984).

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 88 (1891).

Glabrous, rounded perennial, branching from base, to 20 cm high. Leaves fleshy, semiterete or clavate, ± flattened above, congested towards apex of branches. Fruiting perianth sessile or with a short, hollow base; tube subglobular, c. 1 mm high, smooth or faintly ribbed, keeled and gibbous on the side with the radicular protuberance which is sometimes produced into a rounded tubercle. Fig. 41G.

Found from inland southern W.A. eastwards through S.A. and southern N.T. to central and western N.S.W. and western Vic.; generally found in clay soil subject to periodic flooding or on outer margin of salt lakes. Map 331.

W.A.: c. 29 km NE of Menzies, *T. E. H. Aplin* 2276 (PERTH). N.T.: 8 km SW of Mt Connor, *A. C. Beaglehole* 45707 (PERTH). S.A.: 3 km N of South Gap Stn Homestead, *R. Swinbourne* 11 (AD). N.S.W.: Mt Mulyah, *C. W. E. Moore* 5167 (CANB). Vic.: Red Cliffs, *A. C. Beaglehole* 16014 (MEL).

The most widely distributed variant of this species has a sessile perianth with smooth tube, but in the N.T. and northern portion of S.A. a variant is found with a stipitate perianth and strongly ribbed tube; this variant is intermediate in morphology between *O. salsuginosum* and *Sclerolaena urceolata* and probably intergrades with the latter species. Typical *O. salsuginosum* appears to grade into *O. acroptera* var. *deminuta* which could, with equal merit, be placed in the former species.

2. *Osteocarpum acroptera* (F. Muell. & Tate) Volkens, *Nat. Pflanzenfam.* 3(1a): 72 (1893)

Babbagia acroptera F. Muell. & Tate, *Trans. & Proc. Roy. Soc. S. Australia* 6: 108 (1883). T: Lake Torrens Plain, S.A., Aug. 1883, *R. Tate*; lecto: MEL 102306, *vide* P. G. Wilson, *Fl. Australia* 4: 327 (1984).

Rounded perennial, branching from base, c. 15 cm high, glabrous or sparsely pilose when young. Leaves semiterete, 3–5 mm long, fleshy. Fruiting perianth: tube subglobular, c. 0.6 mm high, smooth or multiribbed, stipitate on a hollow cylindrical base equal in length to tube; apex usually produced into two opposite erect tubercles which bear vertical obovate wings, c. 3 mm long, or only the radicular tubercle present and winged, or this tubercle prominent and radially flattened but unwinged. *Babbagia*.

There are two varieties which grade into each other.

Vertical wings 1 or 2, prominent

2a. var. *acroptera*

Vertical wings absent; radicular tubercle narrowly oblong, prominent

2b. var. *deminutum***2a. *Osteocarpum acroptera* (F. Muell. & Tate) Volkens var. *acroptera***

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 39 (1890) as *Babbagia acroptera*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* fig. 45a (1982) as *Babbagia acroptera* var. *acroptera*.

Fruiting perianth with 1 or 2 vertical wings, when 2 the longer borne on the radicular tubercle. Fig. 41D.



316. *Malacocera gracilis*
 319. *Neobassia proceriflora*
 322. *Eremophea spinosa*
 325. *Dissocarpus biflorus*
 var. *villosus*
 328. *Dissocarpus fontinalis*

317. *Malacocera tricornis*
 320. *Eriochiton sclerolaenoides*
 323. *Dissocarpus biflorus*
 var. *biflorus*
 326. *Dissocarpus paradoxus*
 329. *Threlkeldia diffusa*

318. *Neobassia astrocarpa*
 321. *Eremophea aggregata*
 324. *Dissocarpus biflorus*
 var. *cephalocarpus*
 327. *Dissocarpus latifolius*
 330. *Threlkeldia inchoata*

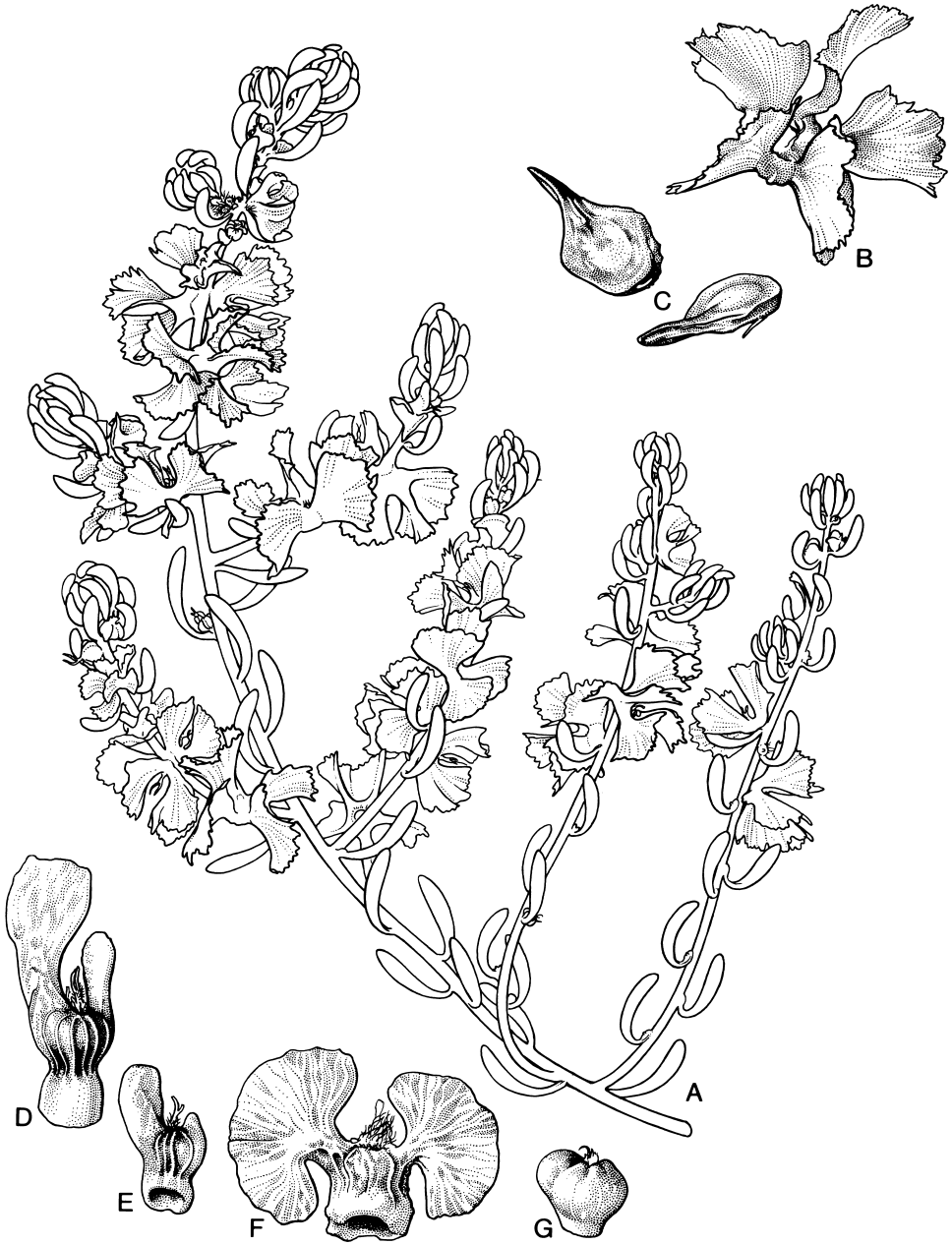


Figure 41. *Osteocarpum*. A–C, *O. pentapterum*. A, habit $\times 3$; B, fruiting perianth $\times 7$; C, seeds $\times 12$ (A–C, R. Purdie 1147, BRI). D–G, fruiting perianths $\times 7$. D, *O. acropterum* var. *acropterum* (C. Moore 7833, CANB). E, *O. acropterum* var. *deminutum* (M. Wilcocks 34, HO). F, *O. dipterocarpum* (F. Hilton 1412, ADW). G, *O. salsuginosum* (D. Symon 7418, ADW).

Occurs from north-western W.A. through southern N.T. and north-western S.A. to south-western Qld and western N.S.W. Map 332.

W.A.: 16 km W of Gascoyne Junction, *P. G. Wilson 8437* (PERTH). N.T.: Erldunda Stn, *T. S. Henshall 57* (NT). S.A.: Yudnapinna, May 1939, *H. N. Douglas* (ADW). Qld: Sandringham Plain, *S. Morton* (NSW 149114). N.S.W.: 64 km E of Wanaaring, *C. W. E. Moore 5793* (CANB).

2b. *Osteocarpum acropterum* var. *deminutum* (J. Black) Paul G. Wilson, *Fl. Australia* 4: 328 (1984)

Babbagia acroptera var. *deminuta* J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 46: 568 (1922). T: Port Augusta West, S.A., 29 Sept. 1920, *J. M. Black*; holotype: AD.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* fig. 45b (1982) as *Babbagia acroptera* var. *deminuta*.

Fruiting perianth without wings; radicular tubercle prominent, erect, narrowly oblong, c. 2 mm high, sometimes pale red. Fig. 41E.

Occurs in eastern S.A. and western N.S.W. and Vic., usually in heavy periodically waterlogged soil. Map 333.

S.A. Oakbank Stn, 21 Sept. 1968, *J. B. Cleland* (AD). N.S.W.: Rowena Stn, *A. Williams 3* (NSW). Vic.: Wyperfeld National Park, *A. C. Beauglehole 29362* (PERTH).

3. *Osteocarpum dipterocharpa* (F. Muell.) Volkens, *Nat. Pflanzenfam.* 3(1a): 72 (1893)

Babbagia dipterocharpa F. Muell., *Rep. Pl. Babbage's Exped.* 21 (1859). T: Stuarts Creek, S.A., *Babbage's expedition*; lectotype: MEL 102307, *fide* P. G. Wilson, *Fl. Australia* 4: 328 (1984).

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 37 (excluding fig. 8) (1890) as *Babbagia dipterocharpa*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 247 fig. 45c (1982).

Rounded perennial, branching from base, c. 15 cm high, glabrous. Leaves clavate, c. 5 mm long, fleshy. Fruiting perianth; tube cup-shaped with rounded inflexed apex, c. 0.7 mm high, ribbed, stipitate on a swollen hollow base c. twice length of tube; apex bearing 2 or 3 vertical wings c. 5 mm high which extend downwards to semicircular base of fruit. Fig. 41F.

Found from southern N.T. to western N.S.W., on margin of salt lakes or on clay pans. Map 334.

N.T.: NW Simpson Desert, *P. K. Latz 4392* (NT). S.A.: Leigh Creek, *T. R. N. Lothian 129* (AD). Qld: 48–56 km S of Bedourie, *S. T. Blake 12311* (BRI). N.S.W.: Kayrunnera, *P. L. Milthorpe 138* (AD).

4. *Osteocarpum pentapterum* (F. Muell. & Tate) Volkens, *Nat. Pflanzenfam.* 3(1a): 72 (1893)

Babbagia pentaptera F. Muell. & Tate, *Trans. & Proc. Roy. Soc. S. Australia* 6: 108 (1883). T: Mount Parry, S.A., 28 Aug. 1883, *R. Tate*; holotype: AD; isotype: MEL.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 40 (1890) as *Babbagia pentaptera*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 247 fig. 45 (1982) as *Babbagia pentaptera*.

Rounded perennial branched from base c. 20 cm high, pilose in leaf axils otherwise glabrous. Leaves congested, clavate, c. 5 mm long, fleshy. Fruiting perianth: tube depressed-globular, sessile, ribbed, c. 1 mm high and 1.5 mm wide; wings 5, erect, fan-shaped, c. 2 mm high, arising from side of tube, in all c. 6 mm diam. Seed horizontal; radicle centrifugal to slightly ascending. Fig. 41A–C.

Occurs in southern N.T., northern and north-eastern S.A. and south-western Qld; grows in heavy soil subject to flooding. Map 335.

N.T.: Andado Stn, *T. S. Henshall 1456* (NT). S.A.: c. 86 km ESE of Bluff Homestead, *T. R. N. Lothian 577* (AD). Qld: W of Betoota, *S. T. Blake 12183* (BRI).

5. Osteocarpum scleropterum (F. Muell.) Volkens, *Nat. Pflanzenfam.* 3(1a): 72 (1893)

Babbagia scleroptera F. Muell., *S. Sci. Rec.*, ser. 2, 1 (Nov. 1885); and *Bot. Centralbl.* 24: 374 (Dec. 1885). T: Warrego River, N.S.W., Sept. 1885, *E. Betche* 54; holo: MEL; iso: NSW.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 38 (1890) as *Babbagia scleroptera*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 247 fig. 45e (1982) as *Babbagia scleroptera*.

Rounded perennial, branching from base, c. 15 cm high, glabrous. Leaves clavate, 3–5 mm long, fleshy. Fruiting perianth: tube very shortly cylindrical, c. 0.5 mm high, 1.5 mm diam., striate, expanded below into a broad smooth swollen base c. 2 mm diam.; apex bearing either 2–5 erect obovate wings up to 2 mm long or an erect narrowly oblong radicular tubercle (which is sometimes produced into a short wing) and four smaller interpaline tubercles with or without short erect wings.

Found in north-western N.S.W. and south-western Qld. Map 336.

Qld: Gilruth Plain, Nov. 1950, *Baker* (BRI). N.S.W.: 32 km W of Bourke, *Soil Conservation Service no.* 1767 (PERTH).

Recorded for S.A. by J. M. Black, *Fl. S. Australia* 2nd edn, 309 (1948), but the collection on which this was based is probably *O. pentapterum*. Black's figure (*loc. cit.*) appears to have been copied from F. Mueller, *Icon. Salsolac. Pl.* t. 38, Fig. 5, third fruit (1890).

The representatives of this species (including the type) are probably of hybrid origin involving *O. acropterum* and possibly *Sclerolaena calcarata* or *S. anisacanthoides*. The only collection in which 2–5 wings are present is the type; the others bear only a very short wing and 1–4 tubercles.

21. SCLEROLAENA

Sclerolaena R. Br., *Prodr.* 410 (1810); from the Greek *scleros* (hard) and *chlaena* (a covering), referring to the hard perianth in fruit.

Type: *S. uniflora* R. Br.

Anisacantha R. Br., *Prodr.* 410 (1810); *Bassia* sect. *Anisacantha* (R.Br.) Volkens, *Nat. Pflanzenfam.* 3(1a): 70 (1892); *Sclerolaena* subgen. *Anisacantha* (R. Br.) Domin, *Biblioth. Bot.* 89: 69 (1921); *Sclerolaena* sect. *Anisacantha* (R. Br.) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 533 (1934). T: *A. divaricata* R. Br. (= *S. divariata* (R. Br.) Smith)

Kentropsis Moq., *Chenop. Monogr. Enum.* 83 (1840). T: *K. lanata* Moq. (= *S. bicornis* Lindley)

Coilocarpus Domin, *Biblioth. Bot.* 89: 71 (1921). T: *C. brevicuspis* (F. Muell.) Domin (= *S. anisacanthoides* (F. Muell.) Domin)

Bassia sect. *Platyacantha* F. Muell. ex R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 321 (1923). T: *B. tridens* F. Muell. (= *S. tridens* (F. Muell.) Domin)

Austrobassia Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 532 (1934); *Austrobassia* sect. *Ventricosae* Ulbr., *loc. cit.*, *nom. illeg.* (superfluous name). T: *A. ventricosa* (J. Black) Ulbr. (= *S. ventricosa* (J. Black) A. J. Scott)

Austrobassia sect. *Orthospermae* Ulbr., *loc. cit.* T: not indicated.

Sclerobassia Ulbr., *op. cit.*: 539 (1934). T: *Sclerobassia littoralis* (Diels) Ulbr. (= *Sclerolaena recurvuspis* (W. Fitzg.) Domin)

Bassia sect. *Trachycarpus* C. White, *Proc. Roy. Soc. Queensland* 55: 77 (1944); *Cyrlwhitea* Ising, *Trans. & Proc. Roy. Soc. S. Australia* 88: 61 (1964). T: *B. walkeri* C. White (= *Sclerolaena walkeri* (C. White) A. J. Scott)

[*Bassia auct. non* All.: R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 317 (1923); Ising, *op. cit.* 63 (1964)]

Perennial herbs or small shrubs, glabrous or variously pubescent with simple (rarely branched) hairs. Leaves small, simple, entire, fleshy, sessile or shortly petiolate. Flowers axillary, solitary or paired, bisexual or rarely unisexual. Perianth usually cup-shaped, shortly 3–5-lobed, accrescent. Stamens 3–5, hypogynous. Ovary thin-walled; stigmas 2 or

Figure 42. *Enchylaena tomentosa*.
Photograph — M. Fagg.

Figure 43. *Didymanthus roei*.
Photograph — M. Fagg.

Figure 44. *Sclerolaena bicornis* var.
bicornis.
Photograph — M. Fagg.

Figure 45. *Sarcocornia blackiana*.
Photograph — P. Bridgewater.

...

3, slender, papillose. Fruiting perianth enveloping utricle as a tube, crustaceous to woody, often with a hollow base filled with moist tissue when fresh; slit or tubercle (radicular tubercle) present opposite radicle; spines 2–6, rarely absent or occasionally to 9, arising between perianth lobes, a contiguous pair often opposite radicle (radicular spines); perianth lobes and upper portion of tube (above the spines) sometimes prominent (the limb). Utricle thin-walled. Seed horizontal to erect; testa membranous; embryo horseshoe-shaped to annular, the radicle often lying within a radicular tubercle; perisperm central.

An endemic genus of 62 species none of which occurs in Tasmania. Typically found in heavy soil in semi-arid regions.

G. Bentham, *Sclerolaena p.p., Anisacantha p.p., Fl. Austral.* 5: 193–196, 198–201 (1870); R. H. Anderson, *Proc. Lin. Soc. New South Wales* 48: 317–355 (1923); E. H. Ising, *Trans. & Proc. Roy. Soc. S. Australia* 88: 63–110 (1964); A. J. Scott, *Feddes Rept.* 89: 110–114 (1978).

Note 1) In the key to species the term ‘perianth’ is used for the fruiting perianth. 2) Species of *Sclerolaena* sometimes hybridise with other members of the genus, or with members of related genera. Hybrids can often be recognised as such by the perianths which may be deformed or be exceedingly variable on the one plant; they are frequently sterile. 3) The full number of spines does not always develop on every perianth; a check should therefore be made of several fruits. 4) Fruiting perianths frequently develop even though the seed does not; these sterile ‘fruits’ sometimes differ substantially from fertile ‘fruits’ and may cause confusion with identification. 5) For economy the spines or tubercles on the fruit are often given in figures, e.g. 4+2, indicating 4 major and 2 radicular spines.

- 1 Spines absent or represented by blunt tubercles
 - 2 Perianth depressed top-shaped, truncate at base and at the 4-angled apex **11. *S. tetragona***
 - 2: Perianth otherwise
 - 3 Perianth tube shortly oblong, dorsiventrally compressed; tubercles 1 or 2 **15. *S. patenticuspis***
 - 3: Perianth tube depressed-globular with a hollow cylindrical base; tubercles 4+2 **7. *S. urceolata***
- 1: Spines present
 - 4 Spines 2–6, weak and slender; perianth covered with long silky hairs **1. *S. eurotioides***
 - 4: Spines 2–10, hard
 - 5 Plant glabrous except axillary tufts of hairs
 - 6 Leaves linear to narrowly oblong or elliptic, flat **37. *S. muricata***
 - 6: Leaves terete to semiterete, fleshy
 - 7 Spines 1–3
 - 8 Perianth and young leaves variously pubescent
 - 9 Perianth limb erect, oblong, c. 3.5 mm long **61. *S. bicuspis***
 - 9: Perianth limb incurved and insignificant **14. *S. brevifolia***
 - 8: Perianth glabrous or with puberulous limb; young leaves glabrous or almost so
 - 10 Spines flattened, spreading horizontally **47. *S. tridens***
 - 10: Spines terete
 - 11 Base of perianth tube expanded; principal spines 2 or 3
 - 12 Principal spines 20–30 mm long **46. *S. longicuspis***
 - 12: Principal spines under 15 mm long

CHENOPODIACEAE

Sclerolaena

- 13 Spines 2, lateral (a pair of short radicular spines sometimes also present) **23. S. crenata**
- 13: Spines 3, symmetrically arranged **36. S. tricuspis**
- 11: Base of perianth tube not expanded
- 14 Limb fully erect; leaf axil woolly-pilose **33. S. articulata**
- 14: Limb incurved, at least at tip; leaf axil shortly pubescent to glabrous
- 15 Principal spines 2, laterally placed and ascending; radicular spine solitary and curved towards the stern axis **32. S. glabra**
- 15: Principal spines 3, almost horizontal (one lateral, one abaxial, and one somewhat adaxial or curved around branch) **31. S. cuneata**
- 7: Spines 4–9
- 16 Spines flattened, horizontally spreading **47. S. tridens**
- 16: Spines terete
- 17 Perianth nearly at right-angles to branch; tube with 4 spines evenly arranged at its apex
- 18 Spines c. 10 mm long, united at base by a cup-shaped outgrowth of the perianth **12. S. hostilis**
- 18: Spines c. 5 mm long, free to base **13. S. tetracuspis**
- 17: Perianth ascending to erect; spines not evenly arranged
- 19 Spines 4 (2 long, 2 short and contiguous); stamens 3
- 20 Longer spines c. 7 mm long, slender, free to base **8. S. fusiformis**
- 20: Longer spines to 2.5 mm long, united below into a shallow cup-shaped outgrowth **9. S. recurvuspis**
- 19: Spines variable in number and arrangement but not as above; stamens 3, 4, or 5
- 21 Longer spines 20–30 mm long, slender; perianth tube very thick with expanded base **46. S. longicuspis**
- 21: Longer spines under 15 mm long
- 22 Spines 6; four evenly arranged and a short contiguous pair on a radicular spur
- 23 Spines erect; perianth cylindrical with a prominent hollow base **6. S. anisacanthoides**
- 23: Spines spreading; perianth somewhat dorsiventrally compressed, the base slightly hollowed **5. S. calcarata**
- 22: Spines 3–9 or if 6 then not with a 4+2 arrangement
- 24 Perianth very shortly cylindrical; attachment basal; spines 5, spreading (3 equidistant and a contiguous pair) **43. S. johnsonii**
- 24: Perianth dorsiventrally compressed; attachment very oblique
- 25 Flowers in short dense spikes; fruiting perianth thin-walled; plant dioecious **28. S. medicaginoides**
- 25: Flowers not in spikes; fruiting perianth hard; flowers bisexual
- 26 Spines 3 or 4; perianth limb inflexed or inflexed at tip

- 27 Principal spines 2, laterally placed 32. *S. glabra*
- 27: Principal spines 2 or 3, one of which is somewhat abaxially placed
- 28 Perianth slightly constricted above base; some spines down-curved 29. *S. blakei*
- 28: Perianth not constricted above base; principal spines horizontal
- 29 Principal spines: 1 abaxial and 2 lateral in line; stamens 3 30. *S. divaricata*
- 29: Principal spines: 1 abaxial, 1 lateral, and 1 somewhat adaxial or curved around branch; stamens 5 31. *S. cuneata*
- 26: Spines 5 (3 principal and 2 minor adaxial); limb erect 34. *S. intricata*
- 5: Plant variously hairy
- 30 Flowers in pairs; perianth appendages ('spines') in two series, dentate or fimbriate; leaves linear, silky
- 31 Intertepaline (horizontal) fan-shaped appendages fimbriate with pungent spines 4. *S. symoniana*
- 31: Intertepaline (horizontal) fan-shaped appendages dentate 3. *S. fimbriolata*
- 30: Flowers solitary in leaf axil; perianth appendages (spines) not in two series
- 32 Spines 2; perianth with a prominently hollowed base
- 33 Perianth tube glabrous
- 34 Leaves and stem almost or quite glabrous 23. *S. crenata*
- 34: Leaves and stem hairy
- 35 Perianth tube shortly cylindrical to depressed-globose, c. 2 mm high, woody, dark red or reddish brown 22. *S. burbridgeae*
- 35: Perianth tube oblong, dorsiventrally compressed, c. 3 mm long, crustaceous, straw-coloured 27. *S. tatei*
- 33: Perianth tube hairy
- 36 Perianth long silky-villous 26. *S. eriacantha*
- 36: Perianth puberulous to shortly woolly
- 37 Spines parallel and erect; perianth expanded into a hollow base with elliptic attachment 25. *S. parallelicuspis*
- 37: Spines not parallel or if so the attachment circular
- 38 Perianth narrowed above the very swollen hollow base to form a dorsiventrally compressed tube 24. *S. constricta*
- 38: Perianth tube and base continuous
- 39 Perianth slightly ribbed on abaxial face; attachment narrowly to broadly elliptic 21. *S. holtiana*
- 39: Perianth smooth or almost so; attachment circular
- 40 Spines erect and almost parallel, mostly 0.5–1 mm long 19. *S. uniflora*
- 40: Spines divergent, mostly c. 2 mm long 20. *S. diacantha*
- 32: Spines 1–9, if 2 then perianth base not prominently hollowed
- 41 Spines 5 or more
- 42 Spines not pungent, short, erect, divided at apex; perianth depressed-globular, c. 2.5 mm wide 2. *S. walkeri*
- 42: Spines pungent, not divided at apex

43 Spines 6

- 44 Spines narrowly oblong or acuminate, flat, horizontal; plant sparsely appressed-hirsute **48. *S. alata***
- 44: Spines terete, recurved or horizontal to erect
- 45 Perianth oblong, dorsiventrally compressed, glabrous; spines spreading, 1–4 mm long **5. *S. calcarata***
- 45: Perianth gobular or shortly cylindrical to shortly turbinate
- 46 Leaves villous
- 47 Apex of perianth broad, 2.5–4 mm diam., cushion-shaped, woolly **44. *S. cornishiana***
- 47: Apex of perianth small, c. 1 mm diam., glabrous **10. *S. microcarpa***
- 46: Leaves glabrous to sparsely hairy
- 48 Perianth attached by a broad truncate base c. 2.5 mm wide; leaves almost glabrous (central Qld) **42. *S. ramulosa***
- 48: Perianth rounded or narrowed to base; leaves sparsely to moderately oppressed hirsute or hirtellous
- 49 Branches sparsely cottony; perianth spines 2.5–4 mm long **50. *S. napiformis***
- 49: Branches appressed-hirtellous; perianth tube c. 1.5 mm wide; spines 1.2 mm long **49. *S. parviflora***

43: Spines 5

- 50 Spines equal, regularly arranged around apex of barrel-shaped tube; plant loosely woolly all over **56. *S. blackiana***
- 50: Spines irregular in arrangement or size
- 51 Perianth tube oblong or cylindrical, longer than wide
- 52 Leaves ovate or elliptic, silky-pubescent; perianth tube dorsiventrally compressed, curved, woolly; spines flattened and fused to form an abaxial group **62. *S. clelandii***
- 52: Leaves linear, glabrous to sparsely hirtellous; perianth tube cylindrical, almost glabrous; spines free **35. *S. tubata***
- 51: Perianth tube squat, shortly turbinate to subglobular
- 53 Perianth densely silky-pilose; apex truncate, square **52. *S. densiflora***
- 53: Perianth glabrous to woolly or sparsely villous; apex not square and truncate
- 54 Perianth glabrous or very sparsely woolly, prominently ribbed; apex cushion-shaped, sunken in centre **40. *S. costata***
- 54: Perianth sparsely villous or woolly, not prominently ribbed, if glabrous then with convex apex
- 55 Perianth tube somewhat narrowed towards base, pubescent or shortly villous; apex convex; attachment circular, not sunken **41. *S. convexula***
- 55: Perianth tube not obviously narrowed towards base; attachment broad or elliptic, sometimes hollowed
- 56 Leaves slender, semiterete, villous; perianth woolly, the 3 longer spines 5–8 mm long **38. *S. deserticola***
- 56: Leaves linear to elliptic or obovate, flattened, sometimes fleshy

- 57 Perianth loosely woolly; longer spines 2–3 mm long **45. S. muelleri**
- 57: Perianth glabrous, sparsely villous, or woolly; longer spines 5–15 mm long
- 58 Perianth densely woolly; apex convex; two longest spines 8–15 mm long **39. S. birchii**
- 58: Perianth glabrous, sparsely villous, or minutely woolly; longer spines 5–10 mm long **37. S. muricata**
- 41: Spines 1–4
- 59 Longer spines 10–30 mm long
- 60 Leaves somewhat sigmoid or with recurved apex when mature; perianth partly embedded in branch **58. S. forrestiana**
- 60: Leaves not sigmoid when mature (apex sometimes recurved); perianth not embedded in branch **59. S. bicornis**
- 59: Longer spines mostly under 10 mm long
- 61 Perianth glabrous (limb sometimes hairy)
- 62 Perianth very depressed with truncate almost square apex, the 4 angles sometimes developing short stout spines **11. S. tetragona**
- 62: Perianth dorsiventrally compressed; spines prominent
- 63 Leaves glossy; hairs oppressed, medifixed **60. S. decurrens**
- 63: Leaves dull; hirsute or villous with basifixed hairs
- 64 Perianth attachment small; base not hollowed **16. S. drummondii**
- 64: Perianth attachment expanded; base hollowed **23. S. crenata**
- 61: Perianth hairy
- 65 Spines 3 or 4; perianth barrel-shaped; limb erect, densely hairy
- 66 Perianth tube c. 3 mm high; seed horizontal **54. S. ventricosa**
- 66: Perianth tube c. 2 mm high; seed vertical **55. S. everistiana**
- 65: Spines 2–4, if 3 or 4 then perianth tube not barrel-shaped
- 67 Leaves tomentose with shortly dendritic (branched) hairs **18. S. limbata**
- 67: Leaves glabrous or with simple (sometimes scabridulous) hairs
- 68 Leaves slender, semiterete, 10–20 mm long, with recurved apex at least when young
- 69 Leaves sigmoid, densely tomentose **57. S. stylosa**
- 69: Leaves straight or with recurved apex, glabrous to moderately silky-pilose **59. S. bicornis**
- 68: Leaves flattened, or ellipsoidal, or if semiterete less than 10 mm long
- 70 Perianth tube 1.5–3 mm long; apex truncate, slightly concave, bordered by 2–4 short spines; attachment minute **51. S. minuta**
- 70: Perianth not as above
- 71 Spines 2, slender, 4–7 mm long, glabrous or sparsely hairy towards base
- 72 Perianth tube downwardly (and sometimes upwardly) spurred at base; spines ascending in different vertical planes; hairs smooth **14. S. brevifolia**
- 72: Perianth tube not or only shortly spurred at base

- 73 Spines ascending in same vertical plane; hairs smooth **15. *S. patenticuspis***
- 73: Spines ascending in different vertical planes; hairs scabridulous **17. *S. obliquicuspis***
- 71: Spines 3 or 4, short or slender, glabrous or densely hairy in lower part
- 74 Perianth tube oblong, dorsiventrally compressed, curved; spines up to 1 mm long **62. *S. clelandii***
- 74: Perianth tube turbinate or shortly cylindrical, not curved; longer spines over 2 mm long
- 75 Perianth pilose; 2 longer spines slender, pilose in lower half **53. *S. lanicuspis***
- 75: Perianth villous; spines glabrous or almost so **55. *S. everistiana***

1. *Sclerolaena eurotioides* (F. Muell.) A. J. Scott, *Feddes Repert.* 89: 112 (1978)

Echinopsilon eurotioides F. Muell., *Fragm.* 7: 13 (1869); *Chenolea eurotioides* (F. Muell.) Benth., *Fl. Austral* 5: 191 (1870); *Bassia eurotioides* (F. Muell.) F. Muell., *Syst. Census Austral. Pl.* 30 (1882). T: W.A., *J. Drummond* 5, *suppl.*: 83; *holo*: MEL.

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 81 (1889) as *Bassia eurotioides*.

Perennial herb, woody at base, c. 30 cm high. Branches closely tomentose. Leaves alternate, fleshy, semiterete, acute, 5–10 mm long, villous to silky. Flowers solitary but forming terminal leafy spikes. Fruiting perianth crustaceous (readily crushed), covered with long straight silky golden hairs c. 10 mm long; tube deeply cup-shaped, c. 2.5 mm high, with a thick truncate base; upper-perianth erect, c. 1 mm high, shortly 5-lobed, pubescent, soft; spines from 2 to 4+2, slender and weak, spreading, when present the four longer 8–15 mm long and the radicular pair somewhat shorter. Pericarp thin; style slender, glabrous. Seed horizontal, thick; embryo circular, radicle centrifugal. Fig. 46A.

Found in the drier areas of subtropical W.A. in subsaline situations. Map 337.

W.A.: Peron Peninsula, *W. E. Blackall* 4663 (PERTH); c. 17 km S of Wiluna, *C. A. Gardner* 2401 (PERTH).

2. *Sclerolaena walkeri* (C. White) A. J. Scott, *Feddes Repert.* 89: 114 (1978)

Bassia walkeri C. White, *Proc. Roy. Soc. Queensland* 55: 77 (1944); *Cyrlwhitea walkeri* (C. White) Ising, *Trans. Roy. Soc. S. Australia* 88: 62 (1964). T: Diamantina–Mackunda Creek channels, Qld, Feb. 1942, L. G. Walker; *holo*: BRI.

Illustration: E. H. Ising, *op. cit.*, 61 as *Cyrlwhitea walkeri*.

Small shrub c. 30 cm high. Branches slender, densely woolly. Leaves slender, subterete, c. 5 mm long, sparsely cottony when young, otherwise glabrous. Flowers solitary. Perianth depressed, disc-like with a broad base, 5-lobed, sparsely cottony. Stamens 5. Fruiting perianth depressed-globular, c. 1.5 mm high and 2.5 mm wide (excluding spines), sparsely cottony; lower two-thirds hollow, radially divided into 5 cavities, 10-ribbed, the 5 intertepaline ribs developing narrow wings; upper third narrowed into a disc-like apex c. 1.5 mm wide from the margin of which arise 4+2 erect intertepaline processes and a very narrow undulate horizontal ring; processes slender, furcate, c. 1 mm high, the contiguous pair either side of the radicular split. Seed horizontal; radicle centrifugal. Fig. 46B.

Found in central Qld on saline river flats. Map 338.

This species appears to be most closely related to *Stelligera endecaspinis* but differs markedly in the fruits having a swollen hollow base and erect furcate spines.

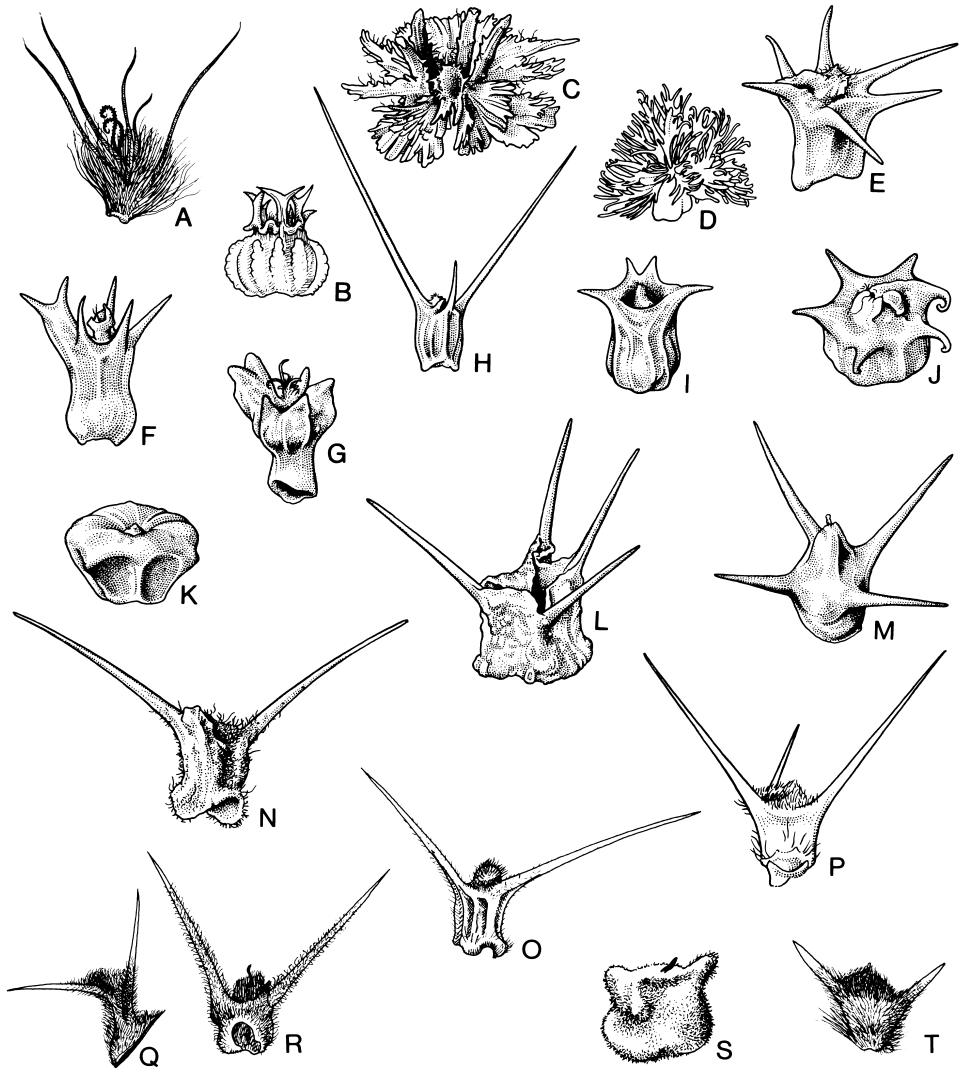


Figure 46. *Sclerolaena* fruits. **A**, *S. eurotioides* $\times 2.5$ (A. George 4682, AD). **B**, *S. walkeri* $\times 10$ (L. Walker, A–D 96021148). **C**, *S. fimbriolata* $\times 4$ (A. George 4679, PERTH). **D**, *S. symoniana* $\times 3.5$ (A. George 8233, PERTH). **E**, *S. calcarata* $\times 6$ (S. Everist 6267, BRI). **F**, *S. anisacanthoides* $\times 7.5$ (S. Blake 10476, AD). **G**, *S. urceolata* $\times 6$ (T. Henshall 1206, NT). **H**, *S. fusiformis* $\times 5$ (A. Oliver G13, PERTH). **I**, *S. recurvuspis* $\times 5$ (T. Aplin 3237, PERTH). **J**, *S. microcarpa* $\times 10$ (A. Ashby 2620, PERTH). **K**, *S. tetragona* $\times 6$ (D. Goodall 3287, PERTH). **L**, *S. hostilis* $\times 3$ (A. Beaglehole 11335, PERTH). **M**, *S. tetracuspis* $\times 5$ (S. Everist 3738, BRI). **N**, *S. brevifolia* $\times 5$ (J. Vickery, NSW 80500). **O**, *S. patentispis* $\times 4$ (J. Cleland, AD 95820128). **P**, *S. drummondii* $\times 5$ (Lake Barker Nature Reserve, W.A., W. Butler, PERTH). **Q**, *S. obliquispis* $\times 3$ (T. Lothian 3794, AD). **R**, *S. limbata* $\times 2$ (T. Lothian, AD). **S**, *S. uniflora* $\times 5$ (D. Symon, ADW 20918). **T**, *S. diacantha* $\times 3$ (T. Lothian 3953, AD). **C–N**, **P**, **S** drawn by M. Menadue. Others reproduced by permission from J. Jessop (ed.), *Fl. Centr. Australia* fig. 82 (1981).

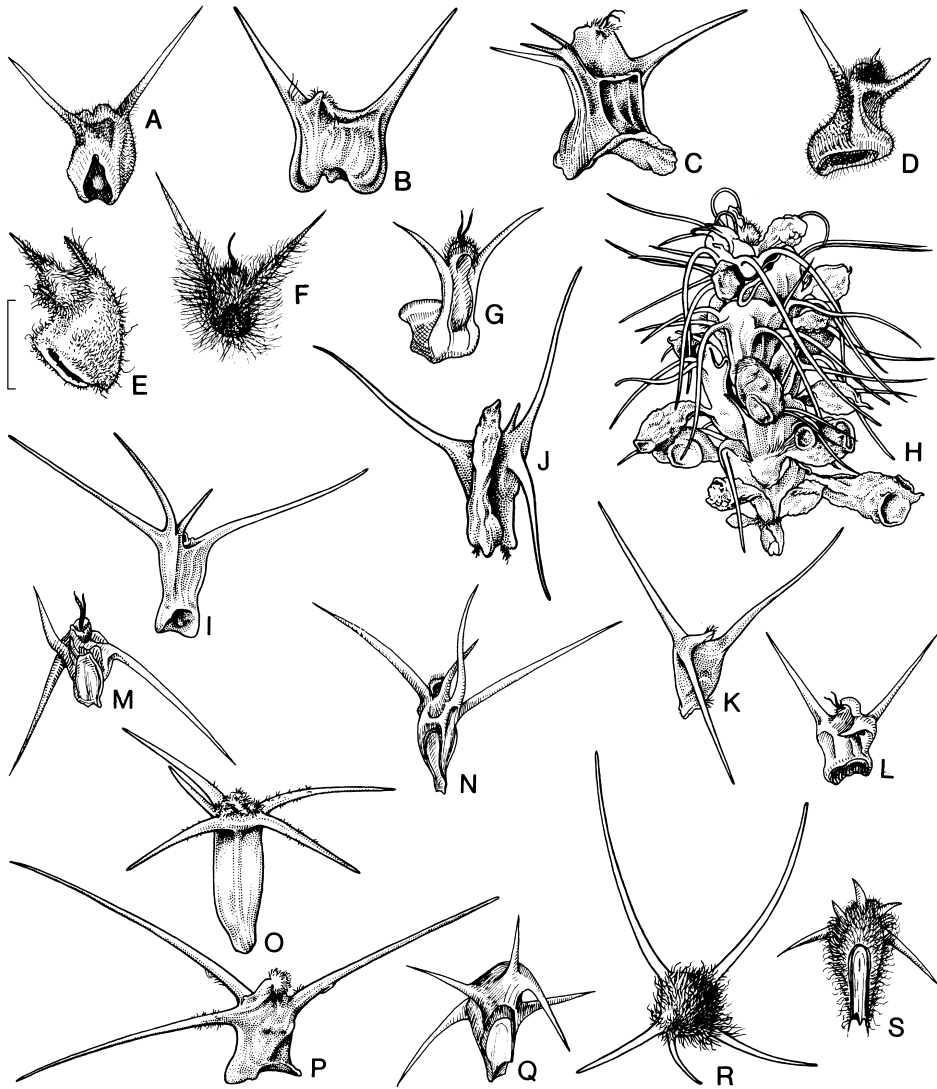


Figure 47. *Sclerolaena* fruits. **A**, *S. holtiana* ×3 (E. Ising, **A–D** 95943002). **B**, *S. burbidgeae* ×6 (A. Oliver L35, PERTH). **C**, *S. crenata* ×5 (N. Henry 380, CANB). **D**, *S. constricta* ×4 (E. Ising, **A–D** 95909066). **E**, *S. parallelicuspis* ×5 (E. Ising AD). **F**, *S. eriacantha* ×3 (T. Henshall 732, AD). **G**, *S. tatei* ×4 (S. Barker 232, AD). **H**, *S. medicaginoides* ×3.5 (S. Hopper 3255, PERTH). **I**, *S. blakei* ×5 (S. Blake 12345, BRI). **J**, *S. divaricata* ×5 (Booligal, N.S.W., E. Constable, NSW). **K**, *S. cuneata* ×3.5 (A. Oliver 11, PERTH). **L**, *S. glabra* ×3 (A. Beauglehole 22737, AD). **M**, *S. articulata* ×3 (A. Beauglehole 10298, AD). **N**, *S. intricata* ×3 (T. Lothian 4675, AD). **O**, *S. tubata* ×5 (S. Blake 13281, BRI). **P**, *S. tricuspis* ×4 (D. Henderson 469, NSW). **Q**, *S. muricata* var. *muricata* ×2 (R. Crocker, **A–D** 96130142). **R**, *S. deserticola* ×4 (D. Symon 2326, ADW). **S**, *S. birchii* ×3 (Adams 1007, AD). **B**, **C**, **E**, **H–K**, **O**, **P**, **R** drawn by M. Menadue. Others reproduced by permission from J. Jessop (ed.), *Fl. Centr. Australia* fig. 82 (1981).

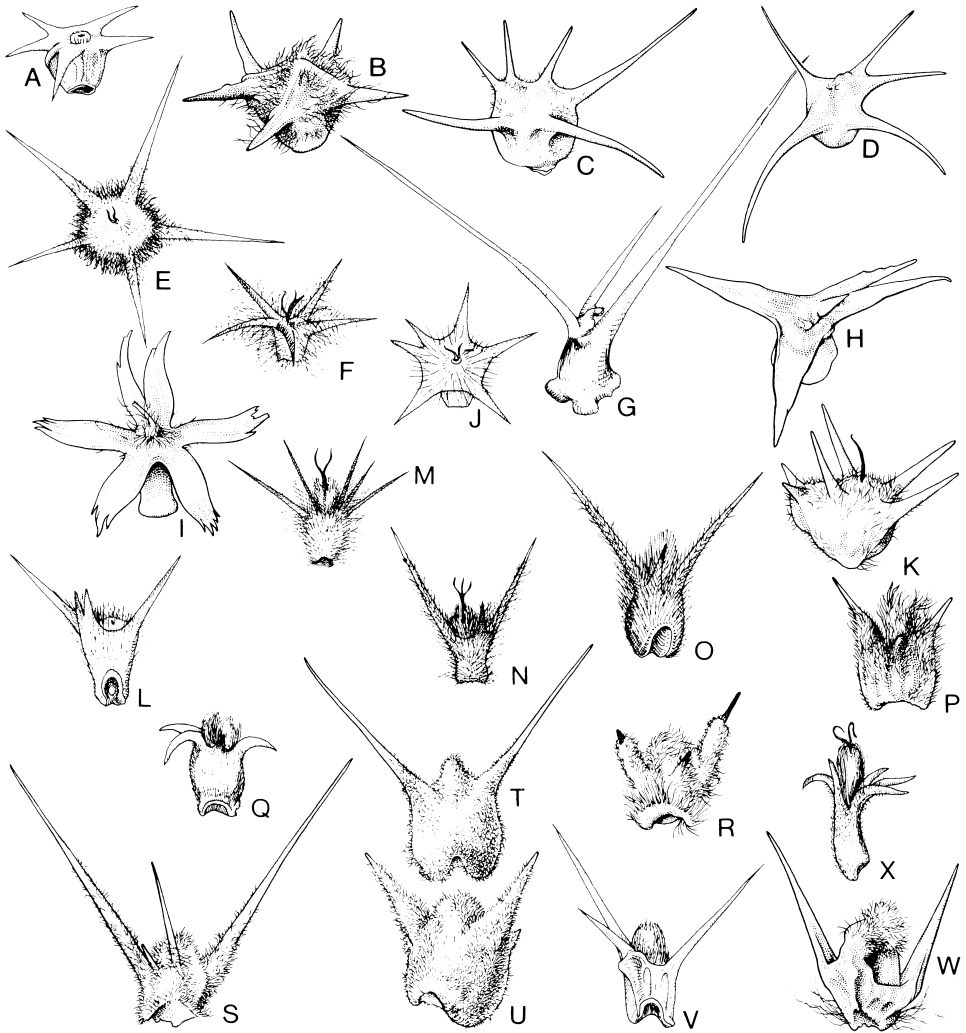


Figure 48. *Sclerolaena* fruits. **A**, *S. costata* $\times 4$ (J. Weber 850, AD). **B**, *S. convexula* $\times 6$ (E. Constable, NSW). **C**, *S. ramulosa* $\times 4$ (N. Byrnes 3590, BRI). **D**, *S. johnsonii* $\times 5$ (G. Chippendale & L. Johnson 3940, NSW). **E**, *S. cornishiana* $\times 2.5$ (T. Lothian 4444, AD). **F**, *S. muelleri* $\times 3$ (T. Henshall 1236, AD). **G**, *S. longicuspis* $\times 2$ (J. Cleland, AD 95820066). **H**, *S. tridens* $\times 4$ (C. Gardner 3291, PERTH). **I**, *S. alata* $\times 5$ (A. Ashby 5054, PERTH). **J**, *S. parviflora* $\times 6$ (E. Ising, A–D 966081113). **K**, *S. napiformis* $\times 4$ (E. D’Arny 424, CANB). **L**, *S. minuta* $\times 10$ (S. Blake 15967, AD). **M**, *S. densiflora* $\times 4$ (G. Chippendale 57481, NSW). **N**, *S. lanicuspis* $\times 3.5$ (E. Ising 2896, AD). **O**, *S. ventricosa* $\times 4$ (M. Dodson, A–D 96820158). **P**, *S. everistiana* $\times 6$ (J. Mann, BRI 93014). **Q**, *S. blackiana* $\times 7$ (J. Cleland, A–D 96309284). **R**, *S. stylosa* $\times 5$ (A. Beaglehole 11780, PERTH). **S**, *S. forrestiana* $\times 2.5$ (P. Wilson 8477, PERTH). **T**, *S. bicornis* var. *bicornis* $\times 2$ (N. Ford, NSW 61452). **U**, *S. bicornis* var. *horrida* $\times 4$ (E. Constable, NSW 4450). **V**, *S. decurrens* $\times 4$ (D. Whibley 2381, AD). **W**, *S. bicuspis* $\times 4$ (P. Wilson 8434, PERTH). **X**, *S. clelandii* $\times 5$ (D. Symon 2372, AD). **B–D**, **H**, **I**, **K**, **P**, **R–U**, **W** drawn by M. Menadue. Others reproduced by permission from J. Jessop (ed.), *Fl. Centr. Australia* fig. 82 (1981).

3. *Sclerolaena fimbriolata* (F. Muell.) A. J. Scott, *Feddes Repert.* 89: 112 (1978)

Kochia fimbriolata F. Muell., *Fragm.* 9: 75 (1875). T: north of Fowlers Bay, S.A., 1875, *E. Giles*; holo: MEL.

Bassia longifolia W. Fitzg., *J. W. Austral. Nat. Hist. Soc. no.* 1: 32 (1904), *nom. illeg.*, non L. (1771). T: Nannine, W.A., Sept. 1903, *W. V. Fitzgerald*; holo: N.S.W.

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 44 (1889) as *Kochia fimbriolata*.

Rounded shrub c. 30 cm high. Branches thick, velvety. Leaves crowded towards branch apices, linear, bluntly trigonous, c. 30 mm long, 3 mm wide, silky. Flowers in pairs. Perianth pubescent, 5-lobed. Stamens 5. Fruiting perianth hard, sparsely pubescent; base shortly cylindrical, c. 1.5 mm high and wide, truncate; attachment circular, c. 2 mm diam.; tube shortly cylindrical, c. 1 mm high, bearing two series of appendages; antetepaline appendages 5, terete to narrowly oblong, c. 3 mm long, rough, 2- or 3-dentate at apex; intertepaline appendages 5, horizontal to reflexed, fan-shaped, 2–3 mm long, rough, dentate on margin. Seed horizontal; radicle centrifugal. Fig. 46C.

Found in the desert of central W.A., in kopi on margins of gypsum salt lakes. Map 339.

W.A.: Lake Auld, *A. S. Mitchell 1062* (PERTH); Lake Miranda, *J. S. Beard 6577* (PERTH).

This species differs from *Sclerolaena symoniana* in having the fruiting perianth appendages only slightly dissected, not fimbriate.

4. *Sclerolaena symoniana* (Ising) A. J. Scott, *Feddes Repert.* 89: 114 (1978)

Bassia symoniana Ising, *Trans. Roy. Soc. S. Australia* 88: 75 (1964). T: W end of Hopkins Lake, W.A., 1 Aug. 1962, *D. E. Symon 2341*; holo AD.

Rounded shrub c. 30 cm high. Branches velvety. Leaves linear, trigonous, to 30 mm long, 2–3 mm wide, silky, succulent. Flowers in pairs. Perianth pubescent, 5-lobed. Stamens 5. Fruiting perianth hard, sparsely pubescent; base solid, truncate, c. 1.5 mm high and wide; attachment circular, c. 2 mm diam.; tube shortly cylindrical, c. 1 mm high, bearing two series of appendages; antetepaline appendages 5, erect, lanceolate, 2–3 mm long, spiny; intertepaline appendages 4–12 recurved, fan-shaped, c. 3 mm long, fimbriate with pungent spines. Seed horizontal; radicle centrifugal. Fig. 46D.

Found in south-western N.T. and adjacent W.A. and in north-western S.A., on sandy margins of salt lakes. Map 340.

W.A.: Van der Linden Lakes, *A. S. George 8233* (PERTH). N.T.: c. 27 km E of Curtain Springs, *P. K. Latz 2454* (NT). S.A.: 12 km E of Serpentine Lakes, *D. E. Symon 12531* (ADW).

This species differs from *Sclerolaena fimbriolata* in having fimbriate margins to the fruiting perianth appendages.

5. *Sclerolaena calcarata* (Ising) A. J. Scott, *Feddes Repert.* 89: 111 (1978)

Bassia calcarata Ising, *Trans. Roy. Soc. S. Australia* 88: 102 (1964). T: Oodnadatta, S.A., 29 Aug. 1955, *E. H. Ising*; holo: AD.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(11) (1982) as *Bassia calcarata*.

Rounded perennial branching from base, c. 25 cm high, glabrous to pilose. Leaves slender, terete, 5–10 mm long, fleshy. Flowers solitary, glabrous. Stamens 5. Fruiting perianth oblong somewhat dorsiventrally compressed, c. 2 mm long, 10-ribbed, glabrous or with pubescent limb, produced at base into 2 spurs; attachment broadly oval, slightly hollowed, oblique; spines 6, 1–4 mm long, spreading, the collateral pair borne on a short radicular tubercle; limb small, membranous, erect, in the slightly sunken apex. Seed vertical; radicle erect. *Redburr.* Fig. 46E.

Found in central and eastern Australia excluding Victoria, in heavy soil. Map 341.

N.T.: Andado Stn, *T. S. Henshall 1472* (NT). S.A.: Oodnadatta, 14 July 1951, *E. H. Ising* (ADW). Qld: Charleville, *S. T. Blake 5332* (BRI). N.S.W.: 10 km S of Louth, *C. W. E. Moore 7617* (CANB).

6. *Sclerolaena anisacanthoides* (F. Muell.) Domin, *Biblioth. Bot.* 89: 70 (1921)

Echinopsilon anisacanthoides F. Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 76 (1858); *Anisacantha echinopsila* F. Muell., *Fragm.* 7: 14 (1869), *nom. illeg.* based on preceding; *Chenolea echinopsila* (F. Muell.) F. Muell., *Fragm.* 10: 92 (1876), *nom. illeg.*; *Bassia echinopsila* (F. Muell.) F. Muell., *Syst. Census Austral. Pl.* 30 (1882), *nom. illeg.*; *Bassia anisacanthoides* (F. Muell.) R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 330 (1923); *Anisacantha anisacanthoides* (F. Muell.) Druce, *Bot. Exch. Club Soc. Brit. Isles* 1916 Suppl. 2: 605 (1917). T: Suttor River, Qld, *F. Mueller*; holotype: MEL.

Anisacantha brevicuspis F. Muell., *Fragm.* 4: 150 (1864); *Threlkeldia brevicuspis* (F. Muell.) F. Muell. ex Benth., *Fl. Austral.* 5: 198 (1870); *Bassia brevicuspis* (F. Muell.) F. Muell., *Syst. Census Austral. Pl.* 30 (1882); *Coilocarpus brevicuspis* (F. Muell.) Domin, *Biblioth. Bot.* 89: 71 (1921). T: Cape River, Qld, *E.M. Bowman 267*; holotype: MEL.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 67 (1891) as *Bassia brevicuspis*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(2) (1982) as *Bassia anisacanthoides*.

Glabrous rounded perennial to 15 cm high, branching from base. Leaves slender, terete, 5–10 mm long, fleshy. Flowers solitary. Stamens 5. Fruiting perianth cylindrical, c. 2.5 mm high excluding spines; lower half to two-thirds forming a hollow, sometimes swollen, base with truncate circular attachment; apex bearing 6 erect spines 0.5–2 mm long, the collateral pair borne on the shortly ascending radicular tubercle; limb insignificant. Seed horizontal with ascending radicle. *Yellow Burr.* Fig. 46F.

Found in north-western and central N.S.W. and Qld in heavy soil. Map 342.

Qld: E of Boulia, *S. T. Blake 6487* (BRI). N.S.W.: Myall Mundi to Trangie, 9 Feb. 1943, *L. R. Clark* (CANB); Mt Sturt Stn, *A. Morris 717* (ADW).

The hollow base does not always develop in sterile fruits, resulting in a short squat perianth.

7. *Sclerolaena urceolata* (Ising) A. J. Scott, *Feddes Repert.* 89: 114 (1978)

Bassia urceolata Ising, *Trans. Roy. Soc. S. Australia* 88: 104 (1964). T: 10 miles (16 km) E of Mt Wedge Homestead, N.T., 1 July 1954, *R. E. Winkworth 382*; holotype: NT.

Glabrous rounded perennial c. 15 cm high, branching from base. Leaves slender, terete, 5–10 mm long, fleshy. Fruiting perianth solitary in leaf axils, glabrous, straw-coloured when dry; tube depressed-globular, c. 0.5–1 mm high, prominently 10-ribbed, narrowed into a hollow cylindrical base equal in height to tube; apex with a prominent erect radicular tubercle c. 1 mm long shortly bifid at apex and with 4 shorter erect tubercles. Seed horizontal with erect radicle. Fig. 46G.

Found in the southern portion of N.T. in heavy soil subject to flooding. Map 343.

N.T.: Napperby Stn, *T. S. Henshall 2208* (NT); Petermann Ranges Reserve, *T. S. Henshall 2208* (NT).

This species probably grades into the N.T. variant of *Osteocarpum salsuginosum*.

8. *Sclerolaena fusiformis* Paul G. Wilson, *Fl. Australia* 4: 329 (1984)

T: 14 km NE of Southern Cross, W.A., *P. G. Wilson 6433*; holotype: PERTH; isotype: NSW.

Dense rounded perennial to 20 cm high, glabrous except slight pubescence in leaf axils. Branches marked by slightly raised leaf scars. Leaves fusiform, 3–5 mm long, fleshy, passing at base into a very short flattened petiole. Flowers solitary. Perianth glabrous except slight pubescence on lobes. Stamens 3. Fruiting perianth glabrous; attachment slightly oblique, circular, c. 1 mm diam.; tube shortly cylindrical (slightly dorsiventrally compressed), c. 1.5 mm high and wide; limb very small and slightly sunken; spines 2+2, slender; abaxial spines laterally placed, ascending, 6–8 mm long; adaxial radicular spines close together, c. 1 mm and 0.5 mm long, placed equidistant between the lateral spines. Seed and radicle erect. Fig. 46H.

Found in the central southern area of W.A. from Southern Cross north to Leonora and east to c. 200 km E of Kalgoorlie; in loamy soil of eucalypt woodland. Map 344.

W.A.: Kalgoorlie, Aug. 1898, *W. V. Fitzgerald* (NSW, PERTH); Cundeleele, *P. Boswell A 13* (PERTH).

9. *Sclerolaena recurvicuspis* (W. Fitzg.) Domin, *Biblioth. Bot.* 89: 70 (1921)

Bassia recurvicuspis W. Fitzg., *J. W. Austral. Nat. Hist. Soc.* no. 1: 32 (May 1904). T: Nannine, W.A., Sept. 1903, *W. V. Fitzgerald*; holotype: NSW.

Bassia litoralis Diels in Diels & E. Pritzel, *Bot. Jahrb. Syst.* 35: 186 (Dec. 1904); *Sclerobassia litoralis* (Diels) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 540 (1934). T: near Carnarvon, W.A., *L. Diels 3735; n.v.*

Rounded glabrous perennial c. 30 cm high. Leaves semiterete, 5–10 mm long, acute, succulent. Flowers solitary. Perianth glabrous, 3-lobed. Stamens 3. Fruiting perianth cylindrical, c. 3 mm high, 2 mm broad, slightly constricted above middle (at apex of tube proper); base truncate; spines 2+2, horizontal to recurved, radicular pair c. 0.5 mm long, the others 1–2.5 mm long, all united at base into a cup-shaped structure continuous with tube. Seed and radicle erect. Fig. 46 I.

Found in north-western W.A. in coastal and inland slightly saline claypans. Map 345.

W.A.: Boolardy, 21 Sept. 1950, *A. W. Humphries* (PERTH); Twin Peaks Stn, *R. D. Royce 5733* (PERTH).

10. *Sclerolaena microcarpa* (R. Anderson) A. J. Scott, *Feddes Repert.* 89: 113 (1978)

Bassia microcarpa R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 348 (1923). T: Poison Creek via Leonora, W.A., Sept. 1909, *A. A. McGregor*; holotype: NSW.

Illustration: R. Anderson, *op. cit.* 48: t. 36 fig. M–Q (1923) as *Bassia microcarpa*.

Decumbent villous perennial. Branches slender. Leaves erect, linear to very narrowly oblong, c. 6 mm long, crowded towards branch apices. Flowers solitary, glabrous. Stamens 5. Fruiting perianth sub-globular, glabrous; attachment basal, horizontal; base rounded, concave; tube depressed-cylindrical to shortly barrel-shaped, 10-ribbed, c. 1 mm high, 1.5 mm wide; apex truncate; spines 4+2, c. 0.5 mm long, recurved at apex, regularly placed at margin of apex with radicular pair close together. Seed horizontal. Fig. 46 J.

Occurs in W.A. between Mt Magnet and Leonora. Map 346.

W.A.: Anketell, *A. M. Ashby 2620* (PERTH); c. 107 km NE of Paynes Find, *H. Demarz 5104* (PERTH).

Similar to *Sclerochlamys brachyptera* in vegetative characters, but the fruit lacks the 5-angled wing of the latter species.

11. *Scelerolaena tetragona* Paul G. Wilson, *Fl. Australia* 4: 330 (1984)

T: 10 km W of Prairie Downs Homestead, W.A., *A. A. Mitchell 656*; holotype: PERTH.

Small erect woody perennial to 30 cm high. Branches cottony. Leaves mostly erect, linear, c. 10 mm long, fleshy, villous. Flowers solitary. Perianth sparsely villous, 4-lobed. Stamens 4. Fruiting perianth hard, glabrous; tube very broadly turbinate, c. 2 mm high and 3.5 mm wide, truncate at apex and base, 4-angled, ribbed; apex cushion-shaped, 4-angled or the angles extending into short stout spines (the radicular spine usually not developed). Seed horizontal. Fig. 46 K.

Found in central area of W.A. on rocky loam. Map 347.

W.A.: 40 km NE of Wonganoo Homestead, *R. J. Chinnock 749* (AD); Bebele Stn, *D. W. Goodall 3287* (PERTH).

12. *Sclerolaena hostilis* (Diels) Domin, *Biblioth. Bot.* 89: 70 (1921)

Bassia hostilis Diels in Diels & E. Pritzel, *Bot. Jahrb. Syst.* 35: 185 (1904). T: Mount Herbert Tableland, W.A., 15 Oct. 1941, C. A. Gardner 6298; neo: PERTH, *fide* E. H. Ising, *Trans. Roy. Soc. S. Australia* 88: 93 (1964).

Intricately branched perennial to 60 cm high, glabrous. Leaves semiterete to slender, clavate, acute, c. 10 mm long, fleshy. Flowers solitary, glabrous except woolly inside of perianth lobes. Stamens 4. Fruiting perianth persistent, very thick-walled, woody within, firmly spongy outside; attachment truncate, circular, 6–8 mm diam.; tube very shortly cylindrical, c. 3 mm high, 6–8 mm wide extending upwards as a thick-walled cup, c. 3 mm high from the corners of which arise four ascending spines, c. 10 mm long. Seed horizontal, thick; radicle erect. Fig. 46L.

Found in north-western W.A. between Roebourne and Nullagine, along creeks and on stony plains. Map 348.

W.A.: between Mt Edgar Homestead and Marble Bar, *N. T. Burbidge 1209* (PERTH); 8 km N of Bonnie Downs, *H. Demarz 5715* (PERTH).

13. *Sclerolaena tetracuspis* (C. White) A. J. Scott, *Feddes Repert.* 89: 114 (1978)

Bassia tetracuspis C. White, *Proc. Roy. Soc. Queensland* 55: 76 (1944). T: The Oaks, 20 miles (32 km) SW of Tara, Qld, 13 Mar. 1939, *S. L. Everist 1738*; holotype: BRI.

Sprawling intricately-branched woody perennial, glabrous. Branches ribbed. Leaves terete, c. 10 mm long, fleshy, narrowed at base into a short petiole. Flowers solitary, glabrous or slightly pubescent above. Perianth 4-lobed. Stamens 4. Fruiting perianth hard, glabrous; attachment circular, truncate, sometimes expanded; tube shortly cylindrical, 2 mm high and wide; limb erect, conical; spines 4, \pm equal, regularly arranged around apex of tube, spreading, c. 4 mm long. Seed oblique; embryo erect. *Brigalow Burr, Dog Burr.* Fig. 46M.

Found in south-eastern Qld and north-eastern N.S.W., principally in heavy soil on land cleared of brigalow (*Acacia harpophylla*). Map 349.

Qld: 18 km S of Pasha, *N. Byrnes 3912* (BRI). N.S.W.: North Star, *B. Auld 120007* (NSW).

14. *Sclerolaena brevifolia* (Ising) A. J. Scott, *Feddes Repert.* 89: 111 (1978)

Bassia brevifolia Ising, *Trans. Roy. Soc. S. Australia* 88: 82 (1964). T: 24 km N of Minnipa, S.A., *P.G. Wilson 544*; holotype: AD.

Small erect shrub c. 30 cm high, \pm hirtellous all over or eventually almost glabrous. Leaves frequently congested, ellipsoidal, 2–3 mm long. Flowers solitary. Fruiting perianth sparsely pubescent, hard; attachment basal, narrowly elliptic, c. 3 mm long, extending as a short decurrent spur down stem and sometimes also upwards; tube c. 1 mm long and wide, \pm dorsiventrally compressed; limb inconspicuous, eventually incurved; spines 2, obliquely spreading in different vertical planes (radicular spine inclined abaxially and the other adaxially), c. 5 mm long, pubescent towards base. Seed and radicle erect. Fig. 46N.

Found from south-eastern W.A. eastwards to northern Eyre Peninsula in S.A., in slightly saline or calcareous soil. Map 350.

W.A.: 176 km E of Balladonia, *A. E. Orchard 1755* (PERTH). S.A.: Hambidge Reserve, *D. E. Symon 4262* (ADW).

A species similar to (and probably intergrading with) *S. obliquicuspis*.

15. *Sclerolaena patenticuspis* (R. Anderson) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 534 (1934)

Bassia patenticuspis R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 338 (1923). T: Barrier Ranges, N.S.W., 21 Aug. 1921, *M. Collins*; lectotype: NSW, *fide* E. H. Ising, *Trans. Roy. Soc. S. Australia* 88: 84



331. *Osteocarpum salsuginosum*

332. *Osteocarpum acropterum*
var. *acropterum*

333. *Osteocarpum acropterum*
var. *deminutum*

334. *Osteocarpum dipterocarpum*

335. *Osteocarpum pentapterum*

336. *Osteocarpum scleropterum*

337. *Sclerolaena eurotioides*

338. *Sclerolaena walkeri*

339. *Sclerolaena fimbriolata*

340. *Sclerolaena symoniana*

341. *Sclerolaena calcarata*

342. *Sclerolaena anisacanthoides*

343. *Sclerolaena urceolata*

344. *Sclerolaena fusiformis*

345. *Sclerolaena recurvuspis*

(1964).

Sclerolaena diacantha var. *longispina* Benth., *Fl. Austral.* 5: 195 (1870), as to lectotype. T: Gawler Ranges, S.A., *F. Sullivan*; lecto: MEL 101468, *fide* Paul G. Wilson, *Fl. Australia* 4: 330 (1984).

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(27) (1982) as *Bassia patenticuspis*.

Rounded perennial c. 20 cm high. Branches pubescent with short curled cottony hairs. Leaves linear to semiterete, 5–10 mm long, villous with simple hairs. Flowers solitary. Perianth shortly villous. Stamens 5. Fruiting perianth shortly and sparsely pilose; attachment oblique, circular or elliptic; tube shortly oblong, c. 1.5 mm high and wide, sometimes spreading at base, the adaxial surface concave, abaxial surface flat or convex; limb erect, c. 1 mm high; spines 2, laterally placed, ascending in nearly the same vertical plane, 4–7 mm long, rarely very reduced or absent; radicular tubercle very small and on adaxial side of one of the spines. Seed and radicle erect. Fig. 46 O.

Found in central N.S.W. and north-western Vic., extending W to central and south-eastern W.A. Map 351.

W.A.: between Blackstone and Cavanagh Range, *A. S. George* 5276 (PERTH). N.T.: Hamilton Downs Stn, *D. J. Nelson* 2247 (NT). S.A.: Yudnapinna, *F. M. Hilton* 683 (ADW). N.S.W.: Wamberra, *B. Semple* 858 (NSW). Vic.: Robinvale, 31 Aug. 1958, *E. J. Rowlands* (MEL).

A rather polymorphic species, some variants of which come close to *S. obliquicuspis*. E. H. Ising, *loc. cit.*, noted a form found principally in the Nullarbor Plain in which one or both spines were weakly developed or were represented merely by small tubercles. In this variant the development of the spines is very variable even on the same plant.

16. *Sclerolaena drummondii* (Benth.) Domin, *Biblioth. Bot.* 89: 70 (1921)

Anisacantha drummondii Benth., *Fl. Austral.* 5: 199 (1870); *Bassia drummondii* (Benth.) F. Muell., *Syst. Census Austral. Pl.* 30 (1882). T: W.A., *J. Drummond s.n.*; holo: MEL.

Anisacantha hispida S. Moore, *J. Linn. Soc., Bot.* 45: 190 (1920); *Bassia drummondii* var. *hispida* (S. Moore) R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 336 (1923); *Sclerolaena drummondii* var. *hispida* (S. Moore) A. J. Scott, *Feddes Repert.* 89: 112 (1978). T: Mulline, W.A., *J. E. C. Maryon* 27; iso: MEL, NSW.

Rounded perennial to 25 cm high. Branches glabrous, glossy, the older ones bearing raised leaf scars. Leaves crowded towards branch apices, very narrowly oblong to narrowly ovate, rounded below, 4–7 mm long, fleshy, hirsute. Flowers solitary. Perianth glabrous except sparsely pubescent lobes. Stamens 5. Fruiting perianth glabrous except pubescent limb; attachment slightly oblique; tube dorsiventrally compressed, \pm square, c. 1.5 mm high and wide, ribbed; limb small, erect; spines slender, 2+2 or 2+1; abaxial pair laterally placed, ascending, c. 10 mm long; adaxial radicular pair placed close to one of the lateral spines, the longer c. 2.5 mm long, the shorter c. 0.5 mm long or reduced to a small tubercle. Seed and radicle erect. Fig. 46P.

Found in inland southern W.A. from Mullewa E to the Kalgoorlie area in red sandy soil. Map 352.

W.A.: c. 22 km N of Norseman, *A. C. Beauglehole* 13324 (PERTH); Morawa, 7 Sept. 1953, *N. S. Marr* (PERTH).

This species has been confused with *Sclerolaena fusiformis*; the latter may be distinguished by its glabrous terete leaves, fewer stamens, and by the radicular spines being placed equidistant between the larger lateral spines.

17. *Sclerolaena obliquicuspis* (R. Anderson) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 533 (1934)

Bassia obliquicuspis R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 337 (1923). T: Broken Hill, N.S.W., 3 May 1920, *A. Morris* 210; lecto: NSW, *fide* E. H. Ising, *Trans. Roy. Soc. S. Australia* 88: 82 (1964).

[*Sclerolaena diacantha* var. *longispina* Benth., *Fl. Austral.* 5: 195 (1870) p.p., not as to lectotype.]

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(23), 255 (1982) as *Bassia obliquicuspis*.

Small shrub c. 30 cm high. Branches closely woolly. Leaves linear to narrowly elliptic, 6–10 mm long, obtuse, fleshy, closely woolly to oppressed pilose, the hairs minutely scabridulous. Flowers solitary. Perianth shortly and closely woolly. Stamens 5. Fruiting perianth closely woolly; attachment basal, narrowly elliptic, c. 4 mm long, shortly spurred along stem above and below tube; tube broadly oblong, c. 2 mm high; limb erect but inconspicuous; spines 2, obliquely spreading in different vertical planes, the radicular spine inclined abaxially and the other adaxially, c. 5 mm long, tomentose towards base; radicular tubercle small at base of abaxial spine. Seed and radicle erect. Fig. 46Q.

Found in south-central and eastern W.A., south-western N.T., S.A., western N.S.W., and far north-western Vic.; often in calcareous soils. Map 353.

W.A.: 48 km E of Rawlinna, *T. E. H. Aptin* 5795 (PERTH). N.T.: Ambalindum road, *D. J. Nelson* 821 (NT). S.A.: Wilson River, S of Hawker, *F. M. Hilton* 1237 (ADW). N.S.W.: Rose Isle Stn, *D. L. W. Henderson* 365 (NSW). Vic.: Mildura, *C. S. Sutton* 2229 (MEL).

This species evidently grades into both *Sclerolaena brevifolia* and *S. patenticuspis*.

18. *Sclerolaena limbata* (J. Black) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 534 (1934)

Bassia limbata J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 46: 567 (1922). T: Parachilna, S.A., 14 Aug. 1920, *H. W. Andrew*; lecto: AD, *fide* E. H. Ising, *Trans. Roy. Soc. S. Australia* 88: 83 (1964).

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(21), 254 (1982) as *Bassia limbata*.

Shrub to 1 m high, tomentose all over with shortly dendritic hairs. Leaves slender, semiterete to clavate, 10–30 mm long, often recurved at apex, fleshy. Flowers solitary. Perianth tomentose. Fruiting perianth hard, tomentose; attachment basal, elliptic, c. 3.5 mm long; tube very shortly turbinate, c. 2 mm high and 3 mm wide at apex; limb erect, cylindrical, shortly exceeding tube; spines 2, divergent, 5–10 mm long; radicular tubercle prominent. Seed horizontal; radicle ascending. Fig. 46R.

Found in eastern S.A. and far western N.S.W. with isolated records from north-western W.A., southern N.T. and central Qld; grows in heavy slightly saline soil. Map 354.

W.A.: 22 km E of Bullara Homestead, *A. S. George* 1239 (PERTH). N.T.: Heavitree Gap, *R. Swinbourne* 430 (NT). S.A.: Merna Merna, *F. M. Hilton* 1244 (ADW). Qld: Jericho, *S. T. Blake* 10228 (AD, *fide* E. H. Ising, *loc. cit.*). N.S.W.: Fowlers Gap, *A. Williams* 44 (NSW).

Similar to *Sclerolaena bicornis* var. *horrida* from which it differs in having a dendritic indumentum and a turbinate perianth tube.

19. *Sclerolaena uniflora* R. Br., *Prodr.* 410 (1810)

Bassia uniflora (R. Br.) F. Muell., *Syst. Census Austral. Pl.* 30 (1882). T: south coast (probably Petrel Bay, Isle St. Francis), S.A., Feb. 1802, *R. Brown*; iso: AD.

?*Sclerolaena coriacea* Moq. in A. DC., *Prodr.* 13(2): 123 (1849). T: 'ins. sterilibus' (?Isles Steriles, = Bernier & Dorre Is., Shark Bay, W.A.), *collector unknown*; n. v.

Perennial herb to 20 cm high. Branches closely and densely tomentose. Leaves congested, narrowly oblong, broader towards the apex, c. 10 mm long, thick, densely silky-pubescent, fawn but becoming grey with age. Flowers solitary. Perianth closely tomentose. Stamens 5. Fruiting perianth depressed-globose to pear-shaped, closely tomentose; tube c. 2.5 mm high and wide including the hollow base which occupies the lower two-thirds; attachment oblique, circular, c. 1.5 mm diam.; limb inconspicuous, incurved; spines 2, laterally placed, to 1(2) mm long, erect and almost parallel, one or both sometimes absent; tubercle prominent, adjacent to a spine, slightly exceeding limb. Seed horizontal; radicle ascending. Fig. 46S.

The typical variant is coastal and occurs on limestone in S.A. and in W.A. as far north as Port Hedland, other variants are found inland. Map 355.

W.A.: Dirk Hartog Is., A. S. *George 11571* (PERTH). S.A.: Ceduna to Thevenard, D. E. *Symon* (ADW 20917).

Very similar to *S. diacantha* with which it may intergrade.

20. *Scelerolaena diacantha* (Nees) Benth., *Fl. Austral.* 5: 194 (1870)

Anisacantha diacantha Nees in Lehm., *Pl. Preiss.* 1: 635 (1845); *Kentropsis diacantha* (Nees) Moq. in A.D.C., *Prodr.* 13(2): 138 (1849); *Chenolea diacantha* (Nees) F. Muell., *Fragm.* 10: 91 (1876); *Bassia diacantha* (Nees) F. Muell., *Syst. Census Austral. Pl.* 30 (1882). T: Quangen Plains, W.A., *L. Preiss*, 2379; iso: MEL.

Anisacantha kentropsidea F. Muell., *Trans. & Proc. Victorian Inst. Advancem. Sci.* 1: 133 (1855). T: 'In the Murray and Darling Desert', Vic. and N.S.W., F. *Mueller*; n.v.

Enchylaena falcata Gand., *Bull. Soc. Bot. France* 66: 224 (1919). T: Victoria, 1902, C. *Walter*; holotype: LY.

Bassia gardneri Ising, *Trans. Roy. Soc. S. Australia* 84: 94 (1961); *Scelerolaena gardneri* (Ising) A. J. Scott, *Feddes Repert.* 89: 113 (1978). T: Wandagee, Minilya River, W.A., 8 Oct. 1941, C. A. *Gardner 6184*; holotype: PERTH.

Bassia beaugleholei Ising, *Trans. Roy. Soc. S. Australia* 93: 119 (1969); *Scelerolaena beaugleholei* (Ising) A. J. Scott, *Feddes Repert.* 89: 111 (1978). T: 27 miles (c. 43 km) SW of Tropic of Capricorn on North West Coastal Highway, W.A., 19 Aug. 1965, A. C. *Beauglehole 11672*; holotype: AD.

Illustrations: F. *Mueller*, *Iconogr. Austral. Salsolac. Pl.* t. 79 (1889) as *Bassia diacantha*; G. M. *Cunningham et al.*, *Pl. W. New South Wales* 251, 253 fig. 46(15) (1982) as *Bassia diacantha*.

Rounded perennial to 30 cm high. Branches closely tomentose. Leaves linear 10–15 mm long, oppressed pubescent. Flowers solitary. Perianth tomentose. Stamens 5. Fruiting perianth depressed-spherical to pear-shaped, smooth, sparsely to densely tomentose; tube c. 2.5 mm high and wide including the deeply hollowed base which occupies lower two thirds; attachment oblique, elliptic, c. 3 mm long; limb inconspicuous, incurved; spines 2, laterally placed, c. 2 mm long, divergent; tubercle adjacent to a spine, inconspicuous to prominent, sometimes hooked, decurrent as a rib. Seed horizontal; radicle ascending. *Grey Coppeburr.* Fig. 46T.

Widespread in subtropical and temperate Australia. Map 356.

W.A.: near Meckering, Mar. 1960, T. E. *H. Aplin* (PERTH). N.T.: 21 km E of Haasts Bluff Homestead, D. J. *Nelson 983* (NT). S.A.: Yudnapinna Stn, F. M. *Hilton 677* (ADW). Qld: Blackall, S. L. *Everist 1608* (BRD). N.S.W.: Nyngan, Mar. 1904, J. H. *Maiden* (NSW). Vic.: 22 km E of Ouyen, R. Y. *Berg 558A* (PERTH).

As recognised here the species includes several variants which are sometimes recognised as distinct species, but these grade into each other and their circumscription is arbitrary.

21. *Scelerolaena holtiana* (Ising) A. J. Scott, *Feddes Repert.* 89: 113 (1978)

Bassia holtiana Ising, *Trans. Roy. Soc. S. Australia* 79: 111 (1955). T: Evelyn Downs Stn, S.A., Aug. 1953, E. H. *Ising 3624*; holotype: AD.

Bassia eichleri Ising, *Trans. Roy. Soc. S. Australia* 84: 96 (1961); *Scelerolaena eichleri* (Ising) A. J. Scott, *op. cit.* 89: 112 (1978). T: Evelyn Downs Stn, S.A., E. H. *Ising 4001*; holotype: AD.

Bassia wilsonii Ising, *op. cit.* 88: 80 (1964); *Scelerolaena wilsonii* (Ising) A. J. Scott, *op. cit.* 89: 114 (1978). T: Wintinna, S.A., P. G. *Wilson 2310*; holotype: AD.

Illustrations: E. H. *Ising*, *Trans. Roy. Soc. S. Australia* 78: 116, figs 17–19 (1955) as *Bassia holtiana*.

Perennial to 20 cm high. Branches tomentose. Leaves linear, c. 10 mm long, fleshy, silky, pilose. Flowers solitary. Perianth tomentose. Stamens 5. Fruiting perianth very closely white-tomentose, somewhat ribbed on abaxial face; tube subglobose, gibbous, c. 2.5 mm high and wide including the deeply hollowed base, adaxial surface very convex, abaxial surface almost flat; attachment elliptic, c. 3 mm long; limb incurved and inconspicuous; spines 2, lateral, slender, to 7 mm long, divergent, sometimes very reduced; radicular tubercle inconspicuous, adjacent to a spine. Seed oblique to erect or rarely horizontal. Fig. 47A.

Found in southern N.T. and northern S.A. Map 357.

N.T.: 22 km S of Docker River Settlement, *P. K. Latz 1007* (NI). S.A.: Mt Dare, *P. L. Milthorpe 3071* (NSW).

In this species the fruit typically has a large hollowed base which is usually eccentric, being developed principally on the adaxial side and so causing the seed to lie in the vertical plane. The variant represented by the type of *S. eichleri* has only a very small hollow base, causing the seed to be horizontal; in all other features it is identical with the type of *S. holtiana* which was collected in the same area. Not clearly distinguishable from *S. diacantha* — *S. uniflora* complex.

22. *Sclerolaena burbridgeae* (Ising) A. J. Scott, *Feddes Repert.* 89: 111 (1978)

Bassia burbridgeae Ising, *Trans. Roy. Soc. S. Australia* 84: 97 (1961). T: Glenorn Stn, W.A., Aug. 1938, *N. T. Burbidge 84*; holo: PERTH.

Illustration: E. H. Ising, *op. cit.* 84: 89 fig. 10 (1961) as *Bassia burbridgeae*.

Rounded perennial to 20 cm high. Branches closely woolly. Leaves erect, linear, c. 10 mm long, appressed-villous, fleshy. Flowers solitary. Perianth almost glabrous except the woolly ciliate lobes. Stamens 5. Fruiting perianth glabrous, dark red or reddish brown; tube shortly cylindrical to depressed-globose, c. 2 mm high and wide, deeply hollowed in lower half, the attachment circular; limb short, incurved; spines 2, divergent, to 2.5 mm long, sometimes one or both reduced and knob-like; tubercle prominent, adjacent to a spine, decurrent as a rib. Fig. 47B.

Known from southern central W.A. Map 358.

W.A.: 84 km from Mt Magnet on Geraldton road, *D. W. Goodall 1854* (PERTH).

Readily distinguished from other species in the *S. uniflora* complex by the glabrous, dark red fruits.

23. *Sclerolaena crenata* (Ising) A. J. Scott, *Feddes Repert.* 89: 112 (1978)

Bassia crenata Ising, *Trans. Roy. Soc. S. Australia* 88: 79 (1964). T: 17 miles (c. 27 km) NNE of Margaret River Stn, N.T., 15 Aug. 1959, *M. Lazarides 6337*; iso: AD.

Annual or short-lived perennial to 20 cm high. Branches sparsely and shortly pilose when young, otherwise glabrous. Leaves sparsely pilose when young, soon glabrous, slender, semiterete, 5–10 mm long. Flowers solitary. Perianth glabrous except ciliate margin to lobes. Stamens 5. Fruiting perianth glabrous, glossy; tube oblong, c. 2 mm high and wide, ribbed, slightly ascending, deeply hollowed and expanded at base forming a flattened circular attachment, crenulate on margin, to 5 mm diam.; limb erect, forming a ciliate ridge c. 1 mm high; spines 2, lateral, divergent, 1–7 mm long (a pair of very short radicular spines sometimes present adjacent to one of the lateral spines), the radicular tubercle decurrent as a prominent rib. Seed and radicle erect. Fig. 47C.

Found in north-eastern W.A. and western N.T., in heavy slightly saline soil. Map 359.

W.A.: 11 km W of Mt Tietkens, *A. S. George 8967* (PERTH). N.T.: Supplejack Stn, *T. S. Henshall 2363* (NT).

24. *Sclerolaena constricta* (Ising) A. J. Scott, *Feddes Repert.* 89: 112 (1978)

Bassia constricta Ising, *Trans. Roy. Soc. S. Australia* 84: 95 (1961). T: Oodnadatta, S.A., 29 Aug. 1955, *E.H. Ising 4000*; holo: AD; iso: NSW.

Bassia uniflora var. *incongruens* J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 48: 254 (1924). T: Hergott, S.A., 14 Oct. 1917, *J. M. Black*; lecto: AD; iso: NSW, *fide* E. H. Ising, *op. cit.* 84: 96 (1961).

Illustrations: E. H. Ising, *op. cit.* 84: 89, fig. 7 (1961) as *Bassia constricta*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 250, 253 fig. 46(12) (1982) as *Bassia constricta*.

Rounded perennial to 20 cm high. Branches velvety to cottony. Leaves linear to very narrowly oblong, c. 10 mm long, sparsely oppressed pilose. Flowers solitary. Perianth

sparsely pilose. Stamens 5. Fruiting perianth ascending, very sparsely pubescent; tube shortly oblong, dorsiventrally compressed c. 1 mm high, slightly constricted around the base, 1.5 mm wide, concave on adaxial face, expanded below into a hollow oblong to circular base 2–3 mm long; limb ridge-like, incurved; spines 2, lateral, 1.5–5 mm long (or one reduced to a small knob), divergent; radicular tubercle adjacent to one of the spines and decurrent as a prominent rib. Seed and radicle vertical. Fig. 47D.

Found from the Lake Eyre region of S.A. SE to western N.S.W., frequently in slightly saline loam or alluvial soil. Map 360.

S.A.: near Lake Frome, *F. M. Hilton 1396* (ADW). N.S.W.: Floods Creek, *P. L. Milthorpe 750* (NSW).

A rather variable species, possibly intergrading with *S. parallelicuspis* and *S. holtiana*.

25. *Sclerolaena parallelicuspis* (R. Anderson) A. J. Scott, *Feddes Repert.* 89: 114 (1978)

Bassia parallelicuspis R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 331 (1923); *Austrobassia parallelicuspis* (R. Anderson) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 532 (1934). T: Mt Lyndhurst, S.A., Dec. 1897, *M. Koch 292*; lecto: NSW 45942, *fide* E. H. Ising, *Trans. Roy. Soc. S. Australia* 88: 78 (1964).

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(25) (1982) as *Bassia parallelicuspis*.

Rounded perennial to 20 cm high. Branches woolly. Leaves slender, semiterete, 7–15 mm long, silky villous, fleshy. Flowers solitary. Perianth densely woolly villous. Stamens 5. Fruiting perianth closely woolly; tube oblong, c. 3 mm high and wide, curved upwards, dorsiventrally compressed, expanded into a hollow base with elliptic attachment c. 5 mm long; limb short, erect, obscured by indumentum; spines 2, lateral, parallel and erect, 1–3 mm long, somewhat obscured by indumentum; radicular tubercle prominent, adjacent to one of the spines. Seed and radicle oblique. Fig. 47E.

Found from southern N.T. SE through north-eastern S.A. to north-western N.S.W. and south-western Qld; often occurring in clay on stony plains or hillsides. Map 361.

N.T.: Lake Cotterill, *A. C. Beauglehole 23119* (NT). S.A.: c. 1.5 km N of Wintinna, *D. E. Symon 2731* (ADW). Qld.: Thargomindah, *S. T. Blake 11784* (BRI). N.S.W.: Mt Wood Stn, *L. A. S. Johnson 2002* (NSW).

26. *Sclerolaena eriacantha* (F. Muell.) Ulbr., *Nat Pflanzenfam.* 2nd edn, 16c: 534 (1934)

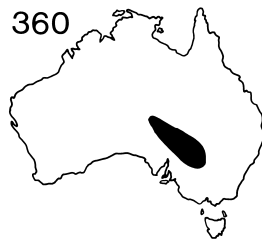
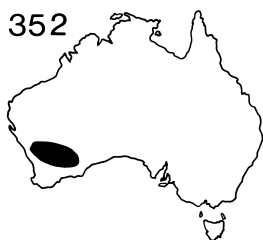
Kentropsis eriacantha F. Muell., *Fragm.* 2: 140 (1861); *Bassia eriacantha* (F. Muell.) R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 328 (1923). T: Darling Desert, N.S.W., *H. Beckler*; holo: MEL; iso: NSW.

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 252, 253 fig. 46(17) (1982) as *Bassia eriacantha*.

Much-branched perennial c. 30 cm high. Branches velvety. Leaves alternate, succulent, semiterete c. 15 mm long, appressed-villous to silky. Flowers solitary. Perianth silky-villous. Stamens 5. Fruiting perianth c. 4 mm high excluding spines, densely long silky-villous, usually fawn-coloured; attachment narrowly oblong, c. 3 mm long, oblique; base hollow, occupying c. 2/3 of perianth; tube dorsiventrally compressed; spines 2, obliquely erect, c. 6 mm long; tubercle prominent; limb erect but inflexed towards apex. Seed oblique to horizontal, depressed; radicle erect. Fig. 47F.

Found in inland Australia; present in all mainland States except Vic., usually in heavy soil or in sand overlying clay. Map 362.

W.A.: Lake Carey, *H. Demarz 4603* (PERTH). N.T.: c. 26 km NW of Lucy Creek Stn, *M. Lazarides 5894* (PERTH). S.A.: Yudnapinna, *F. M. Hilton 737* (ADW). Qld: Tenham Stn, *S. T. Blake 12029* (BRI). N.S.W.: Broken Hill, *A. Morris* (ADW).



346. *Sclerolaena microcarpa*
 349. *Sclerolaena tetracuspis*
 352. *Sclerolaena drummondii*
 355. *Sclerolaena uniflora*
 358. *Sclerolaena burbridgeae*

347. *Sclerolaena tetragona*
 350. *Sclerolaena brevifolia*
 353. *Sclerolaena obliquicuspis*
 356. *Sclerolaena diacantha*
 359. *Sclerolaena crenata*

348. *Sclerolaena hostilis*
 351. *Sclerolaena patenticuspis*
 354. *Sclerolaena limbata*
 357. *Sclerolaena holtiana*
 360. *Sclerolaena constricta*

27. *Sclerolaena tatei* (F. Muell.) A. J. Scott, *Feddes Repert.* 89: 114 (1978)

Bassia tatei F. Muell., *Victorian Naturalist* 7: 66 (1890); *Austrobassia tatei* (F. Muell.) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 532 (1934). T: Lake Torrens, S.A., 11 June 1883, R. Tate; holo: MEL; iso: AD.

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 71 (1891) as *Bassia tatei*.

Rounded perennial c. 50 cm high, usually dioecious. Branches closely woolly. Leaves opposite or subopposite, suborbicular (when short) to semiterete, 5–15 mm long, thick and fleshy with a broad sessile base, shortly appressed-villous, the hairs slightly scabridulous. Flowers solitary. Perianth sparsely pilose. Male flower: stamens 5; pistillode with stigmas slender and long-exserted. Female flower: stamens absent; pistil with stigmas slender and long-exserted. Fruiting perianth thin and weakly crustaceous, straw-coloured; tube oblong, c. 3 mm long and 2 mm wide, very compressed dorsiventrally, glabrous, curving upwards, expanded into a broad spongy hollow base c. 3 mm diam.; limb shortly pubescent, erect, forming a short crest; spines 2, lateral, parallel and erect, to 1 mm long, sometimes with a small radicular spine adjacent to one of the lateral, or spines absent. Seed and radicle erect. Fig. 47G.

Found between Lake Torrens and the Flinders Ranges, S.A. Map 363.

S.A.: Farina, D. E. Symon (ADW 11537).

This species is unusual in being dioecious and in having the leaves opposite or almost so.

28. *Sclerolaena medicaginoidea* Paul G. Wilson, *Fl. Australia* 4: 329 (1984)

Yinnietarra Stn, W.A., Sept. 1970, D. G. Wilcox 162; holo: PERTH.

Shrub to 0.5 m high, pilose in leaf axils, otherwise glabrous, apparently dioecious. Branches brittle. Vegetative leaves narrowly fusiform, 5–8 mm long, fleshy, narrowed into a short flattened petiole. Floral leaves congested towards apex of branchless; lamina ellipsoidal, c. 3 mm long; petiole expanded around base of flower, adaxially silky pilose. Flowers solitary, unisexual. Perianth urceolate, glabrous, membranous; lobes erect, united, membranous, undulate and ciliate on margin. Male flower: stamens 5; pistillode with slender sparsely woolly style and short lobes. Female flower: staminodes absent; ovary glabrous; style stout, c. 1.5 mm long, woolly pilose; stigmas 2, slender, c. 2.5 mm long. Inflorescence a condensed spike which eventually breaks from plant. Fruiting perianth urceolate, dorsiventrally compressed, 3.5–5 mm high, 2.5–4 mm wide, papery, glabrous, glossy; adaxial side flat; abaxial side convex; limb erect; attachment vertical, firmly attached to axis; spines 5, or 1 to 4 of the spines paired to give up to 9, slender, divaricate or descending, sometimes curved, 3–5 mm long, one on adaxial face, the others lateral and abaxial. Seed depressed; radicle ascending. Fig. 47H.

Found in W.A. c. 300 km NE of Carnarvon on gneissic plain in slightly saline soil. Map 364.

W.A.: Barlee Range National Park, A. A. Mitchell 467 (PERTH); Maroonah Stn, A. A. Mitchell 582 (PERTH); Mount Sandiman Stn, R. O'Farrell 11 (PERTH).

29. *Sclerolaena blakei* (Ising) A. J. Scott, *Feddes Repert.* 89: 111 (1978) as *blackei*

Bassia blakei Ising, *Trans. Roy. Soc. S. Australia* 88: 91 (1964). T: Breadalbane Stn, N of Bedourie, Qld, S. T. Blake 12345; holo: AD.

Rounded annual or short-lived perennial c. 15 cm high, glabrous except slight axillary pubescence. Leaves slender, semiterete, 5–15 mm long, fleshy. Flowers solitary. Perianth glabrous except ciliate margin to lobes. Stamens 5. Fruiting perianth erect, narrowly cuneate, constricted at the solid base, dorsiventrally compressed; base 1 mm long, with very oblique attachment, slightly hollowed; tube 2 mm long, multi-ribbed; spines 2+2, slender, spreading (or the longer adaxial down-curved), a lateral spine and a sub-abaxial spine c. 5 mm long, the two radicular spines adaxial, 1 c. 3 mm long and the other c. 1 mm long; limb incurved. Seed and radicle erect. Fig. 47 I.

Known only from the type locality in south-western Qld, where it grows in depressions and channels on gravelly downs. Map 365.

Closely related to *S. cuneata* from which it differs principally in the shape of its fruiting perianth, its multi-ribbed tube, and the longer of the radicular spines being down-curved.

30. *Sclerolaena divaricata* (R. Br.) Smith in Rees, *Cycl.* 31: no. 4 (1815)

Anisacantha divaricata R. Br., *Prodr.* 410 (1810); *Bassia divaricata* (R. Br.) F. Muell., *Syst. Census Austral. Pl.* 30 (1882). T: Bay XII (head of Spencer Gulf), [S.A.], 10 Mar. 1802, R. Brown; iso: AD.

Anisacantha erinacea Moq. in A. DC., *Prodr.* 13 (2): 122 (1849). T: 'In Nova-Hollandia', N.S.W., A. Cunningham; ?iso: AD, labelled 'Molly's Plains'.

Illustrations: J. M. Black, *Fl. S. Australia* 2nd edn, fig. 396 (1948); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 252, 253 fig. 46(16) (1982).

Rounded perennial, glabrous except axillary pubescence. Leaves terete, c. 10 mm long. Flowers solitary, glabrous outside except ciliate perianth lobes. Stamens 3. Fruiting perianth glabrous, somewhat dorsiventrally compressed, oppressed to branch, cuneate-oblong, c. 2.5 mm long, firmly attached but eventually falling, straw-coloured; base slightly concave; attachment very oblique, ovate, slightly 2-spurred; spines 4 (the inner of the radicular pair much smaller than the others), spreading, slender, the three longer 5–15 mm long (two spreading laterally and in line, one abaxially), the small inner radicular spine straight and parallel with its neighbour, 1–3 mm long; limb incurved. Seed erect; radicle erect. *Tangled Copper-burr.* Fig. 47J.

Found in western and central N.S.W. and eastern S.A. Map 366.

S.A.: Lincoln Gap Stn, R. H. Kuchel 479 (AD); Koonamore, 3 Mar. 1930, T. B. Paltridge (AD). N.S.W.: Willotia, D. L. Henderson (NSW 148518).

31. *Sclerolaena cuneata* Paul G. Wilson, *Fl. Australia* 4: 328 (1984)

T: Mount Stuart, N.S.W., 21 Oct. 1949, E. F. Constable; holo: NSW 10492.

Intricately branched rounded perennial to 30 cm high, glabrous except axillary pubescence. Leaves slender, terete, 10–20 mm long, fleshy. Flowers solitary. Perianth glabrous except woolly-ciliate margin of lobes. Stamens 5, rarely 4. Fruiting perianth woody, glabrous; tube oblong-obcuneate, dorsiventrally compressed and with few blunt ribs, c. 3 mm high, rounded at base; limb incurved; attachment oblique, flat, circular, c. 1.5 mm diam.; spines 3, sometimes 4 when small inner radicular spine present, slender, 8–15 mm long, ±horizontally spreading, 1 lateral, 1 abaxial, and 1 radicular spine which is directed somewhat adaxially or is curved around branch. Seed erect. Fig. 47K.

Widespread in inland Australia excluding Vic. Map 367.

W.A.: Winderie Stn, R. J. Cranfield 2233 (PERTH). N.T.: Burt Plain, D. J. Nelson 620 (NT). S.A.: Paralana Springs, D. E. Symon 6087 (ADW). Qld: Lorne Peak, S. L. Everist 2007 (BRI). N.S.W.: 24 km W of Louth, C. W. E. Moore 5249 (NSW).

Closely related to *S. blakei* from which it differs in the shape and ribbing of the perianth tube, and the direction of the spines.

32. *Sclerolaena glabra* (F. Muell.) Domin, *Biblioth. Bot.* 89: 70 (1921)

Kentropsis glabra F. Muell., *Fragm.* 1: 139 (1859); *Anisacantha glabra* (F. Muell.) Benth., *Fl. Austral.* 5: 200 (1870); *Bassia glabra* (F. Muell.) F. Muell., *Syst. Census Austral. Pl.* 30 (1882). T: Sturt Creek, W.A., 1856, F. Mueller; holo: MEL.

Bassia andersonii Ising, *Trans. & Proc. Roy. Soc. S. Australia* 57: 185 (1933); *Sclerolaena andersonii* (Ising) A. J. Scott, *Feddes Repert.* 89: 111 (1978). T: Pedirka, S.A., 22 Aug. 1931, E. H. Ising 2681; holo: AD.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 66 figs 2–5, 7–10 (1891) as *Bassia glabra*; J.M. Black, *Fl. S. Australia* 2nd edn, 304, fig. 397 (1948); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(1) (1982) as *Bassia andersonii*.

Small rounded shrub c. 0.4 m high, glabrous except axillary pubescence. Flowers solitary. Perianth glabrous except ciliate tepals. Stamens 5. Fruiting perianth hard, glabrous; attachment oblique, circular, slightly hollowed; tube oblong, slightly broader at apex, c. 2.5 mm long, dorsiventrally compressed, faintly ribbed; limb erect with tip inflexed, c. 1 mm high; spines 2+1 or 2+2, an opposite pair laterally placed and ascending, 3–7 mm long, a radicular spine curved adaxially, 1–2 mm long, usually with a collateral tubercle or small spine. Embryo erect. Fig. 47L.

Found from north-western W.A. eastwards through N.T. and northern S.A. to western Qld and north-western N.S.W.; usually in heavy somewhat saline soil. Map 368.

W.A.: Derby, V. Semeniuk 23 (PERTH). N.T.: c. 19 km W of Huckitta Stn, M. Lazarides 5938 (CANB). S.A.: Pedirka, E. H. Ising 2887 (AD). Qld: near Birdsville, S. T. Blake 12205 (BRI). N.S.W.: c. 154 km E of Milparinka, W. E. Mulham W570 (NSW).

33. *Sclerolaena articulata* (J. Black) A. J. Scott, *Feddes Repert.* 89: 111 (1978)

Bassia articulata J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 57: 150 (1933). T: Pedirka, S.A., 6 Aug. 1932, J. B. Cleland; holo: AD.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 Fig. 46(3) (1982) as *Bassia articulata*.

Small rounded shrub to 40 cm high, glabrous except woolly-pilose leaf axils. Leaves slender, semiterete, acute, 5–15 mm long. Flowers solitary. Perianth glabrous except woolly-ciliate tepals. Stamens 5. Fruiting perianth hard, erect and oppressed to branch; attachment very oblique, firm; tube semicylindrical, dorsiventrally compressed, c. 3 mm high; limb erect, long woolly-ciliate; spines 3, spreading to recurved, slender, 2.5–5 mm long. Seed and radicle erect. Fig. 47M.

Found in central W.A., north-eastern S.A., western N.S.W., and far north-western Vic., in heavy slightly saline soil. Map 369.

W.A.: Wiluna, A. Oliver D7A (PERTH). S.A.: 12 km E of Copper Hills Homestead, T. S. Henshall 3141 (CANB). N.S.W.: 144 km E of Broken Hill, L. Pidgeon & J. W. Vickery (NSW 61440). Vic.: N of Lake Walla-Walla, 1 Oct. 1978, J. H. Browne (MEL 547546).

Differs from *S. intricata* only in having 3, not 5, spines; possibly conspecific with that species. The fruits are sometimes congested along short portions of a branch which, when dead, may fall to the ground intact.

Hybridisation with *S. cuneata* appears to take place, e.g. a collection from Mt Mulyah, N.S.W., C. E. W. Moore 6812 (CANB), with putative parents in same locality.

34. *Sclerolaena intricata* (R. Anderson) A. J. Scott, *Feddes Repert.* 89: 113 (1978)

Bassia intricata R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 340 (1923); *Austrobassia intricata* (R. Anderson) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 532 (1934). T: Corona, N.S.W., M. Collins; lecto: NSW 79082, *vide* E. H. Ising, *Trans. Roy. Soc. S. Australia* 88: 100 (1964).

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 Fig. 46(18) (1982) as *Bassia intricata*.

Intricately branched dwarf shrub to 40 cm high, glabrous except woolly pilose leaf axils. Leaves clavate and c. 5 mm long to slender and semiterete to 10–15 mm long, acute. Flowers solitary. Perianth glabrous except woolly ciliate tepals. Stamens 5. Fruiting perianth hard, erect and oppressed to branch, persistent; attachment very oblique; tube semicylindrical, dorsiventrally compressed, c. 3 mm high; limb erect, woolly-ciliate; spines 3+2, spreading to recurved, slender, 5–15 mm long, the inner of the radicular pair shorter. Seed and radicle erect. Fig. 47N.

Found in southern N.T., south-western Qld, western N.S.W. and north-eastern S.A, often in heavy slightly saline soil. Map 370.

N.T.: Palmer Valley Stn, T. S. Henshall 2083 (NT). S.A.: Purple Downs Stn, Andrewartha (ADW 8310). Qld: 48 km S of Bedourie, S. T. Blake 12271 (BRI). N.S.W.: c. 10 km W of Oxley, S. Jacobs 1108 (NSW).

35. *Sclerolaena tubata* (R. Anderson) A. J. Scott, *Feddes Repert.* 89: 114 (1978)

Bassia tubata R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 339 (1923). T: Coonamble, N.S.W., 1918, *E. Breakwell*; lecto: NSW 20509, *fide* E. H. Ising, *Trans. Roy. Soc. S. Australia* 88: 100 (1964).

Illustration: R. Anderson, *op. cit.* 48: t. 35 Fig. A–C (1923) as *Bassia tubata*.

Erect tufted perennial to 25 cm high with fleshy taproot, sparsely hirtellous to glabrous. Branches slender. Leaves slender, semiterete to linear, 5–10 mm long. Flowers solitary. Perianth sparsely puberulous. Stamens 4. Fruiting perianth erect, cylindrical, (slightly dorsiventrally compressed), c. 4 mm long, 1 mm wide, thinly woody, sparsely puberulous or glabrous; lower third-forming a hollow stipe very obliquely attached to stem; limb inconspicuous; spines 3+2, 2–3 mm long or one of the radicular pair reduced; radicular pair erect, the others spreading. Seed erect. Fig. 47 0.

Found W of the Dividing Range in south-eastern Qld and north-eastern N.S.W., in heavy soil. Map 37 I.

Qld: Surat, *S. T. Blake 13281* (BRI). N.S.W.: Coonamble, Nov. 1922, *R. McDiarmid* (NSW).

36. *Sclerolaena tricuspis* (F. Muell.) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 534 (1934)

Anisacantha tricuspis F. Muell., *Trans. & Proc. Victorian Inst. Advancem. Sci.* 133 (1855); *Chenolea tricuspis* (F. Muell.) F. Muell., *Fragm.* 10: 92 (1876); *Bassia tricuspis* (F. Muell.) R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 335 (1923). T: Morunde, S.A., Feb. 1851, *F. Mueller*; holo: MEL.

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(30), 257 (1982) as *Bassia tricuspis*.

Shrub to 1 m high, glabrous except pubescence in leaf axils. Leaves slender, terete, 10–20 mm long. Flowers solitary. Perianth glabrous or sparsely puberulous. Stamens 5. Fruiting perianth glabrous standing almost at right angles to branch or ascending; base horizontal, expanded; tube shortly cylindrical, c. 2 mm high and wide; limb conical; spines 3, symmetrically placed around apex of tube, slender, spreading, c. 10 mm long. Seed and radicle horizontal to slightly oblique. *Giant Redburr, Three-spined Bassia*. Fig. 47P.

Found in N.S.W. and south-eastern Qld, eastern S.A. and north-western Vic. Map 372.

S.A.: near Cooleba, *D. E. Symon 11561* (ADW). Qld: Yelarbon, *S. T. Blake 10431* (BRI). N.S.W.: Menindee, *D. W. L. Henderson 469* (NSW). Vic.: Red Cliffs, *A. C. Beauglehole 16007* (MEL).

37. *Sclerolaena muricata* (Moq.) Domin, *Biblioth. Bot.* 89: 69 (1921)

Anisacantha muricata Moq., *Chenop. Monogr. Enum.* 84 (1840). T: Liverpool Plains, N.S.W., 1825, *A. Cunningham*; holo: G-DC, photo seen.

Rounded annual or perennial to 1 m high, intricately and divaricately branched, glabrous to villous or woolly. Leaves flat, linear to narrowly oblong or elliptic, mostly 5–15 mm long. Flowers solitary, glabrous to villous or minutely woolly. Stamens 4. Fruiting perianth hard, glabrous to villous or minutely woolly; base truncate, very oblique, circular; tube very shortly cylindrical, c. 2 mm high and wide, steeply ascending, rounded at apex, spines 3+2 or 3+1, two lateral, one abaxial, and a short adaxial radicular pair (or sometimes only one of the pair developed), the abaxial and lateral spines 5–10 mm long, the radicular spines 1–2 mm long. Seed oblique to horizontal. *Black Roly-poly*.

There are three varieties.

- | | | |
|----|---|-----------------------------|
| 1 | Plant glabrous or almost so; leaves linear to very narrowly oblong | 37a. var. muricata |
| 1: | Plant variously pubescent | |
| 2 | Leaves and branches sparsely appressed-hirsute leaves narrowly elliptic to elliptic | 37b. var. semiglabra |
| 2: | Branches minutely woolly; leaves villous, flat, linear to very narrowly elliptic | 37c. var. villosa |

37a. *Sclerolaena muricata* (Moq.) Domin var. *muricata*

Anisacantha quinquecupis F. Muell., *Trans. & Proc. Victorian Inst. Advancem. Sci.* 1: 134 (1855); *Chenolea quinquecupis* (F. Muell.) F. Muell., *Fragm.* 10: 91 (1876); *Bassia quinquecupis* (F. Muell.) F. Muell., *Syst. Census Austral. Pl.* 30 (1882). T: near junction of Darling and Murray Rivers, N.S.W., Dec. 1853, *F. Mueller*; holotype: MEL.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 76 (excluding upper right fig.) (1889) as *Bassia quinquecupis*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(28), 256 (1982) as *Bassia quinquecupis*.

Plant glabrous or almost so, glaucous. Leaves flat, linear to narrowly elliptic, mostly 5–15 mm long, rarely to 25 mm long. Fruiting perianth glabrous. Fig. 47Q.

Found in eastern Australia from central Qld south to northern Vic. and eastern S.A.; often associated with creeks. Map 373.

S.A.: Murray Bridge, Feb. 1952, *R. H. S. Tapp* (ADW). Qld: 150 km NW of Clermont, *I. J. Dale* 191 (BRI). N.S.W.: 12 km N of Manara, *J. Pickard* 1994 (NSW). Vic.: Sunbury, Mar. 1920, *A. J. Ewart* (MEL).

37b. *Sclerolaena muricata* var. *semiglabra* (Ising) A. J. Scott, *Feddes Repert.* 89: 113 (1978)

Bassia quinquecupis var. *semiglabra* Ising, *Trans. Roy. Soc. S. Australia* 88: 97 (1964). T: 20 miles (32 km) NW of Jerilderie, N.S.W., 28 Mar. 1959, *H. I. Aston* 277; iso: AD.

Plant sparsely appressed-hirsute at least when young. Leaves elliptic to narrowly elliptic, 5–10 mm long. Fruiting perianth sparsely woolly when young.

Found from south-eastern Qld to northern Vic. and south-eastern S.A. Map 374.

S.A.: Pinnaroo, *V. Lohmeyer* (ADW). Qld: Whyte Is., *L. Durrington* 1341 (BRI). N.S.W.: 35 km W of Wagga Wagga, *M. A. Wilson* 6 (PERTH).

This variety grades into var. *muricata*.

37c. *Sclerolaena muricata* var. *villosa* (Benth.) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 533 (1934)

Anisacantha gracilicuspis F. Muell., *Fragm.* 2: 170 (1861); *Anisacantha muricata* var. *villosa* Benth., *Fl. Austral.* 5: 199 (1870); *Bassia quinquecupis* var. *villosa* (Benth.) J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 39: 828 (1915); *Sclerolaena muricata* var. *gracilicuspis* (F. Muell.) Domin, *Biblioth. Bot.* 89: 69 (1921). T: McKenzie Downs, Qld, 1856, *F. Mueller*; holotype: MEL; iso: AD.

Branches sparsely woolly. Leaves flat, linear to narrowly elliptic, villous. Fruiting perianth sparsely woolly.

Found from south-eastern Qld, south to northern Vic. and south-eastern S.A. Map 375.

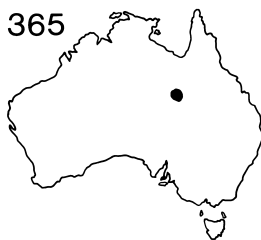
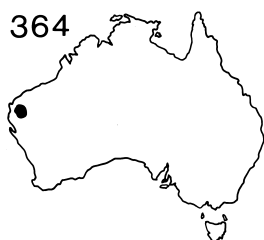
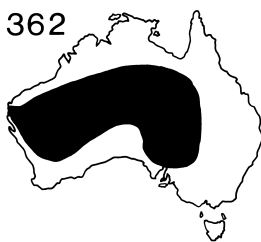
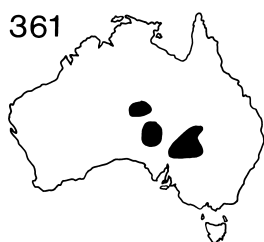
S.A.: Mundalla, *Dept of Agriculture* 487 (ADW). Qld: E of Blackall, *S. L. Everist* 1271 (BRI). N.S.W.: Trangie, *R. G. Scott* (NSW). Vic.: Kings Billabong, *T. S. Henshall* (NSW).

Resembles *S. johnsonii* which has terete leaves and a fruiting perianth with a horizontal base, and horizontal spines.

38. *Sclerolaena deserticola* Paul G. Wilson, *Fl. Australia* 4: 329 (1984)

Bassia quinquecupis var. *lanata* Ising, *Trans. Roy. Soc. S. Austral.* 88: 97 (1964); *Sclerolaena muricata* var. *lanata* (Ising) A. J. Scott, *Feddes Repert.* 89: 113 (1978). T: 24 miles (c. 38 km) S of Barrow Creek township, N.T., 3 Sept. 1955, *R. A. Perry* 5353; holotype: CANB n.v.; iso: NSW, NT.

Divaricately branched perennial to 30 cm high. Branches velvety-tomentose. Leaves slender and semiterete, 5–15 mm long, spreading, villous. Flowers solitary. Perianth 4-lobed, woolly. Stamens 4. Fruiting perianth moderately to densely woolly; tube very shortly cylindrical, c. 2 mm high and 3 mm wide, divaricate or slightly ascending; base slightly oblique to horizontal; attachment broadly elliptic, c. 3–5 mm long, slightly concave; apex slightly convex; spines 3+2, spreading, the three longer c. 5–8 mm long,



361. *Sclerolaena parallelicuspis*
 364. *Sclerolaena medicaginoides*
 367. *Sclerolaena cuneata*
 370. *Sclerolaena intricata*
 373. *Sclerolaena muricata*
 var. *muricata*

362. *Sclerolaena eriacantha*
 365. *Sclerolaena blakei*
 368. *Sclerolaena glabra*
 371. *Sclerolaena tubata*
 374. *Sclerolaena muricata*
 var. *semiglabra*

363. *Sclerolaena tatei*
 366. *Sclerolaena divaricata*
 369. *Sclerolaena articulata*
 372. *Sclerolaena tricuspis*
 375. *Sclerolaena muricata*
 var. *villosa*

the radicular pair to 5 mm long with one longer than the other. Seed horizontal. Fig. 47R.

Found in central W.A., southern N.T., and north-western S.A. Map 376.

W.A.: 3 miles (c. 5 km) W of Dovers Hills, A. S. *George* 9002 (PERTH). N.T.: Erldunda Stn, P. K. *Latz* 4849 (NT). S.A.: near Serpentine Lakes, Connie Sue Highway, D. E. *Symon* 12607 (ADW).

39. *Sclerolaena birchii* (F. Muell.) Domin, *Biblioth. Bot.* 89: 69 (1921)

Anisacantha birchii F. Muell., *Fragm.* 8: 163 (1874); *Bassia birchii* (F. Muell.) F. Muell., *Syst. Census Austral. Pl.* 30 (1882); *Sclerolaena muricata* var. *birchii* (F. Muell.) Domin ex Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 533 (1934). T: Bowen Downs, Qld, 1874, C. W. *Birch*; holotype: MEL.

Bassia filiformis Ising, *Trans. Roy. Soc. S. Australia* 88: 73 (1964); *Sclerolaena filiformis* (Ising) A. J. Scott, *Feddes Repert.* 89: 112 (1978). T: Nindigully, Qld, 30 Mar. 1938, R. *Roe*; iso: AD.

Illustrations: B. A. Auld & P. M. Martin, *Proc. Linn. Soc. New South Wales* 100: t. 17 (1976); F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 72 (excluding right-hand figs) (1891) as *Bassia birchii*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(8) (1982) as *Bassia birchii*.

Intricately-branched shrub to 1 m high. Branches closely woolly. Leaves narrowly obovate, 5–15 mm long, obtuse, woolly-villous. Flowers solitary. Perianth, 4-lobed, woolly. Stamens 4. Fruiting perianth hard, woolly, persistent; attachment very oblique, elliptic, c. 1.5 mm long; tube steeply ascending, turbinate, c. 1.5 mm high and wide, ribbed; apex convex, higher on adaxial side; spines 2+1+2, two abaxial spines stout, divergent, 8–15 mm long, the solitary adaxial spine usually much shorter (1–3 mm long), and the radicular adaxial pair 1–2 mm long, all sometimes rough towards base from persistent hair bases. Seed erect. *Galvanised Burr.* Fig. 47S.

Found in south-eastern Qld, central N.S.W., and occasionally in southern N.T. and south-eastern S.A. Map 377.

N.T.: Tempe Downs Stn, N. N. *Henry* 587 (NT). S.A.: Yongala, 7 Sept. 1964, R. *Kain* (ADW). Qld: Minerva, S. T. *Blake* 8028 (BRI). N.S.W.: 32 km S of Mungindi, D. F. *Blaxell* 996 (NSW).

40. *Sclerolaena costata* (R. Anderson) A. J. Scott, *Feddes Repert.* 89: 112 (1978)

Bassia costata R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 347 (1923); *B. parviflora* var. *costata* (R. Anderson) Ewart, *Fl. Victoria* 457 (1931); *Austrobassia costata* (R. Anderson) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 532 (1934). T: 60 miles (96 km) NE of Camp 2, N.T., 7 June 1911, G. F. *Hill*; lecto: NSW, *fide* E. H. Ising, *Trans. Roy. Soc. S. Australia* 88: 99 (1964).

Bassia obconica Ising, *op. cit.* 88: 96 (1964); *Sclerolaena obconica* (Ising) A. J. Scott, *Feddes Repert.* 89: 113 (1978). T: 30–60 miles (48–96 km) E of Carnarvon, W.A., C. A. *Gardner* 6044; holotype: PERTH.

Small woody perennial to 30 cm high. Branches shortly villous or sparsely woolly. Leaves linear to very narrowly elliptic, 5–10 mm long, appressed-villous. Flowers solitary. Perianth sparsely villous. Stamens 4. Fruiting perianth hard, \pm glabrous; base slightly hollowed, the attachment circular, 0.5–1 mm diam., sometimes slightly spreading; tube turbinate, c. 1.5 mm high and as wide at summit, prominently ribbed; apex cushion-shaped, sunken in centre; spines 3+2, horizontal, 3–5 mm long, the radicular pair shorter and borne on a short spur. Seed horizontal. Fig. 48A.

Found from north-western W.A., E to southern N.T. and north-western S.A. Map 378.

W.A.: Nullagine, A. C. *Beaulehole* 11389 (PERTH). N.T.: Alice Springs, R. A. *Perry* 3219 (PERTH). S.A.: Glen Ferdinand, 18 July 1914, S. A. *White* (NSW).

Similar to *S. convexula* but distinguished by its cushion-shaped apex of the fruit with sunken centre.

41. *Sclerolaena convexula* (R. Anderson) A. J. Scott, *Feddes Repert.* 89: 112 (1978)

Bassia convexula R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 346 (1923); *Austrobassia convexula* (R. Anderson) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 532 (1934). T: Warrego R., N.S.W., Sept. 1885, E. *Beiche*; lecto: NSW, *fide* E. H. Ising, *Trans. Roy. Soc. S. Australia* 88: 100 (1964).

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(13) (1982) as *Bassia convexula*.

Erect woody perennial to 30 cm high. Branches slender, cottony. Leaves linear to narrowly elliptic, 4–10 mm long, appressed-villous. Flowers solitary. Stamens 4. Fruiting perianth hard, somewhat pubescent or shortly villous; attachment basal, circular, c. 1.2 mm diam.; tube turbinate, c. 1 mm high and 1.5 mm wide at summit; apex convex, the limb inconspicuous, pubescent; spines 3+2, 1–2 mm long, radiating, the radicular pair shorter and borne on a short radicular spur. Seed horizontal. Fig. 48B.

Found in central Australia and E to southern Qld and northern N.S.W. Map 379.

W.A.: Mt Aloysius, A. S. George 5238 (PERTH). N.T.: Docker River, T. S. Henshall 2851 (NT). S.A.: Evelyn Downs, Sept. 1950, E. H. Ising (ADW). Qld: Boorara, S. L. Everist 1465 (BRI). N.S.W.: c. 19 km W of Nyngan, J. C. De Nardi 204 (NSW).

Similar to *S. parviflora* but distinguished by its different indumentum and by the fewer stamens and spines.

42. *Sclerolaena ramulosa* (C. White) A. J. Scott, *Feddes Repert.* 89: 114 (1978)

Bassia ramulosa C. White, *Proc. Roy. Soc. Queensland* 55: 76 (1944). T: Banchory, Qld, Oct.–Nov. 1935, Bassingthwaite & Cole 6; holotype: BRI.

Perennial herb to 30 cm high, very sparsely pubescent with short cottony hairs to hirtellous. Leaves narrowly ellipsoidal to almost linear, c. 4 mm long, fleshy. Flowers solitary. Perianth sparsely pubescent. Stamens 3. Fruiting perianth hard, sparsely pubescent; attachment circular, c. 3 mm diam., truncate, often on a slightly raised scar; tube depressed-globose with a broad base, c. 1.5 mm high and 2.5 mm wide; apex convex; limb a narrow ridge; spines 4+2, c. 2 mm long, spreading, the radicular pair shorter and unequal arising from a short radicular spur. Embryo horizontal. Fig. 48C.

Found in southern-central and central-eastern Qld. Map 380.

Qld: Blendon, S. L. Everist 3827 (BRI); St Lawrence tidal flats, N. Byrnes 3590 (BRI).

43. *Sclerolaena johnsonii* (Ising) A. J. Scott, *Feddes Repert.* 89: 113 (1978)

Bassia johnsonii Ising, *Trans. Roy. Soc. S. Australia* 88: 101 (1964). T: 36.2 miles (c. 58 km) E of New Crown Homestead, N.T., L. Johnson & G. Chippendale 3940; holotype: NSW; isotype: AD, CANB, MEL.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(19) (1982) as *Bassia johnsonii*.

Bushy intricately-branched annual or perennial, glabrous. Leaves slender, subterete or very narrowly fusiform, obtuse, mostly 5–10 mm long, rarely to 15 mm long. Flowers solitary, glabrous. Stamens 4. Fruiting perianth hard, glabrous; attachment circular; base truncate, horizontal; tube shortly cylindrical, c. 1.5 mm high, 2 mm wide; apex convex. Spines 3+2, horizontally spreading; radicular pair on a short lateral spur 2–3 mm long, other three principal spines either opposite to or at right angles to radicular pair, 5–7 mm long. Seed horizontal; radicle ascending. Fig. 48D.

Found in southern N.T. and adjacent regions of W.A., S.A., Qld and N.S.W., on sandplains or in sandy swales between dunes. Map 381.

W.A.: W end of Lake Hopkins, A. S. George 8343 (PERTH). N.T.: Stirling Stn, T. S. Henshall 502 (NT). S.A.: 28 km W of Vokes Hill, D. E. Symon 12490 (ADW). Qld: Hammond Downs, S. T. Blake 12051 (BRI). N.S.W.: 40 km NW of Tibooburra, P. L. Milthorpe 1181 (NSW).

Readily distinguished from *S. muricata* var. *muricata*, with which it has been confused, by the terete leaves and transversely positioned fruit which has a horizontal truncate base.

44. *Sclerolaena cornishiana* (F. Muell.) A. J. Scott, *Feddes Repert.* 89: 112 (1978)

Bassia cornishiana F. Muell., *Australas. Chem. Druggist* 8: 41 (1885). T: near Field River, N.T., W.H. Cornish; holotype: MEL n.v.

Illustration: J. M. Black, *Fl. S. Australia* 2nd edn, fig. 411 (1948) as *Bassia cornishiana*.

Intricately branched annual or perennial herb. Branches woolly. Leaves narrowly obovate to obovate, c. 10 mm long, villous. Flowers solitary. Perianth 5-lobed. Stamens 5. Fruiting perianth hard, woolly, persistent; attachment oblique; tube turbinate with a thick solid base, c. 3 mm high, 2.5–4 mm wide at summit; apex ±circular, cushion-shaped, radially 5-grooved; spines radiating and regularly positioned, typically 4+2 (but one of the radicular pair may be very reduced or absent), the longer c. 7 mm long, woolly at base. Seed horizontal; radicle centrifugal. *Cartwheel Burr.* Fig. 48E.

Found in northern central Australia and western Qld. Map 382.

W.A.: northern Gravity Lake, 3 May 1979, A. S. George s.n. (PERTH). N.T.: 40 km WNW of Alice Springs, A. E. Orchard 696 (NT). Qld: Barkly Downs Stn, S. T. Blake 17950 (BRI).

45. *Sclerolaena muelleri* (Benth.) A. J. Scott, *Feddes Repert.* 89: 113 (1978)

Chenolea muelleri Benth., *Fl. Austral.* 5: 191 (1870); *Bassia muelleri* (Benth.) F. Muell., *Syst. Census Austral. Pl.* 1: 30 (1882). T: Sturt Creek, W.A., F. Mueller; iso: NSW.

Bassia chippendalei Ising, *Trans. Roy. Soc. S. Australia* 88: 95 (1964). T: 39.4 miles (c. 63 km) SE of The Granites, N.T., G. Chippendale 4210; holotype: AD.

Illustration: E. H. Ising, *op. cit.* 88: 8, fig. 8 (1964) as *Bassia chippendalei*.

Sprawling perennial to 60 cm high. Branches slender, velvety when young. Leaves very narrowly oblong to linear, 5–20 mm long, fleshy, woolly-villous. Flowers solitary. Perianth villous. Stamens 4. Fruiting perianth hard, villous; attachment circular, c. 2 mm diam., flat or concave; tube turbinate, 2–3 mm high and wide, ribbed; apex convex; spines 3+2, spreading, 2–3 mm long, regular, placed around apex, the two radicular spines on a short spur and shorter than the others. Seed horizontal; radicle slightly ascending. Fig. 48F.

Found in northern central Australia near the W.A.–N.T. border; in slightly saline sandy soil. Map 383.

W.A.: near S end of Lake Gregory, A. S. George 15395 (PERTH). N.T.: 48 km WNW of Mongrel Downs Homestead, P. K. Latz 759 (NT).

46. *Sclerolaena longicuspis* (F. Muell.) A. J. Scott, *Feddes Repert.* 89: 113 (1978)

Bassia longicuspis F. Muell., *Iconogr. Austral. Salsolac. Pl.* 8: t. 74 (1891); *Austrobassia longicuspis* (F. Muell.) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 532 (1934). T: Charlotte Waters, N.T., 1885, H. Kempe; lectotype: MEL; iso: NSW, *vide* E. H. Ising, *Trans. Roy. Soc. S. Australia* 88: 92 (1964).

Anisacantha erinacea var. *longicuspis* F. Muell., *Fragm.* 7: 14 (1869). T: between Stokes Range and Coopers Creek, Wheeler; holotype: MEL 101459.

Bassia cucullata Ising, *op. cit.* 88: 90 (1964); *Sclerolaena cucullata* (Ising) A. J. Scott, *Feddes Repert.* 89: 112 (1978). T: Tranby, Qld, 8 May 1936, S. T. Blake 11376; holotype: AD.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 74 (1889) as *Bassia longicuspis*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(22), 254 (1982) as *Bassia longicuspis*.

Rounded glabrous perennial to 60 cm high. Leaves slender, trigonous in T.S., 2–3 cm long. Flowers solitary. Perianth glabrous outside, woolly within. Stamens 5. Fruiting perianth glabrous outside; attachment broad and expanded, the base somewhat spreading around branch; tube cylindrical, narrowing towards apex, c. 5 mm high and wide at base; wall very thick, somewhat spongy on outside, woody within; limb conical, c. 2 mm high, erect or inflexed at tip; spines 2(rarely 4) + 1(2), slender, ascending; lateral pair 20–30 mm long; adaxial radicular pair with one 5–10 mm long, the other minute or up to 2 mm long (or the longer radicular spine absent), one or two long abaxial spines sometimes present or these represented by a small tubercle. Seed and radicle erect. Fig. 48G.

Found in southern N.T., northern and eastern S.A., south-western Qld and north-western N.S.W.; frequently in stony soil on hills. Map 384.

N.T.: New Crown Stn, *T.S.Henshall 1800* (NT). S.A.: Leigh Creek, *A. C. Beaglehole 20895* (PERTH). Qld: near Eromanga, *S. T. Blake 11902* (BRI). N.S.W.: Fowlers Gap, *S. Jacobs 2261* (NSW).

Variable in number of spines but readily recognised by the long slender leaves and slender spines.

The type of *Bassia cucullata* is possibly a hybrid involving *S. longicuspis* since all fruits examined were sterile (although Ising, *loc. cit.*, stated the seed to be horizontal). Other specimens determined by Ising as *B. cucullata* had vertical seeds as is found in *S. longicuspis*.

47. *Sclerolaena tridens* (F. Muell.) Domin, *Biblioth. Bot.* 89: 70 (1921)

Bassia tridens F. Muell., *Fragm.* 12: 12 (1882). T: Gascoyne River, W.A., 1882, *J. Forrest*; holotype: MEL; isotype: PERTH.

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 64 (1889) as *Bassia tridens*.

Open perennial to 30 cm high, glabrous except axillary hairs. Leaves semiterete, c. 5 mm long, fleshy. Flowers solitary, glabrous. Perianth 3-lobed. Stamens 3. Fruiting perianth hard, cartilaginous, glabrous, straw-coloured; attachment broad; tube turbinate, c. 1.5 mm high, including the concave to hollowed base; spines 2(+2), horizontal, strongly flattened, oblong, acute, c. 4 mm long, the radicular pair contiguous or fused together; upper perianth flat or slightly sunken. Seed horizontal; embryo circular; radicle centrifugal. Fig. 48H.

Found in the Gascoyne River area of W.A., predominantly on clay flats. Map 385.

W.A.: 72 km SSE of Carnarvon, *A. C. Beaglehole 11750* (PERTH); Bidgemia Stn, *D. G. Wilcox 21* (PERTH).

This species is readily recognised by its flat horizontal spines in which the radicular pair are close together (or even fused) to give the appearance of there being 3 spines in all.

48. *Sclerolaena alata* Paul G. Wilson, *Fl. Australia* 4: 328 (1984)

T: Nookawarra Stn, W.A., 27 Aug. 1974, *A. M. Ashby 5054*; holotype: PERTH; isotype: AD.

Erect perennial c. 20 cm high. Branches slender, moderately appressed-hirsute. Leaves sessile, linear, c. 5 mm long, 0.5 mm wide, fleshy, sparsely appressed-hirsute. Flowers solitary. Perianth 5-lobed. Stamens 5. Fruiting perianth woody, sparsely appressed-hirsute; tube turbinate, c. 2.5 mm high, faintly 10-ribbed, truncate and slightly hollowed at base, convex to broadly conical at apex; appendages 4+2, wing-like, intertepaline, radiating horizontally; each appendage oblong to linear-acuminate, c. 2.5 mm long, hard, lacerate at apex or entire, the radicular pair narrower than the other four. Style stout and hard. Seed horizontal, thick. Fig. 48 I.

Found in central W.A. between 24° and 29°S lat. on outer margin of salt lakes. Map 386.

W.A.: c. 3 km E of Carnegie Homestead, *A. S. George 5540* (PERTH); Lake Hopkins, *P. K. Latz 2358* (NT).

49. *Sclerolaena parviflora* (R. Anderson) A. J. Scott, *Feddes Repert.* 89: 114 (1978)

Bassia parviflora R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 347 (1923); *Austrobassia parviflora* (R. Anderson) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 532 (1934). T: Queen Victoria Spring, W.A., *Young*; lectotype: MEL, *fide* E. H. Ising, *Trans. Roy. Soc. S. Australia* 88: 105 (1964).

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(26), 256 (1982) as *Bassia parviflora*.

Erect woody perennial to 30 cm high, sparsely appressed-hirtellous. Branches slender, Leaves narrowly ellipsoidal, 2–3 mm long or slender and subterete to 6 mm long, fleshy. Flowers solitary. Perianth hirtellous. Stamens 5. Fruiting perianth hard, very shortly cylindrical or broadly turbinate, smooth or ribbed, c. 1 mm high and 1.5 mm wide, sparsely appressed-hirtellous to glabrous, glossy; apex truncate; base rounded, sometimes hollowed; attachment circular; limb depressed and inconspicuous; spines 4+2, 1–2 mm long, the radicular pair often shorter than the others, radiating. Seed horizontal. Fig. 48J.

Widespread in the drier central and southern portions of Australia. Map 387.

W.A.: Cundeelee, *P. Boswell* 89 (PERTH). N.T.: Lake Neale, *P. K. Latz* 2435 (NT). S.A.: 64 km SE of Kingoonya, *D. E. Symon* 1146 (ADW). N.S.W.: 38 km NE of Wentworth, *J. C. De Nardi* 331 (NSW). Vic.: Mildura, *W. S. Campbell* (NSW).

50. *Sclerolaena napiformis* Paul G. Wilson, *Fl. Australia* 4: 330 (1984)

T: Jerilderie, N.S.W., *E. D'Arny* 424; holotype: CANB; isotype: NSW.

Erect perennial c. 30 cm high. Branches slender, sparsely cottony. Leaves linear, 10–15 mm long, appressed-hirsute with minutely scabridulous hairs. Flowers solitary. Perianth 5-lobed, sparsely pubescent. Stamens 5. Fruiting perianth sparsely pubescent; tube broadly turbinate, c. 3 mm high and as wide at apex, faintly ribbed; attachment \pm flat, horizontal, circular, c. 1.2 mm diam.; apex convex; limb inconspicuous; spines 4+2 radiating and slightly ascending, the 4 major spines 2.5–4 mm long, the radicular pair to 1 mm long and arising from a short spur that is decurrent as a rib. Seed horizontal; radicle ascending. Fig. 48K.

Found in south-central N.S.W. and north-central Vic. Map 388.

Vic.: Creswick Swamp, *A. C. Beauglehole* 68721 (PERTH).

Possibly a hybrid involving *S. parviflora*.

51. *Sclerolaena minuta* (Ising) A. J. Scott, *Feddes Repert.* 89: 113 (1978)

Bassia minuta Ising, *Trans. Roy. Soc. S. Australia* 88: 89 (1964). T: near Boulia, Qld, 24 July 1936, *S. T. Blake* 12373; holotype: BRI; isotype: AD.

Annual or short-lived perennial branching from base, to 20 cm high. Branches pilose. Leaves very narrowly ovate to very narrowly oblong, 5–10 mm long, villous. Flowers solitary. Perianth villous. Stamens 5. Fruiting perianth villous; attachment basal and oblique, minute; tube turbinate, somewhat dorsiventrally compressed, 1.5–3 mm long; apex truncate, slightly concave, but with erect membranous limb in centre; spines 2, lateral, ascending, 0.5–1.5 mm long, a pair of adjacent minute radicular tubercles also present or these developing short spines. Seed and radicle erect. Fig. 48L.

Found in north-eastern W.A., southern N.T. and western Qld, on rocky hillsides. Map 389.

W.A.: 10 km NW of Waldburg Stn, *T. L. Setter* 391 (ADW). N.T.: Kurundi Stn, *T. S. Henshall* 2052 (NT). Qld: 64 km E of Camooweal, *S. T. Blake* 15967 (BRI).

52. *Sclerolaena densiflora* (W. Fitzg.) A. J. Scott, *Feddes Repert.* 89: 112 (1978)

Bassia densiflora W. Fitzg., *J. W. Austral. Nat. Hist. Soc.* 1: 31 (1904). T: Gwalia, W.A., Nov. 1903, *W. V. Fitzgerald*; lectotype: NSW, *vide* E. H. Ising, *Trans. Roy. Soc. S. Australia* 88: 95 (1964).

Erect, perennial to 30 cm high, silky-pilose all over. Leaves linear, 10–20 mm long, fleshy. Flowers solitary but clustered towards apex of branches. Perianth silky-pilose. Stamens 5. Fruiting perianth silky-pilose, hard; attachment basal, minute, c. 0.3 mm diam.; tube turbinate, 1–1.5 mm high, apex truncate, square; spines 3+2, ascending, 3–5 mm long, positioned at corners of apex, the radicular pair collateral, close together and frequently appearing to be of one spine. Embryo and radicle erect. Fig. 48M.

Found in the central and northern desert areas of W.A. Map 390.

W.A.: W of Anketell, A. M. Ashby 2647 (PERTH); c. 6 km S of Agnew, T. E. H. Aplin 2362 (PERTH).

53. *Sclerolaena lanicuspis* (F. Muell.) F. Muell. ex Benth., *Fl. Austral.* 5: 195 (1870)

Anisacantha lanicuspis F. Muell., *Fragm.* 2: 170 (1861); *Bassia lanicuspis* (F. Muell.) F. Muell., *Syst. Census Austral. Pl.* 1: 30 (1882). T: Salt plains along W side of Barrier Range, N.S.W., 1860, H. Beckler; holo: MEL.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(20) (1982) as *Bassia lanicuspis*.

Woody perennial c. 25 cm high. Branches tomentose. Leaves semiterete, 10–20 mm long, fleshy, pilose. Flowers solitary. Perianth pilose. Stamens 5. Fruiting perianth pilose all over, readily detached; attachment basal, circular, concave, 0.4–1.2 mm diam.; tube turbinate, dorsiventrally compressed, 1.5–3 mm long; limb erect, membranous; spines 3, rarely 4, two erect and lateral, c. twice length of tube and one (or 2 adjacent collateral) adaxial either erect and equal to lateral spines or divaricate and shorter. Seed and radicle erect. *Spinach-burr*, *Copper-burr*. Fig. 48N.

Found in central and northern W.A., N.T., S.A., central and western Qld, western N.S.W., and north-western Vic. Map 391.

W.A.: Mt Tietkens, A. S. George 8953 (PERTH). N.T.: Alice Springs, A. O. Nicholls 526 (NI). S.A.: Coondambo, A. C. Beauglehole 20038 (PERTH). Qld: Corona, S. L. Everist 128 (BRI). N.S.W.: Fowlers Gap, J. H. Leigh W182 (NSW). Vic.: SE of Red Cliffs, 21 Oct. 1980, J. H. Browne (MEL).

Some variants of this species closely resemble *S. densiflora* which may, however, be distinguished by the square apex to its fruit on which there are 5 spines, 2 of which are close together and collateral. As delimited here *S. lanicuspis* may encompass a number of distinct taxa.

54. *Sclerolaena ventricosa* (J. Black) A. J. Scott, *Feddes Repert.* 89: 114 (1978)

Bassia ventricosa J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 46: 566 (1922); *Austrobassia ventricosa* (J. Black) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 532 (1934). T: Hergott Springs, S.A., 10 Oct. 1917, J. M. Black; lecto: AD, *fide* E. H. Ising, *Trans. Roy. Soc. S. Australia* 88: 86 (1964).

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(31), 259 (1982) as *Bassia ventricosa*.

Compact perennial c. 30 cm high. Branches loosely woolly. Leaves slender, terete or semiterete, 10–15 mm long, dorsiventrally flattened at base, appressed-villous or eventually almost glabrous. Flowers solitary. Perianth tomentose. Stamens 5. Fruiting perianth pilose; attachment small, circular, c. 0.5 mm diam.; tube barrel-shaped to shortly cylindrical, rounded at base, c. 3 mm high and wide, faintly ribbed; limb erect, conical, c. 1.5 mm high, not hardened; spines 2+1 or 2+2, rarely 3+2; the 2 principal spines lateral, ascending to divergent c. 5 mm long; the radicular spines 1 or 2, adaxially placed, up to 1 mm long or reduced to a small tubercle. Seed horizontal; radicle ascending. Fig. 48 O.

Found in southwestern Qld and western N.S.W., extending W to central S.A.; grows in heavy soil. Map 392.

S.A.: Coward Springs, D. E. Symon 11263 (ADW). Qld: Lake Numalla, 18 Sept. 1971, J. P. Stanton (BRI). N.S.W.: Fowlers Gap, J. H. Leigh W181 (NSW).

55. *Sclerolaena everistiana* (Ising) A. J. Scott, *Feddes Repert.* 89: 112 (1978)

Bassia everistiana Ising, *Trans. Roy. Soc. S. Australia* 88: 84 (1964). T: Woodstock, W of Winton, Qld, 29 Apr. 1934, S. T. Blake 6502; holo: AD.

Spreading perennial. Branches hirsute. Leaves semiterete, c. 10 mm long, villous. Flowers solitary. Perianth villous. Stamens 5. Fruiting perianth sparsely villous; attachment small, circular, basal, c. 1 mm diam.; tube shortly cylindrical, slightly dorsiventrally compressed,

c. 2 mm high and wide, ribbed; limb erect, thin, c. 1 mm long; spines 2+1, the lateral pair divergent 2–3 mm long, the adaxial radicular spine very short, c. 0.5 mm long. Seed and radicle erect. Fig. 48P.

Found in central Qld in Gidgee (*Acacia cambagei*) country on more or less stony lateritic soil. Map 393.

Qld: Hughenden, Sept. 1936, *J. Mann* (BRI).

56. *Sclerolaena blackiana* (Ising) A. J. Scott, *Feddes Repert.* 89: 111 (1978)

Bassia blackiana Ising, *Trans. & Proc. Roy. Soc. S. Australia* 57: 91 (1933). T: Oodnadatta, S.A., 7 Sept. 1931, *E. H. Ising* 2670; holotype: AD.

Illustrations: *E. H. Ising, op. cit.* 57: 92, figs 1–3 (1933); *G. M. Cunningham et al., Pl. W. New South Wales* 253 fig. 46(9) (1982) as *Bassia blackiana*.

Rounded herb to 30 cm high. Branches loosely woolly. Leaves slender, semiterete, 5–20 mm long, silky-villous or eventually glabrous. Flowers solitary. Perianth woolly, 5-lobed. Stamens 5. Fruiting perianth woolly-villous or eventually glabrous; attachment small, basal; tube barrel-shaped, c. 2 mm high, hard (possibly fleshy outside when fresh), smooth or 5–10-ribbed; apex conical, woolly on lobes; spines 5, 0.5–1.5 mm long (the radicular one the shortest), recurved. Seed slightly oblique; radicle ascending. Fig. 48Q.

Found in northern S.A., south-western Qld and western N.S.W. Map 394.

S.A.: Mt Evelyn Stn, *T. S. Henshall* 3156 (NSW). Qld: Mt Howitt Stn, *S. T. Blake* 11969 (BRI). N.S.W.: 5 km E of Wilcannia, *P. L. Milthorpe* 1449 (NSW).

57. *Sclerolaena stylosa* (Ising) A. J. Scott, *Feddes Repert.* 89: 114 (1978)

Bassia stylosa Ising, *Trans. Roy. Soc. S. Australia* 93: 124 (1969). T: 103 miles (c. 165 km) SSE of Carnarvon, W.A., 21 Aug. 1965, *A. C. Beaglehole* 11780; holotype: AD.

Small shrub c. 50 cm high. Branches tomentose when young. Leaves slender, semiterete, 10–15 mm long, somewhat sigmoid (at least when young) with the apex recurved, densely tomentose. Flowers solitary. Perianth tomentose. Stamens 5. Fruiting perianth tomentose; tube cylindrical, c. 2 mm high and wide, somewhat dorsiventrally compressed; base oblique; attachment elliptic; limb erect, c. 1 mm long; spines 2+1 or 2, tomentose, the lateral pair to 4 mm long, divergent, the radicular spines 1 or 2, adaxial, c. 1 mm long. Seed erect. Fig. 48R.

Only known from the type collection from north-western W.A. Map 395.

The sigmoid leaf-shape (similar to that found in *S. forrestiana*) gives this species a distinctive aspect. Possibly a hybrid involving *S. forrestiana*.

58. *Sclerolaena forrestiana* (F. Muell.) Domin, *Biblioth. Bot.* 89: 70 (1921)

Bassia forrestiana F. Muell., *Fragm.* 12: 12 (1882). T: Gascoyne River, W.A., 1882, *J. Forrest*; holotype: MEL.

Illustration: *F. Mueller, Iconogr. Austral. Salsolac. Pl.* t. 75 (1889) as *Bassia forrestiana*.

Erect perennial to 30 cm high. Branches stout, velvety. Leaves slender, semiterete or trigonous, 1.5–3 cm long, somewhat sigmoid with recurved apex, silky. Flowers solitary. Perianth velvety. Stamens 5. Fruiting perianth partly embedded in branch axis, velvety; tube disc-shaped, c. 1 mm high, 3 mm wide; limb conical, erect to 3 mm high; spines 2+2, the abaxial spines laterally placed and ascending, slender, 2–3 cm long, the radicular adaxial spines to 1 cm long or with one sometimes reduced to a tubercle. Seed horizontal; radicle ascending. Fig. 48S.

Found in north-western W.A. on sandplains inland of Carnarvon. Map 396.

W.A.: Williambury Stn, *R. J. Cranfield* 1926 (PERTH); Yinnietharra Stn, *D. G. Wilcox* 159 (PERTH).

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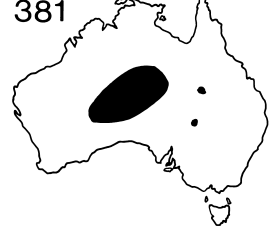
379



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376. *Sclerolaena deserticola*
 379. *Sclerolaena convexula*
 382. *Sclerolaena cornishiana*
 385. *Sclerolaena tridens*
 388. *Sclerolaena napiformis*

377. *Sclerolaena birchii*
 380. *Sclerolaena ramulosa*
 383. *Sclerolaena muelleri*
 386. *Sclerolaena alata*
 389. *Sclerolaena minuta*

378. *Sclerolaena costata*
 381. *Sclerolaena johnsonii*
 384. *Sclerolaena longicuspis*
 387. *Sclerolaena parviflora*
 390. *Sclerolaena densiflora*

59. *Sclerolaena bicornis* Lindley in T. Mitch., *Three Exped. E. Australia* 2: 47 (1838)

Anisacantha bicornis (Lindley) F. Muell., *Fragm.* 7: 14 (1869); *Bassia bicornis* (Lindley) F. Muell., *Syst. Census Austral. Pl.* 30 (1882); *Chenolea bicornis* (Lindley) F. Muell. ex Tate, *Trans. & Proc. Roy. Soc. S. Australia* 3: 58 (1880). T: between Lachlan and Darling Rivers, N.S.W., 21 Apr. 1836, *T. L. Mitchell*; holo: CGE, photo seen.

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 79 (1889) as *Bassia bicornis*.

Intricately branched shrub to c. 50 cm high. Branches closely white-woolly. Leaves well-spaced, slender and semiterete, c. 20 mm long, erect and spreading at tips when young, sparsely silky-pilose with scabridulous hairs to glabrous. Flowers solitary. Perianth densely woolly. Stamens 5. Fruiting perianth woody, covered with a thick white woolly indumentum except distal portion of spines; attachment basal, elliptic, 2–5 mm long; tube globular, 4–6 mm diam.; limb erect; spines 2, rarely 3, opposite, erect to spreading, 3–20 mm long. Seed horizontal, radicle erect. *Goathead Burr*.

There are 2 varieties.

Fruit with a thick woolly indumentum; spines 10–20 mm long

59a. var. *bicornis*

Fruit with a thin woolly indumentum; spines less than 5 mm long

59b. var. *horrida*

59a. *Sclerolaena bicornis* Lindley var. *bicornis*

Kentropsis lanata Moq., *Chenop. Monogr. Enum.* 83 (1840); *Anisacantha lanata* (Moq.) F. Muell., *J. Landsborough's Exped. Carpentaria in search of Burke & Wills* Suppl. 13 (1862). T: 'In nova Hollandia'; ?iso: Molle's Plains, 1817, *A. Cunningham* 380, MEL.

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(4) (1982) as *Bassia bicornis* var. *bicornis*.

Fruiting perianth c. 6 mm diam., with a thick white woolly indumentum; spines 10–20 mm long, erect to spreading, slender. Figs 44, 48T.

Found from north-western W.A. eastwards through southern N.T. and S.A. to Qld and central and western N.S.W., in heavy soil. Map 397.

W.A.: Tovera Stn, *R. J. Cranfield* 1796 (PERTH). N.T.: Henbury Stn, *T. S. Henshall* 1080 (NT). S.A.: Murnpeowie Stn, *D. E. Symon* 5643 (ADW). Qld: Cloncurry, *C. E. Hubbard* 7333 (BRI). N.S.W.: c. 18 km E of Ivanhoe, *T. M. Whaite* 1400 (NSW).

59b. *Sclerolaena bicornis* var. *horrida* Domin, *Biblioth. Bot.* 89: 69 (1921)

Bassia bicornis var. *horrida* (Domin) C. White, *Proc. Roy. Soc. Queensland* 55: 75 (1944). T: near Winton, Qld, Mar. 1910, *K. Domin*; *n.v.*

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(5) (1982) as *Bassia bicornis* var. *horrida*.

Fruiting perianth c. 4 mm diam., with a close woolly indumentum; spines two, 3–4 mm long, erect, often with a small additional radicular spine or tubercle. Fig. 48U.

Found in northern N.S.W. and in central and southern Qld, usually in red-brown soil. Map 398.

Qld: N of Ilfracombe, *S. T. Blake* 11353 (BRI). N.S.W.: Coolabah, *G. M. Cunningham* 338 (NSW).

60. *Sclerolaena decurrens* (J. Black) A. J. Scott, *Feddes Repert.* 89: 112 (1978)

Bassia decurrens J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 46: 567 (1922); *Austrobassia decurrens* (J. Black) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 532 (1934). T: Port Augusta West, S.A., 29 Sept. 1920, *J. M. Black*; lecto: AD, *fide* E. H. Ising, *Trans. Roy. Soc. S. Australia* 88: 83 (1964).

Illustrations: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 251, 253 fig. 46(14) (1982) as *Bassia decurrens*.

Small dense shrub to 30 cm high. Branches loosely woolly. Leaves semiterete, flattened towards base, 5–10 mm long, acute, appressed-hirsute to glabrous, glossy; hairs medifixed

with the ascending arm longer than the descending. Flowers solitary. Perianth moderately pilose. Stamens 5. Fruiting perianth hard, glossy; attachment slightly oblique, \pm circular, depressed, c. 1.5 mm diam.; tube shortly turbinate, ribbed, c. 1.5 mm high and 2 mm broad at apex, glabrous; limb oblong, erect, exceeding tube, thin, sparsely pilose towards apex; spines 2 or 3, two of these opposite and divergent, 5–7 mm long, and one radicular 2.5 mm or less, or this reduced to a tubercle, the radicular canal produced into a flange which is decurrent down tube as a prominent rib. Seed erect. Fig. 48V.

Found from southern N.T. through to south-western Qld, western N.S.W. and far north-western Vic., usually in heavy slightly saline soil. Map 399.

N.T.: c. 46 km ESE of Alice Springs, *D. J. Nelson 786* (NT). S.A.: Yudnapinna Stn, *F. M. Hilton 750* (ADW). Qld: Barcaldine ex Lochnagar, *S. T. Blake 6850* (BRI). N.S.W.: Narran Lake, *D. J. McGillivray 2871* (NSW). Vic.: Abbotsford Bridge, 7 Sept. 1980, *J. H. Browne* (PERTH).

Evidently closely related to *S. bicuspis* but distinguished by its woolly branches, the somewhat differently shaped fruit, and the medifixed hairs on the leaves.

61. *Sclerolaena bicuspis* (F. Muell.) Domin, *Biblioth. Bot.* 89: 70 (1921)

Anisacantha bicuspis F. Muell., *Trans. & Proc. Victorian Inst. Advancem. Sci.* 133 (1855); *Chenolea bicuspis* (F. Muell.) F. Muell. ex Tate, *Trans. & Proc. Roy. Soc. S. Australia* 3: 58 (1880); *Bassia bicuspis* (F. Muell.) F. Muell., *Syst. Census Austral. Pl.* 30 (1882). T: Cudnaka, S.A., *F. Mueller*; holotype: MEL, n. v.

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 73 (1891).

Small shrub c. 15 cm high. Branches robust, glabrous, glossy, densely pilose in axils. Leaves crowded, slender and semiterete, flattened towards base, 1–1.5 cm long, sparsely pilose when young. Flowers solitary but congested. Perianth pilose. Stamens 5. Style robust, pilose. Fruiting perianth woody; attachment oblique, circular, c. 1.5 mm diam.; tube very shortly turbinate, 1.5–2 mm high and c. 4 mm wide at apex, ribbed, sparsely pilose; limb erect, oblong c. 3.5 mm high, membranous to crustaceous, sparsely pilose; spines 2, rarely 3, erect or slightly spreading, opposite, 8–13 mm long; radicular tubercle present. Seed horizontal. Fig. 48W.

Known from the Flinders Range area, S.A., and one locality in the Carnarvon district, W.A. Map 400.

W.A.: 16 km W of Gascoyne Junction, *P.G. Wilson 8434* (PERTH). S.A.: Yudnapinna, 17 Oct. 1939, *H. M. Douglas* (NSW).

62. *Sclerolaena clelandii* (Ising) A. J. Scott, *Feddes Repert.* 89: 112 (1978)

Bassia clelandii Ising, *Trans. Roy. Soc. S. Australia* 88: 94 (1964). T: 44 miles (c. 70 km) W of Erlunda Stn, N.T., 1 June 1935, *J. B. Cleland*; holotype: AD.

Illustration: E. H. Ising, *op. cit.* 88: 69, fig. 10 (1964).

Perennial to 30 cm high. Branches woolly. Leaves narrowly ovate to elliptic, acute, c. 5 mm long, 1.5 mm wide, thick, somewhat boat-shaped, silky-pubescent, crowded towards branch apices. Flowers solitary, tomentose. Stamens 5. Fruiting perianth hard, woolly, persistent; attachment basal, circular, concave; base slightly gibbous, tube oblong, c. 3 mm long, dorsiventrally flattened, somewhat recurved; limb erect, c. 1 mm long; spines 4–5, flattened and fused together in 2 pairs as short oblong plates on abaxial and adaxial surfaces of perianth, a lateral spine sometimes also present or this fused to the abaxial pair, the plates either very short or up to 1 mm long and recurved, bearing at their apex short tubercles or slender spines to 1 mm long. Seed erect; radicle vertical. Fig. 48X.

Found in central Australia, usually in clay on the margins of salt lakes. Map 401.

W.A.: W end of Hopkins Lake, *D. E. Symon 2342* (ADW). N.T.: Erlunda Stn, *T. S. Henshall 49* (NT). S.A.: Tallaringa Well, *T. R. N. Lothian 3793* (AD). Qld: Kaliduwarra Stn, *R. L. Crocker* (NSW n.v.).

Excluded Names

Bassia intricata var. *hirsuta* J. Black, *Fl. S. Australia* 194 (1924).

T: Everard Range, S.A., n. v.

Identity unknown. See E. H. Ising, *Trans. Roy. Soc. S. Australia* 88: 107 (1964).

Sclerolaena aellenii (Ising) A. J. Scott, *Feddes Repert.* 89: 111 (1978); *Bassia aellenii* Ising, *Trans. Roy. Soc. S. Australia* 88: 88 (1964).

T: Corny Point, S.A., 1 Oct. 1957, *Hj. Eichler 14188*; holotype: AD.

Plant sterile; probably a hybrid between *Sclerolaena uniflora* R. Br. and *Threlkeldia diffusa* R. Br.

Sclerolaena caput-casuarii (J. H. Willis) A. J. Scott, *op. cit.* 111; *Bassia caput-casuarii* J.H. Willis, *Victorian Naturalist* 73: 153 (1957).

T: 5–6 miles S of Benetook, Vic., 1 July 1950, *E. Ramsay*; holotype: MEL.

Probably a hybrid between *Babbagia acroptera* F. Muell. & Tate and *Sclerolaena divaricata* (R. Br.) Smith.

Sclerolaena clavata (Ising) A. J. Scott, *op. cit.* 112; *Bassia clavata* Ising, *op. cit.* 88: 105 (1964).

T: Southern Cross, W.A., Aug. 1902, *Day*; holotype: PERTH; isotype: AD.

Probably a hybrid between *S. drummondii* (Benth.) Domin and *S. parviflora* (R. Anderson) A. J. Scott.

Sclerolaena copleyi (Ising) A. J. Scott, *op. cit.* 112; *Bassia copleyi* Ising, *op. cit.* 93: 119 (1969).

T: 115 km NE of Buronga, N.S.W., 13 Apr. 1968, *R. Copley 1883*; holotype: AD.

Probably a hybrid between *S. diacantha* (Nees) Benth. and *Osteocarpum acropterum* var. *deminuta* J. Black. See S. W. L. Jacobs & J. Pickard, *Pl. New South Wales* 104 (1981).

Sclerolaena cristata (Ising) A. J. Scott, *op. cit.* 112; *Bassia cristata* Ising, *op. cit.* 88: 79 (1964).

T: base of Mt Woodroffe, S.A., 10 Aug. 1962, *D. E. Symon 2649*; holotype: AD.

Probably a hybrid between *S. lanicuspis* (F. Muell.) Benth. and *S. uniflora* R.Br. s. lat.

Sclerolaena georgei (Ising) A. J. Scott, *op. cit.* 113; *Bassia georgei* Ising, *op. cit.* 88: 73 (1964).

T: Lake Throssell, W.A., 31 Aug. 1961, *A. S. George 2985*; holotype: PERTH.

Plant sterile, the perianths deformed. Probable hybrid between species of *Sclerolaena* and *Maireana*.

Sclerolaena globosa (Ising) A. J. Scott, *op. cit.* 113; *Bassia globosa* Ising, *op. cit.* 88: 80 (1964).

T: W of Thargominda, Qld, 25 June 1936, *S. T. Blake 11790*; holotype: BRI.

Plant sterile. Probably a hybrid involving *S. bicornis* var. *horrida* Domin.

Sclerolaena lanata (Ising) A. J. Scott, *op. cit.* 113; *Bassia lanata* Ising, *op. cit.* 93: 121 (1969).

T: 55 km S of Edwards Creek, S.A., 31 July 1968, *T. R. N. Lothian 4944*; holotype: AD.

Probably a hybrid involving *S. ventricosa* (J. Black) A. J. Scott.

Sclerolaena murrayae (Ising) A. J. Scott, *op. cit.* 113; *Bassia murrayae* Ising, *op. cit.* 88: 103 (1964).

T: near Arcoona, S.A., Sept. 1927, *B. J. Murray*; holo: AD; iso: NSW.

Plant sterile. Probably a hybrid between a species of *Maireana* and *Sclerolaena anisacanthoides* (F. Muell.) Domin.

Sclerolaena nitida (Ising) A. J. Scott, *op. cit.* 113; *Bassia nitida* Ising, *op. cit.* 93: 123 (1969).

T: Paralana Hot Springs, S.A., 24 Aug. 1968, *R. H. Kuchel* 2684A; holo: AD.

Probably a hybrid between *Sclerochlamys brachyptera* F. Muell. and *Sclerolaena* sp.

Sclerolaena oppositicuspis (Ising) A. J. Scott, *op. cit.* 113; *Bassia oppositicuspis* Ising, *op. cit.* 88: 86 (1964).

T: Yudnapinna Stn, S.A., 11 Sept. 1946, *N. T. Burbidge s.n.*; iso: AD.

Probably a hybrid between *S. decurrens* (J. Black) A. J. Scott and *S. intricata* (R. Anderson) A. J. Scott. See S. W. L. Jacobs & J. Pickard, *op. cit.* 105.

Sclerolaena ramsayae (J. H. Willis) A. J. Scott, *op. cit.* 114; *Bassia ramsayae* J. H. Willis, *Victorian Naturalist* 73: 152 (1957).

T: 5–6 miles S of Benetook, Vic., July 1950, *E. Ramsay*; holo: MEL.

Plant sterile. Probably a hybrid involving *Sclerochlamys brachyptera* F. Muell.

Sclerolaena scrymgeouriae (Ising) A. J. Scott, *op. cit.* 114; *Bassia scrymgeouriae* Ising, *op. cit.* 93: 123 (1969).

T: 450 mile peg, North West Coastal Highway, W.A., 2 Oct. 1966, *E. M. Scrymgeour* 1472; holo: PERTH.

Probably a hybrid involving *Sclerolaena recurvicuspis* (W. Fitzg.) Domin.

22. STELLIGERA

Stelligera A. J. Scott, *Feddes Repert.* 89: 114 (1978); from the Latin *stelliger* (star-bearing), in reference to the radially oriented spines in its fruit.

[*Maireana* sect. *Asterocarpa* F. Muell., *Fragm.* 1: 139 (1859) *nom. inval.*]; *Austrobassia* sect. *Stelligerae* Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 532 (1934); *Bassia* sect. *Asterocarpa* (F. Muell.) Ising, *Trans. Roy. Soc. S. Australia* 88: 76 (1964), *nom. illeg.*

Type: *S. endecaspinis* A. J. Scott (*Maireana stelligera* F. Muell.)

Small woolly shrubs. Leaves alternate, sessile, linear, somewhat fleshy. Flowers bisexual, solitary and axillary, ebracteolate. Perianth urceolate, shortly 5-lobed. Stamens 5. Stigmas 2, slender. Fruiting perianth subglobular, hard, with an obvious radicular tube; apex with a narrow horizontal wing (rarely absent) from which protrude about 11 short radiating spines; pericarp thick and crustaceous above, membranous below. Seed horizontal, circular; radicle centrifugal; perisperm central.

A monotypic genus of eastern temperate Australia.

Stelligera endecaspinis A. J. Scott, *Feddes Repert.* 89: 115 (1978)

Maireana stelligera F. Muell., *Fragm.* 1: 139 (1859); *Echinopsilon stelligerus* (F. Muell.) F. Muell., *Fragm.* 7: 13 (1869); *Kochia stelligera* (F. Muell.) Benth., *Fl. Austral.* 5: 189 (1870); *Bassia stelligera* (F. Muell.) F. Muell., *Iconogr. Austral. Salsolac. Pl.* 7: t. 68 (1891); *Austrobassia stelligera* (F. Muell.) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 532 (1931). T: Salt plains on the Darling River, N.S.W., J. Dallachy; holotype: MEL.

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 68 (1891) as *Bassia stelligera*; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 253 fig. 46(29), 257 (1982) as *Bassia stelligera*.

Straggly shrub to 0.5 m high. Branches woolly. Leaves linear, 5-10 mm long, woolly-villous. Fruiting perianth subglobose, hard, c. 2.5 mm diam., glabrous except woolly-ciliate margins to lobes; wing rigid, c. 3 mm diam. including spines, margin from crenate-dentate to c. 11-spined.

Found in southern Qld, central and western N.S.W., eastern S.A., and north-western Vic., usually in heavy seasonally waterlogged soil.

S.A.: Millewa homestead, Mar. 1937, G. M. Clarke (ADW). Qld: Biddenham, S. L. Everist 3787 (BRI). N.S.W.: 3 km S of Bourke, C. W. E. Moore (CANB). Vic.: Lake Arawak, 25 June 1970, G. W. Anderson (MEL).

Evidently closely related to *Sclerolaena walkeri*, *Sclerochlamys brachyptera* and *Maireana microcarpa* but differing in the development of the perianth wing.

23. SCLEROCHLAMYS

Sclerochlamys F. Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 76 (1858); from the Greek *scleros* (hard) and *chlamys* (cloak), alluding to the hard perianth.

Type: *S. brachyptera* F. Muell.

Small pubescent shrubs. Leaves alternate, sessile, linear, somewhat fleshy. Flowers bisexual, solitary and axillary, ebracteolate. Perianth urceolate, shortly 5-lobed, fleshy in lower half. Stamens 5. Stigmas 2, slender. Fruiting perianth shortly turbinate, hard, glabrous, with 5 prominent tepaline and 5 less obvious intertepaline ribs; base truncate and slightly hollowed; apex truncate and extending into hard narrow entire horizontal 5-angled wing; pericarp crustaceous above, membranous below. Seed horizontal, circular; radicle centrifugal; perisperm central. Testa membranous.

A monotypic genus of central and eastern temperate Australia.

Sclerochlamys brachyptera F. Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 76 (1858)

Echinopsilon brachypterus (F. Muell.) F. Muell., *Fragm.* 7: 13 (1869); *Kochia brachyptera* (F. Muell.) Benth., *Fl. Austral.* 5: 189 (1870); *Bassia brachyptera* (F. Muell.) R. Anderson, *Proc. Linn. Soc. New South Wales* 48: 351 (1923); *Austrobassia brachyptera* (F. Muell.) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 532 (1934). T: Salt flats on Murray River, N.S.W., F. Mueller; lectotype: MEL, *vide* E.H. Ising, *Trans. Roy. Soc. S. Australia* 88: 76 (1964).

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 59 (1890) as *Kochia brachyptera*; B. M. Cunningham *et al.*, *Pl. W. New South Wales* 250, 253, fig. 46(10) (1982) as *Bassia brachyptera*.

Decumbent shrub, villous on leaves and branches. Leaves linear, c. 10 mm long. Fruiting perianth with tube c. 1.5 mm high and 2 mm wide; wing c. 3 mm diam. *Hairy Bassia*, *Short-wing Saltbush*.

Found in south-western Qld, central and western N.S.W., western Vic., S.A., southern N.T., and north-central W.A., usually in heavy somewhat saline soils. Map 403.

W.A.: Rudall River, A. S. George 10759 (PERTH). N.T.: Victory Downs, A. Nicholls 934 (NT). S.A.: Kingston-on-Murray, M. E. Phillips (CBG 023749). Qld: Birdsville, S. L. Everist and L. S. Smith 89 (BRI). Vic.: Kulkyn National Forest, J. H. Willis (MEL 501699).

Clearly related to *Stelligera endecaspinis* and *Sclerolaena tetragona* but distinctive in the hard pentagonous flat winged apex to the fruit.

Trib. III. BETEAE

Trib. *Beteae* Moq. in A. DC., *Prodr.* 13(2): 49 (1849).

Type: *Beta* L.

Flowers often clustered and connate. Perianth hardened in fruit. Ovary semi-inferior; stigmas papillose within. Fruit operculate. Embryo annular; perisperm copious.

Represented in Australia by one genus.

24. BETA

Beta L., *Sp. Pl.* 1: 222 (1753); *Gen Pl.* 5th edn, 103 (1754); the Latin name for the beet.

Type: *B. vulgaris* L.

Annual, biennial or perennial herbs, glabrous. Leaves flat, entire. Flowers bisexual, in small clusters forming a slender spike; clusters subtended by a bract and a pair of bracteoles. Perianth 5-lobed. Stamens 5. Ovary semi-inferior, connate with perianth tube; stigmas 2 or 3, sessile, ovate, papillose on inner surface. Fruit with hard apex which eventually falls away as an operculum. Seed horizontal; testa crustaceous; embryo almost annular; perisperm abundant, central.

A genus of c. 7 species from Europe and Asia one of which is adventive in Australia. Cultivars derived from *B. vulgaris* subsp. *vulgaris* provide several food plants including Beetroot, Sugarbeet, Spinach Beet, etc., and occasionally become established.

****Beta vulgaris*** L., *Sp. Pl.* 1: 222 (1753)

subsp. *maritima* (L.) Thell., *Fl. Adv. Montp.* 189 (1912)

B. maritima L., *Sp. Pl.* 2nd edn, 1: 322 (1762); *B. vulgaris* var. *perennis* L., *Sp. Pl.* 1: 222 (1753); *B. vulgaris* var. *maritima* (L.) Moq in A. DC., *Prodr.* 13(2): 56 (1849) T: from Europe; *n.v.*

Illustration: J. M. Black, *Fl. S. Australia* 2nd edn, 2: 293 (1948).

Biennial herb with slender taproot. Stems decumbent. Leaves rosetted and cauline, glossy, often tinged with red; lamina ovate, c. 5 cm long; petiole slender, half to equal length of lamina. Flowers in clusters of 3 or 4, green. Perianth lobes narrowly oblong. Fruiting perianth indurated, united in clusters and falling as a whole; pericarp hard. *Wild Beet*.

Recorded from coastal S.A. and Vic. and central coastal N.S.W. but probably more widespread; native to Europe. Map 404.

S.A.: Cape Spencer, 10 Apr. 1936, *J. B. Cleland* (AD); between Fulham and Glenelg, 7 Dec. 1926, *J. B. Cleland* (AD). Vic.: Saltwater River, Apr. 1886, *C. Walter* (MEL).

Trib. IV SALICORNIEAE

Trib. *Salicornieae* Dumort., *Fl. Belg.* 23 (1827).

Type: *Salicornia* L.

Succulent plants with articulated branches, appearing leafless. Flowers immersed in succulent bracts usually forming compact spikes. Ovary superior. Embryo curved or horse-shoe shaped; perisperm present or absent.

Represented in Australia by 6 genera.

P.G. Wilson, A revision of the Australian species of Salicornieae (Chenopodiaceae), *Nuytsia* 3: 3–154 (1980).

This account is based on the revision by P. G. Wilson, *loc. cit.*

25. SARCOCORNIA

Sarcocornia A. J. Scott, *Bot. J. Linn. Soc.* 75: 366 (1977); from the Greek, *sarx* (flesh) and the Latin *cornu* (horn).

Type: *S. perennis* (Miller) A. J. Scott

Perennial herbs or subshrubs, glabrous, appearing leafless. Branches of cylindrical segments or articles (internodes) that are cup-shaped or two-lobed at apex, succulent; sclereids usually present in palisade tissue. Inflorescence a terminal spike-like thyrses consisting of 3–12-flowered cymes, sessile in axils of bracts; bracts united in opposite pairs. Flowers apparently embedded in the spongy mesophyll of the succulent axis, bisexual or unisexual by abortion, or the plants dioecious. Perianth succulent, gamotepalous; apex truncate, exposed, the orifice a vertical slit; lobes 3 or 4, 2 lateral and 1 small semicircular outer adaxial lobe (sometimes also a small abaxial lobe). Stamens 2, on abaxial and adaxial side of ovary. Fruiting perianth spongy; pericarp membranous, eventually separating from axis just above base. Seed ovate to orbicular; testa weak, papillose or with slender hairs; embryo horseshoe shaped; albumen absent.

A cosmopolitan genus of 16 species; 3 species native to Australia.

This account is based on the revision by P. G. Wilson, *loc. cit.*

- | | | |
|----|--|----------------------------------|
| 1 | Decumbent or caespitose plant often rooting at nodes; flowers 5–12 in each axillary cyme | |
| 2 | Seed with slender acuminate (sometimes hooked) hairs | 1. <i>S. quinqueflora</i> |
| 2: | Seed papillose with short rounded hairs | 2. <i>S. blackiana</i> |
| 1: | Erect plant, not rooting at nodes; flowers in 3-flowered cymes; seed minutely tuberculate over radicle | 3. <i>S. globosa</i> |

1. *Sarcocornia quinqueflora* (Bunge ex Ung.-Sternb.) A. J. Scott, *Bot. J. Linn. Soc.* 75: 368 (1977)

Salicornia quinqueflora Bunge ex Ung.-Sternb., *Vers. Syst. Salic.* 59 (1866). T: Port Adelaide, S.A., F. Mueller; lecto: K; iso: MEL, *fide* P. G. Wilson, *Nuytsia* 3: 71 (1980).

Salicornia australis Sol. ex F. Muell., *Fragm.* 7: 15 (1869). T: Bay III (Fowlers Bay), [S.A.], 29 Jan. 1802, R. Brown; *n.v.*

Salicornia australis Sol. ex Benth., *Fl. Austral.* 5: 205 (1870), *nom. illeg.* T: New Zealand, Forster, lecto: BM, *n.v.*, *fide* Paul G. Wilson, *loc. cit.*

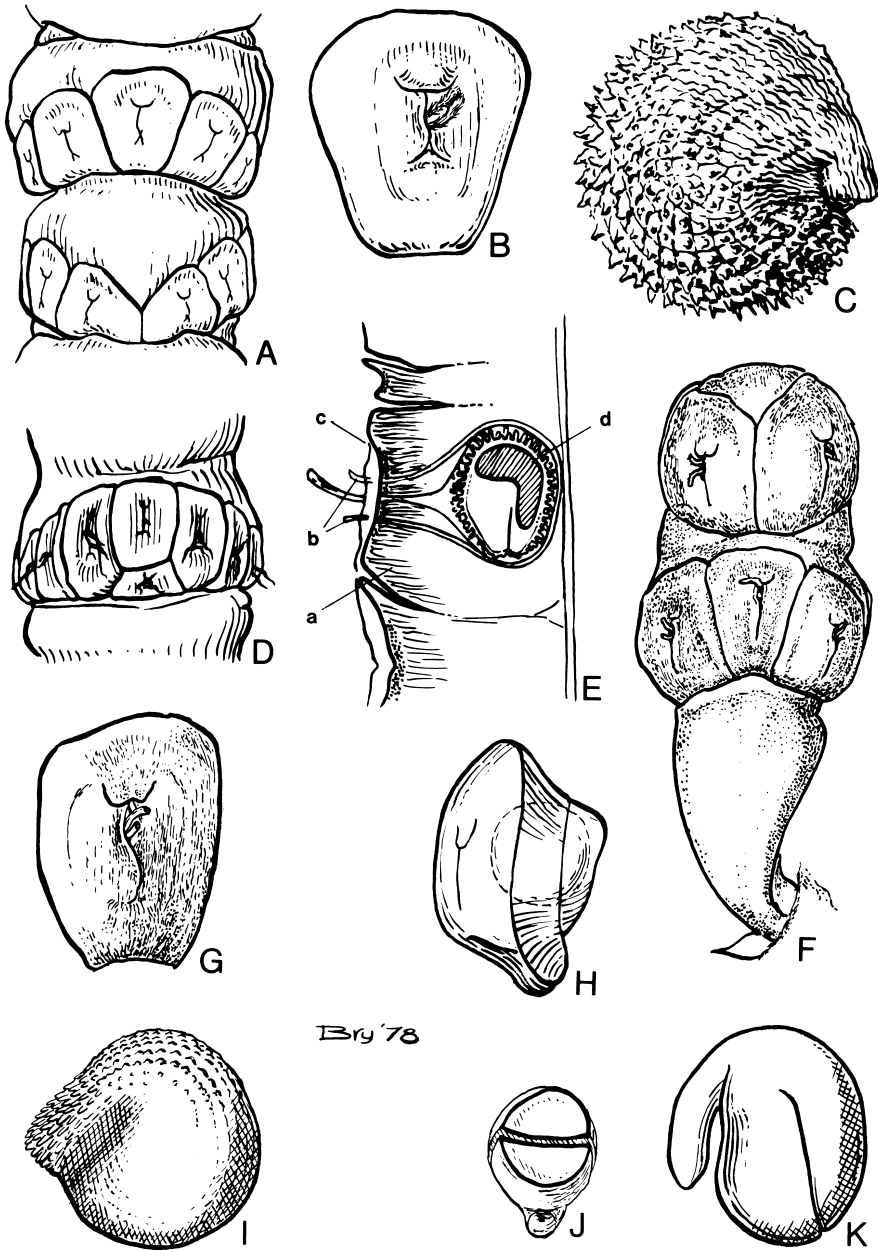
Arthrocnemum heptiflorum Moss, *J. S. African Bot.* 20: 18 (1954) *nom. illeg.* non Moss ex Fourc. (1941). T: New Zealand, Forster; *n.v.*

[*Salicornia indica* auct. non Willd. (1792): R. Brown, *Prodr.* 411 (1810)]

Erect and caespitose or decumbent perennial, rooting at nodes, to 50 cm high. Branches slender; articles cylindrical to narrowly obovoid, 5–15 mm long; sclereids uniformly (rarely spirally) thickened. Spikes 2–5 cm long, 4–5 mm diam. in fruit; cymules 5–9-flowered in a single row. Perianth with small semicircular adaxial lobe; abaxial lobe minute. Seed circular with acute, sometimes uncinat, hairs.

There are 2 subspecies.

- | | |
|---|---------------------------------------|
| Plant decumbent or shrubby; seed with slender, often uncinat, trichomes | 1a. subsp. <i>quinqueflora</i> |
| Plant caespitose; seed with short acute trichomes | 1b. subsp. <i>tasmanica</i> |



Bry '78

Figure 49. *Sarcocornia*. **A–B**, *S. quinqueflora* subsp. *quinqueflora*. **A**, portion of inflorescence $\times 7.5$; **B**, apex of flower (not recorded) $\times 15$. **C**, *S. quinqueflora* subsp. *tasmanica*, seed $\times 45$ (Kingston, Tas., W. Curtis, HO). **D–E**, *S. blackiana*. **D**, portion of inflorescence $\times 15$; **E**, L.S. through fruiting spike (**a**, perianth; **b**, stamens; **c**, pericarp; **d**, seed) $\times 15$ (**D–E**, E. Bennett 2913, PERTH). **F–K**, *S. globosa*. **F**, inflorescence $\times 7.5$; **G**, apex of flower $\times 7.5$; **H**, side of flower $\times 7.5$; **I**, seed $\times 18$; **J**, section through embryo $\times 7.5$; **K**, embryo $\times 18$ (**F–K**, A. George 10502, PERTH). Reproduced by permission from *Nuytsia* 3(1): fig. 33 (1980).

1a. Sarcocornia quinqueflora (Ung.-Sternb.) A.J. Scott subsp. **quinqueflora**

Plant decumbent to erect, sometimes shrubby, rooting at nodes, to 50 cm high. Spikes 2–5 cm long, narrowly cylindrical. Seed with slender, acute, often uncinuate hairs. Figs 49A–B, 50A.

Found around the E and S coasts and on the W coast as far north as Port Hedland, inland in north-western Vic. and south-western W.A.; also grows in New Zealand and New Caledonia; in moderately saline, frequently flooded situations, particularly around estuaries. Map 405.

W.A.: Lake Coyreup, *K. Newbey 3156* (PERTH). S.A.: Lake Robe, *J. R. Dodson 139* (AD). Qld: Sandgate, *S. T. Blake 2384* (BRI). Vic.: Port Phillip Bay, *H. I. Aston 269* (MEL). Tas.: Eaglehawk Neck, *N. T. Burbidge 3221* (HO).

1b. Sarcocornia quinqueflora subsp. **tasmanica** Paul G. Wilson, *Nuytsia* 3: 74 (1980).

T: Bond Bay, Port Davey, Tas., 14 Mar. 1954, *M. Davis 1306*; holo: MEL; iso: HO.

Plant caespitose or with a dense cluster of slender stems arising from short horizontal stolons. Branches slender. Spike shortly cylindrical, c. 15 cm long, 4 mm wide. Seed covered with short acute trichomes. Fig. 49C.

Found in Tas. and S coast of Vic., on rocky coasts where subject to periodic inundation by the sea.

Vic.: Mt Martha, *L. A. S. Johnson* (NSW). Tas.: Cape Wickham, King Is., Mar. 1885, *Dobson* (MEL); Southport, *S. Jacobs 2027* (NSW).

2. Sarcocornia blackiana (Ulbr.) A. J. Scott, *Bot. J. Linn. Soc.* 75: 369 (1978)

Salicornia pachystachya J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 45: 8 (1921), *nom. illeg.*, non Ung.-Sternb. (1866); *Salicornia blackiana* Ulbr., *Nat. Pflanzenfam* 2nd edn, 16c: 552 (1934); *Arthrocnemum heptiflorum*, Moss ex Fourc., *Bot. Survey [S. Africa] Memoir* 20: 19, 115 (1940) *nom. illeg.* T: Patawalonga R., Glenelg, S.A., 20 Jan. 1920, *J. M. Black*; lecto: AD, *fide* P. G. Wilson, *Nuytsia* 3: 75 (1980).

Erect or decumbent perennial to 80 cm high, frequently rooting at nodes. Articles narrowly obovoid to cylindrical, to 10 mm long; sclereids numerous, spirally thickened. Spikes cylindrical, 2–5 cm long, c. 8 mm diam. in fruit; cymules 5–13-flowered, frequently with the central florets in two tiers. Perianth with small semicircular adaxial lobe; abaxial lobe minute. Seed circular with spreading papilliform hairs. Figs 45, 49D–E, 50B.

Found around the coast of Tas., Vic., S.A. and W.A. as far north as Shark Bay, also inland in north-western Vic. and south-western W.A.; grows in periodically waterlogged saline soils, frequently around estuaries. Map 407.

W.A.: Garden Is., *T. E. H. Aplin 646* (PERTH). S.A.: 3 km N of Elliston, *Hj. Eichler 19448* (AD). Vic.: Altona, Port Phillip Bay, *H. I. Aston 302* (MEL). Tas.: Ralphs Bay, *F. H. Long 136* (HO).

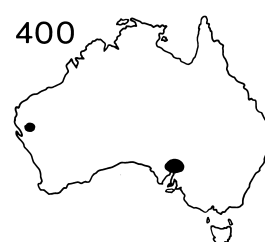
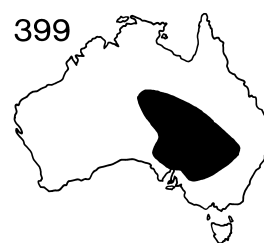
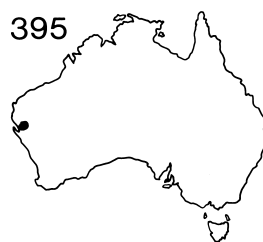
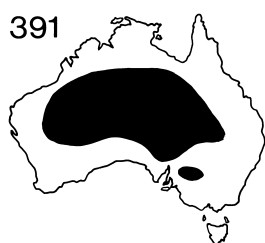
3. Sarcocornia globosa Paul G. Wilson, *Nuytsia* 3: 76 (1980).

T: One Mile Rocks Reserve, W.A., 33°12'S, 119°46'E, Nov. 1970, *A. S. George 10502*; holo: PERTH.

Illustration: P. G. Wilson, *op. cit.* 101 fig. 33F–K (1980).

Erect perennial to 20 cm high. Articles obovoid, c. 5 mm long; sclereids abundant, slender, spirally thickened. Spikes of 1 or 2 (rarely 3) spherical articles c. 6 mm diam.; cymules 3-flowered. Perianth 3-lobed; lateral lobes straight; adaxial lobe small, semicircular; abaxial lobe absent. Seed sub-circular, c. 2 mm long; testa minutely tuberculate over radicle otherwise smooth, pale brown. Fig. 49F–K.

Found in inland south-western W.A. around salt lakes. Map 408.



391. *Sclerolaena lanicuspis*

394. *Sclerolaena blackiana*

397. *Sclerolaena bicornis*
var. *bicornis*

400. *Sclerolaena bicuspis*

403. *Sclerochlamys brachyptera*

392. *Sclerolaena ventricosa*

395. *Sclerolaena stylosa*

398. *Sclerolaena bicornis*
var. *horrida*

401. *Sclerolaena clelandii*

404. *Beta vulgaris*

393. *Sclerolaena everistiana*

396. *Sclerolaena forrestiana*

399. *Sclerolaena decurrens*

402. *Stelligera endecaspinis*

405. *Sarcocornia quinqueflora*
subsp. *quinqueflora*

W.A.: Mt Caroline, 1891, *G. Sewell* (MEL); 3 km E of Meckering, *P. G. Wilson 10965* (PERTH).

26. HALOSARCIA

Halosarcia Paul G. Wilson, *Nuytsia* 3: 28 (1980), from the Greek *halos* (salt) and *sarx* (flesh), in reference to the succulent stems

Type: *H. halocnemoides* (Nees) Paul G. Wilson.

Glabrous shrubs or herbs. Branches when young with globose to cylindrical segments or articles (internodes); segments succulent, the outer portion eventually shrivelling and falling, the apex shortly cup-shaped or bilobed representing the reduced opposite leaves; sclereids absent from palisade tissue. Inflorescence a spike-like thyrse usually terminal to a branchlet, consisting of triads of flowers (cymes) in the axil of each bract (in *H. pluriflora* up to 7 flowers in a cyme). Opposite bracts united or rarely free, succulent. Flowers sessile, usually bisexual but the stamens or ovary sometimes not developed, in some variants only female. Perianth gamotepalous, initially membranous or succulent; lobes 3 (2 lateral and a medial abaxial). Stamen 1, abaxial. Ovary vertical, membranous or succulent; style slender, 2(3)-lobed. Fruiting perianth membranous, succulent, spongy, pithy, crustaceous, or corneous. Seed ovoid to circular; testa membranous to crustaceous; embryo curved; perisperm abundant, lateral.

A genus of 23 species, one of which is found around the Indian Ocean, Malaysia and Australia, the others are endemic in Australia.

P. G. Wilson, *Halosarcia*, *Nuytsia* 3: 28–69 (1980).

This account is based on the revision by P.G. Wilson, *loc. cit.*

- | | | |
|-----|--|-------------------------------------|
| 1 | Opposite bracts free from each other | |
| 2 | Flowers intimately fused to each other and to upper bract | 13. <i>H. peltata</i> |
| 2: | Flowers free | |
| 3 | Seed pale brown, tuberculate over embryo | 12. <i>H. flabelliformis</i> |
| 3: | Seed white with prominent uneven scale-like ribs | 9. <i>H. pterygosperma</i> |
| 1: | Opposite bracts united | |
| 4 | Perianth apex rounded to truncate | |
| 5 | Seed white, with prominently raised concentric scale-like ribs | |
| 6 | Spikes long and slender, even in outline; ribs smooth, only on circumference of seed | 8. <i>H. lepidosperma</i> |
| 6: | Spikes short, undulate in outline; ribs uneven, covering whole of seed | 9. <i>H. pterygosperma</i> |
| 5: | Seed brown to black, tuberculate to granular | |
| 7 | Seed dark reddish brown to black, covered with concentric rounded, striate ribs | |
| 8 | Spikes even in outline; bracts ciliolate | 7. <i>H. doleiformis</i> |
| 8: | Spikes even or undulate in outline; bracts entire | 6. <i>H. pergranulata</i> |
| 7: | Seed brown, variously tuberculate | |
| 9 | Bracts denticulate or ciliolate; cymules 3–7-flowered | |
| 10 | Cymules 3-flowered; seed concentrically tuberculate over embryo | 1. <i>H. halocnemoides</i> |
| 10: | Cymules 3–7-flowered; seed concentrically ridged over embryo | 5. <i>H. pluriflora</i> |
| 9: | Bracts entire; cymules 3-flowered | |

- 11 Perianth crustaceous in fruit; seed smooth 11. *H. leptoclada*
- 11: Perianth spongy to membranous in fruit; seed ribbed or tuberculate over embryo
- 12 Branches and spikes very slender, smooth in outline (resembling *Casuarina* branchlets); fruit apex abruptly apiculate 10. *H. lylei*
- 12: Branches undulate in outline
- 13 Fruitlets falling entire (not tearing at base to expose seed); abaxial perianth lobe external 4. *H. fontinalis*
- 13: Fruitlets tearing at base to expose seed; abaxial perianth lobe internal 1. *H. halocnemoides*
- 4: Perianth dorsiventrally flattened at apex
- 14 Margins of articles and of bracts denticulate or ciliate
- 15 Perianth in fruit pithy; pericarp horny all over; fruitlets entire (not torn at base) 23. *H. indica*
- 15: Perianth thin in fruit, membranous or cartilaginous; pericarp membranous at least towards base
- 16 Articles with broad rounded lobes; fruitlets falling entire; perianth cartilaginous 19. *H. entrichoma*
- 16: Articles with acuminate to caudate lobes; fruitlets tearing at base to expose seed; perianth thin, weak
- 17 Articles glossy, entire to crenulate on margin; perianth entire on apical margin 3. *H. nitida*
- 17: Articles dull or glossy, fimbriate on margin; perianth fimbriate on margin 2. *H. fimbriata*
- 14: Margins of articles and bracts entire
- 18 Perianth pithy in fruit; pericarp horny at least towards apex
- 18: Perianth various in fruit but not pithy
- 19 Perianth papery or soft; fruitlets free from each other
- 20 Articles shortly acuminate; testa tuberculate over embryo 21. *H. cupuliformis*
- 20: Articles truncate; testa smooth 20. *H. chartacea*
- 19: Perianth crustaceous; fruitlets free or united
- 21 Fruitlets united
- 22 Fruitlets persistent, released only on decay of perianth and bracts 22. *H. calyptrata*
- 22: Fruitlets splitting in medial line to release seed; pericarp not forming a persistent cap
- 23 Spikes terminating branches; articles barrel-shaped, glaucous 15. *H. auriculata*
- 23: Spikes becoming intercalary; articles obovoid, dull 16. *H. syncarpa*
- 21: Fruitlets free
- 24 Bracts truncate or undulate on margin, cup-shaped at fruiting stage; fruitlets muricate; spikes terminal 14. *H. pruinosa*
- 24: Bracts undulate, shrivelled at fruiting stage; spikes usually sessile
- 25 Fruitlets smooth and glossy; vegetative articles c. 7 mm long 17. *H. undulata*
- 25: Fruitlets prominently muricate; vegetative articles c. 15 mm long 18. *H. bulbosa*

1. Halosarcia halocnemoides (Nees) Paul G. Wilson, *Nuytsia* 3: 31 (1980)

Arthrocnemum halocnemoides Nees in Lehm., *Pl. Preiss.* 1: 632 (1845). T: Fremantle, W.A., Jan. 1839, *L. Preiss 1910*; iso: AD, K, MEL.

Spreading or erect shrub to 50 cm high. Articles globular to obovoid, mostly 3–5 mm long; lobes entire (denticulate in subsp. *caudata*). Spikes terminal, the articles circular or compressed; opposite bracts united, undulate to truncate. Flowers free from each other and from bracts, exposed at apex, vertical to spike axis. Perianth succulent; apex truncate to rounded; lateral lobes prominent; abaxial lobe small and within lateral lobes. Fruiting perianth either soft and becoming shrivelled on drying, or firm, chartaceous and translucent, free from bracts; pericarp thin, intimately fused to perianth. Seed discoid, ovate to circular, c. 1 mm long; testa crustaceous, reddish brown, tuberculate in concentric rows over embryo. Fruitlets eventually breaking away from axis with the seed protruding at the torn base.

A widespread, variable species with 5 subspecies.

- | | | |
|----|---|---------------------------------|
| 1 | Articles denticulate; lobes caudate | 1b. subsp. caudata |
| 1: | Articles entire; lobes rounded, obtuse, or rarely apiculate | |
| 2 | Spikes slender, to 8 cm long, even in outline; seed semicircular, smooth | 1c. subsp. longispicata |
| 2: | Spikes to 2 cm long, undulate or even in outline; seed smooth or granular | |
| 3 | Branchlets moniliform, slender; seed ovate, smooth | 1d. subsp. catenulata |
| 3: | Branchlets with articles narrowly cylindrical, barrel-shaped, or obovoid; seed suborbicular, granular | |
| 4 | Articles narrowly cylindrical to narrowly barrel-shaped; spikes slender, regular in outline | 1e. subsp. tenuis |
| 4: | Articles obovoid (often broadly so), spikes undulate in outline | 1a. subsp. halocnemoides |

1a. Halosarcia halocnemoides (Nees) Paul G. Wilson subsp. **halocnemoides**

Illustration: P. G. Wilson, *Nuytsia* 3: 87, fig. 19A–B (1980).

Articles narrowly obovoid to subglobular, 2–5 mm long, usually glossy, entire. Spikes of 2–14 articles, undulate in outline. Seed flattened, broadly ovate to suborbicular; testa tuberculate over embryo, elsewhere granular. Fig. 50C.

Found in Vic., S.A. and W.A. over a wide range of saline habitats. Map 409.

W.A.: Lake Ninan, *T. E. H. Aplin 734* (PERTH). S.A.: Port Pirie, *H. W. Andrew 23* (AD). Vic.: Lake Tyrell, *A. C. Beauglehole 55466* (PERTH).

A polymorphic subspecies containing many local variants.

1b. Halosarcia halocnemoides subsp. **caudata** Paul G. Wilson, *Nuytsia* 3: 34 (1980).

T: 9 miles (c. 14 km) S of Pingrup, W.A., 23 Nov. 1969, *K. Newbey 3075*; holo: PERTH; iso: CANB, K.

Articles barrel-shaped to obovoid, c. 3 mm long, dull, papillose; lobes caudate, denticulate. Spikes 5–10 mm long, circular in T.S. Seed broadly ovate, strongly tuberculate over embryo, otherwise smooth. Fig. 50D.

Found in the Lake Grace to Norseman area of W.A. around salt lakes. Map 410.

W.A.: Lake King, *A. S. George 9357* (PERTH); Lake Grace, *P. G. Wilson 10125* (PERTH).

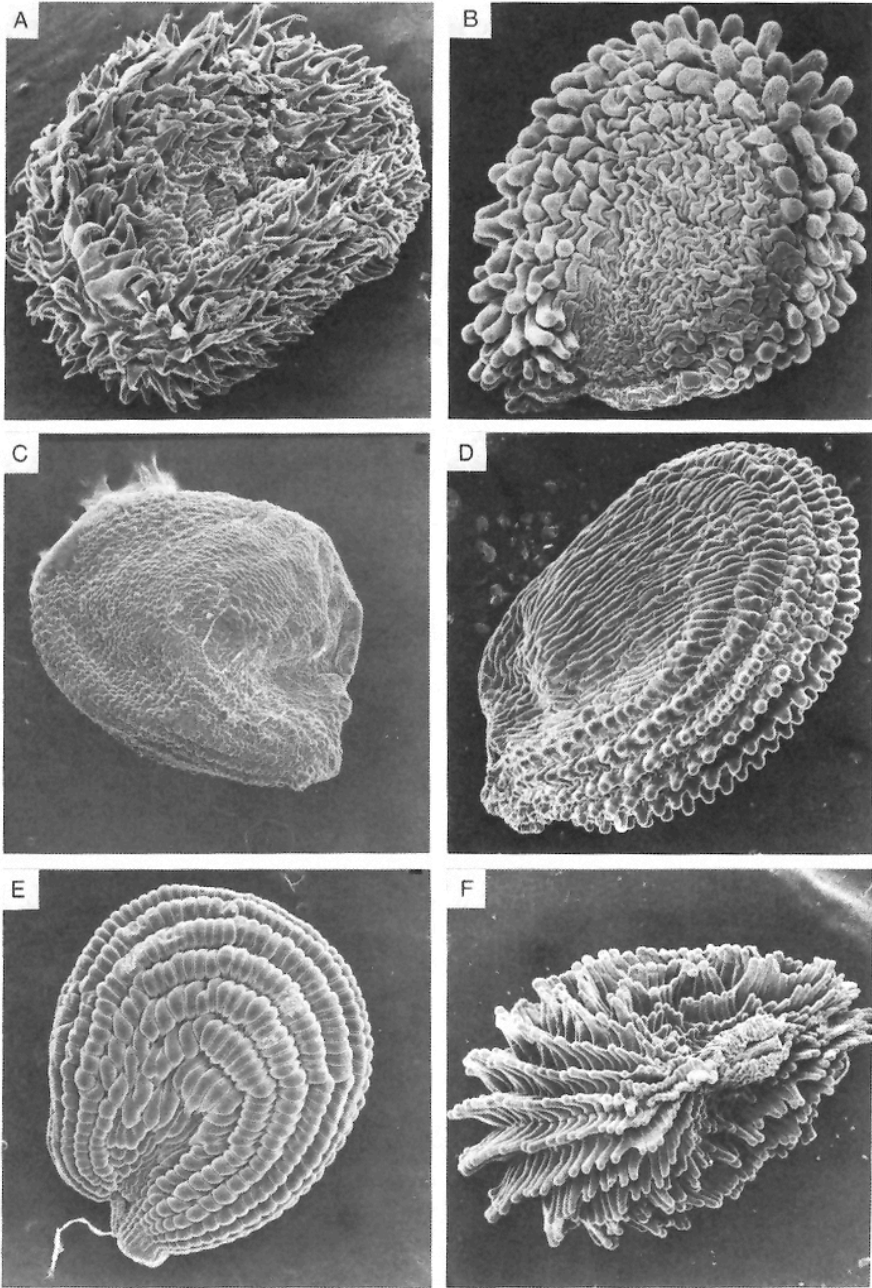


Figure 50. Seeds. **A–B**, *Sarcocornia*. **A**, *S. quinqueflora* subsp. *quinqueflora* $\times 50$ (K. Newbey 3156, PERTH). **B**, *S. blackiana* $\times 50$ (K. Newbey 4030 PERTH). **C–F**, *Halosarcia*. **C–D**, *H. halocnemoides*. **C**, subsp. *halocnemoides* $\times 45$ (P. Wilson 8698, PERTH); **D**, subsp. *caudata* $\times 60$ (P. Wilson 8650, PERTH). **E**, *H. pergranulata* subsp. *pergranulata* $\times 55$ (P. Wilson 10106, PERTH). **F**, *H. pterygosperma* subsp. *pterygosperma* $\times 45$ (N. Macfarlane 852, PERTH). Reproduced by permission from *Nuytsia* 3(1): figs 38, 40, 42, 46, 68, 70 (1980).

1c. Halosarcia halocnemoides subsp. **longispicata** Paul G. Wilson, *Nuytsia* 3: 34 (1980).

T: Finke River, N.T., 24 Aug. 1967, *B. G. Briggs* 1257; holo: NSW.

Articles barrel-shaped, c. 5 mm long, 2.5 mm diam., entire. Spikes slender, cylindrical, regular in outline, 2–8 cm long, 3 mm diam. Seed semicircular, tuberculate over embryo, otherwise smooth.

Found in central Australia in saline situations. Map 411.

N.T.: Eridunda Stn, *T. S. Henshall* 55 (NT). S.A.: Moolawatana Bore, *R. H. Kuchel* 2672 (AD). Qld: Pulchra Waterhole, *P. K. Latz* 519 (PERTH). N.S.W.: Western interior, 1880, *C. Moore* (MEL).

1d. Halosarcia halocnemoides subsp. **catenulata** Paul G. Wilson, *Nuytsia* 3: 35 (1980).

T: 6 km S of Lake Barlee Homestead, W.A., 26 Aug. 1970, *P. G. Wilson* 8849; holo: PERTH.

Illustration: *P. G. Wilson, op. cit.* 87, fig. 19C–D.

Branchlets slender; articles barrel-shaped, 2–3 mm long, 3 mm diam., glossy or glaucous, entire. Spike slender, even in outline, 5–10 mm long. Seed ovate, tuberculate over embryo, otherwise smooth.

Found in the Mt Magnet–Meekatharra area, Lake Barlee and Lake King, W.A. Map 412.

W.A.: c. 24 km SW of Nannine, *N. H. Speck* 729 (PERTH); Lake Barlee, *P. G. Wilson* 8814 (PERTH); Lake King, *P. G. Wilson* 9991 (PERTH).

At Lake King the plants are glaucous whereas the typical plants found farther north are glossy; in other respects the two variants are similar.

1e. Halosarcia halocnemoides subsp. **tenuis** Paul G. Wilson, *Nuytsia* 3: 36 (1980).

T: near aerodrome, Wyndham, W.A., 20 July 1949, *R. A. Perry* 2558; holo: CANB; iso: AD, BRI, NSW, NT, PERTH.

Illustration: *P. G. Wilson, op. cit.* 87, fig. 19E–F.

Branchlets slender; articles narrowly barrel-shaped, c. 5 mm long and 2 mm wide, dull (not glaucous) to glossy, entire. Spikes almost cylindrical, 10–25 mm long, rarely to 70 mm. Seed suborbicular, finely tuberculate over embryo, otherwise granular.

Occurs in coastal tropical Australia and central Australia, in coastal flats and around inland salt lakes. Map 413.

W.A.: Derby, *R. D. Royce* 335 (PERTH). N.T.: Tanami Desert, *A. C. Beaglehole* 50927 (PERTH). S.A.: Cootanoorina, 5 May 1891, *R. Helms* (AD). Qld: Elliott Heads, *L. S. Smith* 489 (BRI).

2. Halosarcia fimbriata Paul G. Wilson, *Nuytsia* 3: 37 (1980).

T: 5 km S of Morawa, W.A., 4 Sept. 1970, *P. G. Wilson* 9968; holo: PERTH.

Illustration: *P. G. Wilson, op. cit.* 88, fig. 20A–C.

Shrub to 1 m high with ascending branches. Articles broadly obovoid, c. 3 mm long, deeply lobed; lobes triangular, acuminate to caudate, prominently fimbriate. Spikes short, 5–10 mm long, initially terminal but usually continuing growth vegetatively; bracts deeply lobed and fimbriate, completely obscuring flowers. Flowers ascending, free. Perianth thin; apex dorsiventrally flattened and fimbriate. Ovary wall membranous. Fruitlets eventually breaking away from axis with seed protruding at torn base. Seed broadly ovate, 1 mm long; testa chartaceous, reddish brown, concentrically tuberculate over embryo, otherwise smooth.

Found in the Lake Annean to Three Springs area of W.A. on margin of salt and gypsum lakes. Map 414.

W.A.: N side of Lake Austin, *A. S. George 793* (PERTH); c. 5 km S of Three Springs, *B. R. Maslin 735* (PERTH).

3. *Halosarcia nitida* Paul G. Wilson, *Nuytsia* 3: 38 (1980).

T: SE end of Pernatty Lagoon, between L. Torrens and L. Gairdner, S.A., 23 Oct. 1966, *Hj. Eichler 18855*; holo: AD.

Shrub c. 50 cm high. Articles glossy, c. 5 mm long; margin entire to crenulate; lobes shortly acuminate. Spikes terminal; bract-pairs similar to (but slightly shorter than) vegetative articles. Flowers free, steeply ascending, dorsiventrally compressed and slightly winged towards apex. Perianth thin when dry, the apex rounded to acuminate. Pericarp ellipsoidal, papery with membranous base. Seed ovoid, 1 mm long; testa very thin, pale brown, concentrically granular over embryo, otherwise smooth. Fruitlets eventually tearing away from axis and exposing seed.

Found in north-western Vic. and central S.A. in strongly saline or gypseous soils. Map 415.

S.A.: SE corner of Lake Gairdner, *J. Pickard 2468* (NSW); S shore of Lake Frome, 18 Sept. 1972, *D. A. Webb* (CANB). Vic.: Nowingi, 30 Nov. 1949, *A. M. O'Neill* (MEL).

4. *Halosarcia fontinalis* Paul G. Wilson, *Nuytsia* 3: 39 (1980).

T: Dalhousie Springs, S.A., 24 Sept. 1974, *D. E. Symon 9302*; holo: ADW; iso: PERTH.

Illustration: P. G. Wilson, *op. cit.* 92, figs 24C–E, 66.

Shrub to 70 cm high. Branchlets slender; articles bluntly lobed, entire. Spikes terminal, slender, 30–80 mm long, c. 3–5 mm diam. Flowers free, somewhat ascending; apex rounded; lateral lobes short; abaxial lobe semicircular outside lateral lobes; perianth and ovary succulent. Fruiting perianth shrivelled, pithy, or chartaceous at apex, membranous towards base; pericarp membranous, fused to perianth. Seed ovate, c. 1 mm long; testa crustaceous, with low rounded striate ribs over embryo, otherwise smooth, dark reddish brown. Fruitlets shed entire, the seed enclosed by and adherent to pericarp.

Found in northern S.A., usually around saline springs. Map 416.

S.A.: Nilpena, 2 May 1981, *R. Helms* (AD); c. 80 km NE of William Creek, 25 Aug. 1969, *A. C. Robinson* (AD).

5. *Halosarcia pluriflora* Paul G. Wilson, *Nuytsia* 3: 39 (1980).

T: Lake Eyre, S.A., May 1951, *C. W. Bonython 1194*; holo: ADW.

Illustration: P. G. Wilson, *op. cit.* 135, fig. 67.

Shrub to 1 m high. Branchlets slender; articles acutely lobed, denticulate. Spikes terminal, slender. Flowers 3–7 in each of the opposite bracts, when over 3 the lateral ones reduced in size, free, somewhat ascending. Perianth succulent towards apex, thin at base; apex rounded; lobes 3, irregular, denticulate. Ovary thin. Fruiting perianth pithy or chartaceous; pericarp membranous, fused to perianth. Seed semicircular, c. 1 mm long, with rounded striate ribs over embryo, otherwise smooth, dark reddish brown. Mature fruitlets eventually breaking away from axis to expose seed at base.

Found in central and northern S.A. and north-eastern N.S.W., on margins of salt lakes and springs. Map 417.

S.A.: Moolawatana Bore, *R.M. Kuchel 2669* (AD); Dalhousie Springs, *D.E. Symon 9312* (ADW). N.S.W: Warroo, *K.I. Morris 4* (BRI).

6. *Halosarcia pergranulata* (J. Black) Paul G. Wilson, *Nuytsia* 3: 40 (1980)

Arthrocnemum halocnemoides var. *pergranulatum* J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 43: 359 (1919). T: Railway Bridge between Port Elliot and Victor Harbour, S.A., 12 Feb. 1919, *H.W. Andrew*; lecto: AD, *fide* P.G. Wilson, *loc. cit.*

Erect, spreading, or decumbent shrub or perennial herb to 50 cm high. Articles cylindrical to obovoid, dull or glaucous; lobes rounded, entire. Spikes terminal, to 5 cm long. Flowers free or variously fused to each other and to upper bract; abaxial surface ascending. Perianth succulent, apex curved or truncate; abaxial lobe prominent and either within or outside laterals. Ovary succulent. Fruiting perianth fleshy, spongy, or chartaceous with pithy interior; pericarp fused (and similar) to perianth. Seed broadly ovate to circular, c. 1 mm diam., testa crustaceous, with rounded striate ribs all over. Fruitlets either persistent or breaking away from axis. *Blackseed Samphire*.

There are 4 subspecies.

- 1 Flowers free from each other and from upper bract; lower perianth-lobe obvious
- 2 Spikes undulate in outline; articles somewhat compressed; lower perianth-lobe obvious **6a. subsp. pergranulata**
- 2: Spikes slender, terete; lower perianth-lobe short **6b. subsp. elongata**
- 1: Flowers \pm fused to each other and to upper bract; lower perianth lobe insignificant
- 3 Plant sprawling or decumbent; spikes slender, erect (coastal species) **6c. subsp. queenslandica**
- 3: Plant erect; spikes spreading (inland species) **6d. subsp. divaricata**

6a. Halosarcia pergranulata (J. Black) Paul G. Wilson subsp. **pergranulata**

Illustration: P.G. Wilson, *Nuytsia* 3: 90, fig. 22A–C (1980).

Erect shrub c. 50 cm high. Articles obovoid, dull or glaucous. Flowers free. Perianth with curved apex; abaxial lobe large, semicircular. Fig. 50E.

Found in southern Australia (excluding Tas.) mainly S of 25° lat., on the coast, in estuaries and swamps and on margins of salt lakes. Map 418.

W.A.: c. 38 km N of Karonie, *K.M. Allan* 292 (PERTH). S.A.: Wallaroo, *B.J. Blaylock* 382 (AD). N.S.W.: Wentworth, *T.M. Whaité* 1809 (NSW). Vic.: Nhill, *A.C. Beauglehole* 19975 (PERTH).

6b. Halosarcia pergranulata subsp. **elongata** Paul G. Wilson, *Nuytsia* 3: 43 (1980)

T: 7 miles (c. 11 km) SE of Rabbit Flat, N.T., 26 May 1970, *J.R. Maconochie* 1032; holo: PERTH; iso: CANB.

Illustration: P.G. Wilson, *op. cit.* 90, fig. 22D–E.

Erect to decumbent perennial to 25 cm high. Articles barrel-shaped, glaucous. Spikes slender, cylindrical, to 6 cm long. Flowers free. Perianth \pm truncate; lobes \pm equal, the abaxial semi-orbicular and slightly overlapping laterals.

Found in central Australia on margin of salt lakes. Map 419.

N.T.: Napperby Salt Lake, *C. Dunlop* 2352 (PERTH). S.A.: Curdimurka, *A.C. Beauglehole* 20885 (AD).

6c. Halosarcia pergranulata subsp. **queenslandica** Paul G. Wilson, *Nuytsia* 3: 44 (1980)

T: Townsville Common, Qld, 24 Feb. 1977, *P.G. Wilson s.n.*; holo: PERTH; iso: BRI, CANB, K, NSW.

Straggly often decumbent shrub to 25 cm high; branches slender. Articles barrel-shaped, dull to glaucous. Spikes erect, narrowly cylindrical, 1–3 cm long. Flowers either fused along entire length to upper bract or free at distal margin, either free or fused to each other. Perianth with lateral lobes sinuous; lower lobe not observed.

Found along the Qld coast from Burketown to Brisbane on tidal mud-flats. Map 420.

Qld: 48 km N of Burketown, *T.J. Hall* 590 (BRI); near Cooktown, *S.T. Blake* 21876 (BRI).



406. *Sarcocornia quinqueflora*
subsp. *tasmanica*

409. *Halosarcia halocnemoides*
subsp. *halocnemoides*

412. *Halosarcia halocnemoides*
subsp. *catenulata*

415. *Halosarcia nitida*

418. *Halosarcia pergranulata*
subsp. *pergranulata*

407. *Sarcocornia blackiana*

410. *Halosarcia halocnemoides*
subsp. *caudata*

413. *Halosarcia halocnemoides*
subsp. *tenuis*

416. *Halosarcia fontinalis*

419. *Halosarcia pergranulata*
subsp. *elongata*

408. *Sarcocornia globosa*

411. *Halosarcia halocnemoides*
subsp. *longispicata*

414. *Halosarcia fimbriata*

417. *Halosarcia pluriflora*

420. *Halosarcia pergranulata*
subsp. *queenslandica*

6d. Halosarcia pergranulata subsp. **divaricata** Paul G. Wilson, *Nuytsia* 3: 45 (1980)

T: Goyders Lagoon, 8 km S of Koonchera Waterhole, S.A., 14 Aug. 1975, *J. Z. Weber 4497*; holo: AD.

Erect shrub to 1 m high. Articles cylindrical to obovoid, greyish green. Spikes divaricate, usually on very short branchlets, cylindrical, 1–3 cm long. Flowers fused to each other and to upper bract; apex truncate with centre slightly raised. Perianth with prominent imbricate, lateral lobes and a very thin semicircular abaxial lobe. Fruitlets remaining attached to spike.

Found in central eastern Australia from north-western Vic. and south-western Qld to central S.A., predominantly in only moderately saline claypans. Map 421.

S.A.: Mt Dare Stn, *P. K. Latz 4780* (NT). Qld: Nockatunga, 5 Jan. 1935, *A. C. Boyle* (BRI). N.S.W.: Delalah Downs, *G. M. Cunningham 516* (NSW). Vic.: 17 km NW of Kerang, *A. C. Beaglehole 57137* (PERTH).

7. Halosarcia doleiformis Paul G. Wilson, *Nuytsia* 3: 46 (1980)

T: c. 8 km E of Mt Narryer, W.A., 2 Sept. 1970, *P. G. Wilson 9914*; holo: PERTH; iso: CANB, K, NSW.

Illustration: *P. G. Wilson, op. cit.* 90, fig. 22F–G.

Spreading shrub to 50 cm high. Articles barrel-shaped, c. 6 mm long, pithy when dry, lobes ciliolate. Spikes terminal, narrowly cylindrical, attenuate, to 15 mm long, grey and smooth with pithy texture when mature; bracts closely sheathing, ciliolate. Flowers steeply ascending, coalescent to each other; apex rounded. Perianth succulent distally; abaxial lobe prominent, semi-orbicular, ciliolate, overlapping lateral lobes. Fruiting perianth pithy; pericarp thin and soft, adherent to perianth. Seed flat, almost circular, c. 1 mm diam.; testa crustaceous, ribbed all over, very dark reddish brown.

Found in south-western W.A., in saline soil. Map 422.

W.A.: Lake Ninan, *T. E. H. Aplin 731* (PERTH); Dirk Hartog Is., *A. S. George 11609* (PERTH); 93 km N of Esperance, *P. G. Wilson 10129* (PERTH).

8. Halosarcia lepidosperma Paul G. Wilson, *Nuytsia* 3: 47 (1980)

T: Baandee townsite, W.A., 21 June 1969, *R. A. Saffrey 621b*; holo: PERTH; iso: CANB.

Illustrations: *Paul G. Wilson, op. cit.* 91, fig. 23D–F; and 113–114, figs 44–45.

Erect shrub to 1 m high. Branches slender erect. Articles obovoid to cylindrical, 5–10 mm long, entire, slightly glaucous. Spikes terminal, slender, cylindrical, to 50 mm long, 3.5–5 mm diam. Flowers almost free, slightly ascending; apex truncate and broadly oblong. Perianth succulent; abaxial lobe large and semicircular, overlapping lateral lobes; ovary membranous. Fruiting perianth not or scarcely exceeding bracts, succulent and eventually spongy, shrivelled on drying or firm and papery on outside; pericarp membranous and fused to perianth. Fruitlets eventually tearing away from axis exposing seed at base. Seed suborbicular, c. 1.5 mm long, white or pale fawn when dry; outer testa raised on the margin to form 5–7 concentric scale-like ribs with transverse corrugations. Fig. 52A.

Found in south-western W.A. and south-western S.A., in slightly saline soil. Map 423.

W.A.: 8 km W of Tammin, *K. M. Allan 1* (PERTH); c. 1.6 km N of Ongerup, *K. Newbey 3067* (PERTH). S.A.: Stenhouse Bay, *D. E. Symon 9641B* (ADW); Lake Pillie, *P. G. Wilson 2678* (AD).

9. Halosarcia pterygosperma (J. Black) Paul G. Wilson, *Nuytsia* 3: 48 (1980)

Arthrocnemum halocnemoides var. *pterygospermum* J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 60: 166 (1936). T: Mt Victor Stn, S.A., 24 May 1936, *C. M. Eardley*; holo: AD; iso: MEL.

Spreading shrub to 50 cm high. Branches slender. Articles narrowly to broadly obovoid, c. 5 mm long, dull or glaucous, entire or ciliate. Spikes terminal, to 30 mm long; bract pairs united or apparently free. Flowers free or adherent, vertical to spike axis; apex

truncate, quadrate to transversely oblong. Perianth succulent; abaxial lobe semicircular, overlapping lateral lobes, entire or denticulate. Fruiting spikes with thin shrivelled bracts between disjunct whorls of fruitlets. Fruitlets readily shed when mature with enclosed seed; perianth glossy, hollow; pericarp membranous. Seed thick, ovoid, c. 1.5 mm long, pale fawn to cream; outer testa prominently raised into corrugated scale-like ribs over whole seed or the scales developed into rows of uncinata hairs.

There are 2 subspecies.

Vegetative articles with rounded to obtuse lobes; testa raised into scale-like ribs

9a. subsp. pterygosperma

Vegetative articles with acuminate or apiculate lobes; testa with uncinata hairs

9b. subsp. denticulata

9a. *Halosarcia pterygosperma* (J. Black) Paul G. Wilson subsp. *pterygosperma*

Illustrations: P. G. Wilson, *Nuytsia* 3: 114–115, figs 46, 47 (1980).

Articles with rounded to obtuse lobes, entire to ciliolate. Spikes \pm cylindrical; fertile articles undulate. Perianth: abaxial lobe entire. Seed with scale-like ribs. Fig. 50F.

Found in western N.S.W. and Vic. west to the Shark Bay area of W.A., on margin of salt lakes. Map 424.

W.A.: Nanga Stn, *A. Devitt* 71 (PERTH). S.A.: Koonamore, *Hj. Eichler* 12433 (AD). N.S.W.: Donsandel, 10 Oct. 1974, *L. Richley* (NSW). Vic.: Cowangie, 29 Aug. 1955, *J. H. Willis* (MEL).

9b. *Halosarcia pterygosperma* subsp. *denticulata* Paul G. Wilson, *Nuytsia* 3: 49 (1980)

T: 6 miles (c. 10 km) SW of Yardie Creek Homestead, W.A., 6 Sept. 1970, *A. S. George* 10311; holo: PERTH.

Illustration: P. G. Wilson, *op. cit.* 92.

Articles with acuminate or apiculate lobes, ciliolate. Spikes ellipsoidal; opposite bracts distinct or slightly united. Perianth: abaxial lobe denticulate. Seed with the prominent ribs separating into rows of uncinata hairs which are often fused at base.

Occurs along the W coast of W.A. from Lake MacLeod to the Eighty Mile Beach, on tidal flats or margin of salt lakes. Map 425.

W.A.: c. 14 km N of Yardie Creek, *K. Allen* 454 (PERTH); Cape Keraudren, 26 June 1974, *R. E. Johnstone* (PERTH).

10. *Halosarcia lylei* (Ewart & J. White) Paul G. Wilson, *Nuytsia* 3: 49 (1980)

Salicornia lylei Ewart & J. White, *J. Roy. Soc. New South Wales* 42: 195 (1908); *Arthrocnemum lylei* (Ewart & J. White) J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 43: 359 (1919). T: Cowcoving, W.A., Sept. 1904, *M. Koch* 1051; lecto: MEL, *vide* J. M. Black, *op. cit.* 360.

Illustrations: P. G. Wilson, *op. cit.* 91, fig. 23A–C; 116–117, figs 48–49.

Erect shrub to 1 m high, frequently fastigiate. Branchlets very slender. Articles cylindrical, c. 3 mm long, dull, lobes eciliate. Spikes terminal, slender to 20 mm long, c. 4 mm diam.; bracts short with the flowers exposed. Flowers free, vertical to spike axis; apex quadrate, truncate. Perianth succulent; abaxial lobe overlapped by laterals. Fruitlets protruding from bracts; perianth firm and pithy; pericarp convex and crustaceous at apex, protruding slightly from perianth to give a mammillate appearance. Seed broadly elliptical, 1–1.5 mm long; testa crustaceous, reddish brown, concentrically granular over embryo. Fig. 52B.

Found in western Vic., south-western S.A. and south-western W.A., around salt lakes and other somewhat saline and seasonally waterlogged localities. Map 426.

W.A.: c. 3 km W of Waeel, *T. E. H. Aplin 665* (PERTH). S.A.: S of Lake Bring, *D. E. Symon 3391* (ADW). Vic.: Landrook Lake, *A. C. Beauglehole 19814* (PERTH).

11. Halosarcia leptoclada Paul G. Wilson, *Nuytsia* 3: 50 (1980)

T: Mt Sandiman Stn, W.A., Aug. 1969, *D.G. Wilcox 53*; holo: PERTH.

Open shrub c. 30 cm high. Branchlets slender. Articles dull to glaucous; lobes not ciliate. Spikes terminal, narrowly ellipsoidal, to 10 mm long; fertile articles closely imbricate with horizontal margin. Flowers obscured by bracts, ascending, at first adherent to each other but eventually free. Perianth succulent towards apex; abaxial lobe minute and within laterals. Stamen absent or, if present, sterile. Fruiting spike with bracts shrivelling and falling as plate-like rings from axis. Fruitlets free, completely enclosing seed; perianth crustaceous, areolate-muricate outside; pericarp thin. Seed ovate, c. 0.8 mm long; testa membranous, pale fawn, lineolate over embryo.

Fertile stamens have not been seen in either of the 2 subspecies.

Articles cylindrical to barrel-shaped; perianth (in flower) dorsiventrally flattened towards apex

11a. subsp. leptoclada

Articles narrowly obovoid; perianth (in flower) rounded to truncate at apex

11b. subsp. inclusa

11a. Halosarcia leptoclada Paul G. Wilson subsp. **leptoclada**

Articles narrowly cylindrical or barrel-shaped. Flowers with perianth lobes forming a beak-like ascending conical apex. Stamen sterile. Stigmas slender, exerted. Fruitlets with truncate broadly elliptic apex, the perianth lobes projecting in centre.

Found in the Gascoyne River area of W.A. Map 427.

W.A.: Wanna, *J. S. Beard 6064* (NSW); Mt Vernon, *A. Mitchell 221* (PERTH).

11b. Halosarcia leptoclada subsp. **inclusa** Paul G. Wilson, *Nuytsia* 3: 51 (1980)

T: 3 km E of Meckering, W.A., 4 Nov. 1977, *P. G. Wilson 11692*; holo: PERTH; iso: CANB, K, MEL.

Illustration: Paul. G. Wilson, *op. cit.* 93.

Articles narrowly obovoid. Perianth \pm truncate, the lateral lobes eventually prominent in fruit as a vertical beak. Style frequently remaining within perianth. Stamen absent or minute.

Found in south-western W.A., in sandy loam around salt lakes. Map 428.

W.A.: 324 km N of Westonia, *K. M. Allan* (PERTH); 8 km W of Pingaring, *A. S. George 9361* (PERTH).

12. Halosarcia flabelliformis Paul G. Wilson, *Nuytsia* 3: 52 (1980)

T: Webb Beach, S.A., 30 Jan. 1977, *R. J. Chinnock 3368*; holo: AD; iso: K, MEL, NSW, NY, PERTH.

Illustrations: P. G. Wilson, *op. cit.* 92, fig. 24F-H; 118-119, figs 50-51.

Woody perennial to 20 cm high. Branches ascending. Articles narrowly obovoid to barrel-shaped, c. 5 mm long and 2.5 mm wide, dull to glossy; lobes almost truncate, entire. Spikes terminal, cylindrical, 20-40 mm long; opposite bracts free from each other. Flowers vertical to axis, free. Perianth succulent; apex truncate; lateral lobes prominent; abaxial lobe very small, overlapped by laterals. Fruiting spike eventually disarticulating into separate axis, bracts, perianth halves, and pericarps with enclosed seed; perianth translucent; pericarp membranous. Seed broadly elliptic, flat, c. 1.8 mm long; testa thin, translucent, with several rows of small tubercles over embryo. Fig. 52C.

Found in southern S.A. on coast near Adelaide and on Flinders Island, also in north-western Vic. on salt-pans. Map 429.

S.A.: Port Parham, *R. J. Chinnock 2984* (AD); Flinders Island, 8 Jan. 1924, *T. G. B. Osborn* (AD, NSW). Vic.: Raak Plains, *J. H. Browne 29* (PERTH).

13. *Halosarcia peltata* Paul G. Wilson, *Nuytsia* 3: 53 (1980)

T: 5.5 km S of Morawa, W.A., 4 Sept. 1970, *P. G. Wilson 9969*; holo: PERTH; iso: CANB, K, MEL, NSW.

Shrub to 1 m high. Articles obovoid, 3–5 mm long, dull; lobes frequently apiculate, entire. Spikes terminal, broadly cylindrical, 5–10 mm long with rounded apex; opposite bracts free from each other or almost so, sub-orbicular on outer surface. Flowers vertical to axis, fused to each other and to upper bract. Perianth succulent; apex truncate; lateral lobes large, protruding from spike, overlapping the small hemispherical abaxial lobe. Fruiting perianth fleshy (pithy when dry) with prominently exerted lateral lobes; pericarp thin pithy, compressed, fused to perianth. Seed ovate, c. 1.3 mm long; testa thin, smooth, pale brown.

Found in southern W.A. from Shark Bay S to Northam and E to Kalgoorlie, on margin of salt lakes. Map 430.

W.A.: Lake Annean, Aug. 1971, *H. G. Baker* (PERTH); 16 km S of Widgiemooltha, *R. A. Saffrey 1576* (PERTH).

14. *Halosarcia pruinosa* (Paulsen) Paul G. Wilson, *Nuytsia* 3: 54 (1980)

Arthrocnemum pruinosum Paulsen, *Dansk Bot. Ark.* 2(8): 63 (1918). T: Carnarvon, W.A., 31 Oct. 1914, *C. H. Ostenfeld 349*; iso: K.

Illustrations: P. G. Wilson, *op. cit.* 95, fig. 27D–F; 121, fig. 53.

Shrub to 1 m high. Articles obovoid, 3–8 mm long, often pruinose; lobes rounded, entire. Spikes terminal, occasionally continuing growth vegetatively, narrowly cylindrical, 1.5–3.5 cm long, rarely to 10 cm, 3–5 mm diam., bracts shortly barrel-shaped, closely overlapping and obscuring flowers. Flowers free with age, steeply ascending; apex dorsiventrally compressed, acute. Perianth thin but fleshy; lateral lobes large, conduplicate; abaxial lobe small, included. Fruiting bracts spongy, retaining shape. Fruitlets totally enclosed, free; perianth brittle, areolate, muricate outside; pericarp free, thinly crustaceous towards apex, membranous towards base or absent. Seed ovoid, c. 1 mm long; testa membranous, with faint concentric granulation over embryo, pale brown. Perianth eventually splitting in medial sagittal plane to release seed.

Found in southern half of W.A., south-western N.T., S.A. and north-western Vic., in moderately saline soil both on coast and inland. Map 431.

W.A.: Lake Throssell, *A. S. George 2994* (PERTH). N.T.: Lake Neale, *P. K. Latz 4256* (PERTH). S.A.: St. Francis Is., *N. M. Wace 103* (AD). Vic.: Lake Wakpool, *N. MacFarlane 851* (PERTH).

15. *Halosarcia auriculata* Paul G. Wilson, *Nuytsia* 3: 55 (1980)

T: 13 km N of Sandfire Roadhouse, between Port Hedland and Broome, W.A., 30 July 1973, *R. A. Saffrey 1707*; holo: PERTH.

Illustrations: P. G. Wilson, *op. cit.* 95, fig. 27A–C; 122–123, figs 54–55.

Spreading shrub to 50 cm high. Articles barrel-shaped, glaucous; margin \pm truncate, entire. Spikes terminal, constricted between articles, 1–2 cm long, c. 4 mm diam.; bracts firm, somewhat swollen, corky when mature. Flowers completely obscured, steeply ascending, coalescent to each other and to upper bract. Perianth at first succulent, steeply ascending, strongly dorsiventrally flattened at apex; lateral lobes on abaxial face, small and auriculate; abaxial lobe large, rounded. Fruitlets obscured, fused to each other; perianth crustaceous, readily splitting in medial sagittal plane; pericarp free, laterally compressed, crustaceous at apex, membranous towards base. Seed ovate, 1 mm long, adherent to pericarp; testa thin, concentrically granular over embryo, pale brown. Fig. 52D.

Found in north-western W.A. in saline situations. Map 432.

W.A.: 21 km E of Broome, *M. Lazarides 6578* (PERTH); 3 km NW of Well 24, Canning Stock Route, *B. R. Maslin 2252* (PERTH).

16. Halosarcia syncarpa Paul G. Wilson, *Nuytsia* 3: 56 (1980)

T: Lake Grace, W.A., 7 May 1969, *P. G. Wilson 8277*; holo: PERTH; iso: CANB, K, NSW.

Illustration: P. G. Wilson, *op. cit.* 97, fig. 29E–G.

Decumbent to erect shrub 0.2–1 m high. Articles broadly obovoid, c. 5 mm long, glossy or dull, bluntly to acutely lobed, apiculate; margin entire or denticulate. Spikes sessile, or terminal on lateral branchlets, continuing growth vegetatively; articles 1 to 10, similar at anthesis to vegetative articles. Flowers coalescent, almost completely obscured by bracts. Perianth with thick lateral walls; apex strongly dorsiventrally flattened; lateral lobes large, conduplicate and imbricate; abaxial lobe minute. Fruiting spike continuing growth vegetatively. Fruitlets fused laterally to each other; perianth with leathery or crustaceous lateral walls, pericarp free from perianth, spongy to crustaceous. Seed ovoid, c. 1.2 mm long, testa membranous, pale brown, concentrically granular over embryo. Seed released enclosed in pericarp through the longitudinal splitting of perianth.

Found from southern W.A. to western Vic., either coastal or on margin of salt lakes. Map 433.

W.A.: c. 14 km S of Pingrup, *K. Newbey 3074* (PERTH). S.A.: Lower end of Coorong, *D. E. Symon 10484* (ADW). Vic.: Dimboola, *Reader 20* (MEL).

A very variable taxon which may be found to consist of several species.

17. Halosarcia undulata Paul G. Wilson, *Nuytsia* 3: 58 (1980)

T: 1 km W of Meckering, W.A., 23 Nov. 1967, *P. G. Wilson 6404*; holo: PERTH; iso: CANB, K.

Illustrations: P. G. Wilson, *op. cit.* 97, fig. 29A–D; 124, fig. 56.

Shrub to 50 cm high. Articles broadly barrel-shaped, c. 7 mm long, dull to glaucous; lobes rounded, rarely acuminate, entire. Spikes terminal or sessile and axillary, conical to cylindrical, 10–35 mm long, 3–5 mm diam., rarely to 9 mm, outline undulate; bract pairs short, closely imbricate, convex, margin undulate; entire. Flowers totally enclosed, ± free, steeply ascending, strongly dorsiventrally flattened at apex. Perianth fleshy but soon becoming brittle; lateral lobes large, conduplicate and intricate. Fruitlets free, dorsiventrally flattened; perianth thin, usually crustaceous, glossy; pericarp membranous or crustaceous apex, absent towards base. Seed ovoid, c. 1 mm long; testa thin, pale brown. Bract pairs eventually deciduous, the fruitlets falling entire.

Found in southern half of W.A. and northern S.A., in saline or gypseous soil. Map 434.

W.A.: W of Watheroo, *T. E. M. Aplin 1332* (PERTH); near Southern Cross, *W. E. Blackall 924* (PERTH). S.A.: Dalhousie Springs, *P. K. Latz 4795* (NT).

A variant is found between Cue and Lake Barlee in W.A. with broadly ellipsoidal, usually black, pedunculate spikes and carbonaceous pericarps; it rarely sets seed. It is uncertain whether this plant represents a hybrid or a distinct species.

18. Halosarcia bulbosa Paul G. Wilson, *Nuytsia* 3: 59 (1980)

T: 10 km E of Morawa, W.A., 29 Apr. 1979, *P. G. Wilson 11702*; holo: PERTH; iso: CANB, K.

Illustration: P. G. Wilson, *op. cit.* 98, fig. 30.

Sprawling shrub c. 1 m high, 2–3 m diam. Articles barrel-shaped, c. 15 mm long and 12 mm wide, truncate with a narrow scarious entire rim, pruinose. Spikes subsessile, fusiform, 15–20 mm long, often continuing growth vegetatively; bract pairs closely imbricate, undulate. Flowers completely enclosed, somewhat coalescent, ascending, dorsiventrally flattened towards apex. Perianth deeply divided into two imbricate lateral lobes; abaxial lobe minute. Fruiting spike persistent, dark brown. Fruitlets free; perianth crustaceous, black, deeply areolate towards base; pericarp thinly crustaceous at apex,

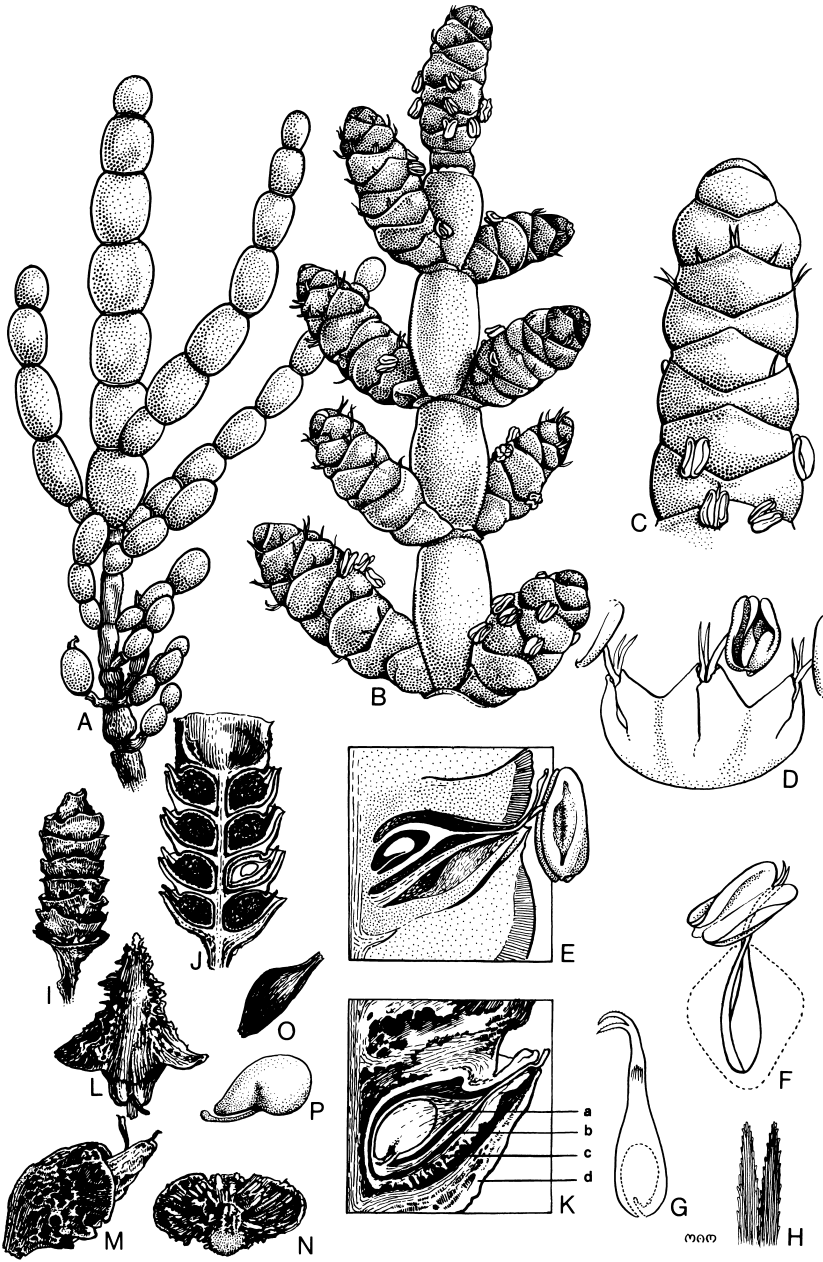


Figure 51. *Halosarcia bulbosa*. **A**, vegetative branch $\times 0.6$; **B**, flowering branch $\times 2$; **C**, spike $\times 5$; **D**, triad $\times 7.5$; **E**, L.S. flower $\times 10$; **F**, stamen and ovary $\times 10$; **G**, ovary $\times 10$; **H**, stigmas $\times 75$ (**A–H**, near Morawa, W.A., H. Demarz, PERTH). **I**, fruiting spike $\times 1.5$; **J**, L.S. fruiting spike $\times 3$; **K–N**, fruitlet $\times 7.5$; **K**, L.S. (**a**, pericarp; **b**, staminal filament; **c**, perianth; **d**, lower bract) $\times 10$; **L**, from above $\times 7.5$; **M**, from side $\times 7.5$; **N**, apex $\times 7.5$; **O**, utricle $\times 7.5$; **P**, seed $\times 7.5$ (**I–P**, P. Wilson 11702, PERTH). Reproduced by permission from *Nuytsia* 3(1): fig. 30 (1980).

membranous towards base. Seed ovoid, c. 1.3 mm long; testa membranous, pale brown. Fig. 51

Only known from an area between Morawa and the Koolanooka Hills, W.A., in slightly saline loam. Map 435.

W.A.: N end of Koolanooka Hills, *R.J. Hnatiuk 800040* (PERTH).

19. Halosarcia entrichoma Paul G. Wilson, *Nuytsia* 3: 60 (1980)

T: Frank Hann National Park, 79.2 km E of Lake King township, W.A., 15 Oct. 1978, *D. Monk 482*; holo: PERTH; iso: CANB, K, MEL, NSW.

Illustration: P. G. Wilson, *op. cit.* 99, fig. 31A–D.

Dwarf decumbent shrub. Articles broadly obovoid, c. 10 mm long, 5 mm broad, dull to glaucous; lobes rounded; margin ciliolate. Spikes terminal, ovoid, c. 20 mm long; bract pairs deeply undulate, swollen, ciliolate. Flowers obscured, ascending. Perianth laterally compressed, thinly coriaceous; apex dorsiventrally flattened; lateral lobes imbricate, denticulate; abaxial lobe small, semicircular. Fruitlets free; perianth cartilaginous; pericarp crustaceous at apex, membranous towards base. Seed ellipsoidal, laterally compressed, c. 2 mm long; testa membranous, smooth, pale fawn.

Only known from an area E of Lake King township, W.A. where it grows on the margins of slightly brackish lakes (fresh in winter) in clay soil. Map 436.

W.A.: Frank Hann National Park, *D. N. Butcher 336* (PERTH).

20. Halosarcia chartacea Paul G. Wilson, *Nuytsia* 3: 61 (1980)

T: 5 km S of Warren Bore, c. 115 km ENE of Bandy Homestead, W.A., 28 Aug. 1968, *P. G. Wilson 7446*; holo: PERTH; iso: AD, NSW.

Illustrations: P. G. Wilson, *op. cit.* 88, fig. 20D–F; 125, fig. 57.

Erect shrub to 1 m high. Articles narrowly obovoid, c. 10 mm long; margin truncate, entire. Spikes terminal on short lateral branchlets, cylindrical, 20–40 mm long, 4–6 mm diam.; bract pairs closely imbricate, truncate, margin entire. Flowers obscured, steeply ascending, at first adherent; perianth thin, not succulent, dorsiventrally flattened at apex; lateral lobes large, conduplicate. Fruitlets free, urceolate, c. 4 mm long; perianth chartaceous, completely enclosing seed; pericarp diaphanous. Seed broadly ellipsoidal; testa membranous.

Found in central W.A. on very slightly saline clay pans. Map 437.

W.A.: Lake Yindarlgooda, *J. Elkington 628* (PERTH).

21. Halosarcia cupuliformis Paul G. Wilson, *Nuytsia* 3: 61 (1980)

T: Pulchra Waterhole, 30 miles (48 km) WNW of Sandringham Stn, Qld, 21 Jan. 1970, *P. K. Latz 518*; holo: PERTH; iso: CANB, NT.

Illustration: P. G. Wilson, *op. cit.* 100, fig. 32.

Small shrub c. 25 cm high. Branches slender. Articles narrowly cylindrical, c. 10 mm long; lobes rounded, shortly acuminate, entire. Spikes terminal, narrowly cylindrical, to 80 mm long, 4 mm diam. Bract pairs cupuliform, loosely imbricate when dry; lobes obtuse and shortly acuminate. Flowers obscured, adherent to each other and to upper bract, steeply ascending; perianth succulent, divided on abaxial surface into lateral halves, apex dorsiventrally compressed. Fruitlets eventually free; perianth weakly pithy, separating into lateral halves; pericarp membranous. Seed ovate, c. 1.2 mm long; testa membranous, minutely tuberculate over embryo, pale brown.

Found in south-western Qld and north-eastern S.A., in white clay soil. Map 438.

S.A.: Eyre Creek, 1889, *A. Henry* (MEL).



421. *Halosarcia pergranulata*
subsp. *divaricata*
424. *Halosarcia pterygosperma*
subsp. *pterygosperma*
427. *Halosarcia leptoclada*
subsp. *leptoclada*
430. *Halosarcia peltata*
433. *Halosarcia syncarpa*

422. *Halosarcia doleiformis*
425. *Halosarcia pterygosperma*
subsp. *denticulata*
428. *Halosarcia leptoclada*
subsp. *inclusa*
431. *Halosarcia pruinosa*
434. *Halosarcia undulata*

423. *Halosarcia lepidosperma*
426. *Halosarcia lylei*
429. *Halosarcia flabelliformis*
432. *Halosarcia auriculata*
435. *Halosarcia bulbosa*

22. Halosarcia calpytrata Paul G. Wilson, *Nuytsia* 3: 62 (1980)

T: 18 km S of Wiluna, W.A., 28 Aug. 1970, *P. G. Wilson* 8939; holo: PERTH; iso: CANB, K.

Illustrations: *P. G. Wilson, op. cit.* 93, fig. 25A–C; 126–127, figs 58–59.

Divaricately-branched shrub to 1 m high. Branches slender. Articles barrel-shaped to obovoid, c. 6 mm long, 3 mm diam., dull to glaucous; lobes rounded, entire. Spikes terminal (sometimes continuing growth vegetatively) or sessile and axillary, narrowly cylindrical, 10–20 mm long rarely to 40 mm; axis thick and woody. Bract-pairs shortly barrel-shaped, c. 3 mm high, truncate. Flowers obscured, fused to each other; perianth vertical to axis, succulent, dorsiventrally compressed towards apex, splitting at anthesis into lateral halves. Fruiting spike persistent; bracts and perianth crustaceous; pericarp thick and crustaceous at apex forming a cap to seed, membranous towards base; style base hard and persistent. Seed ovoid, 1 mm long; testa thin, pale brown.

Found in southern N.T. and north-central W.A., on margins of salt lakes or slightly saline clay pans. Map 439.

W.A.: Jigalong, *R. D. Royce* 1557 (PERTH). N.T.: Lake Amadeus, *T. S. Henshall* 748 (NT).

23. Halosarcia indica (Willd.) Paul G. Wilson, *Nuytsia* 3: 63 (1980)

Salicornia indica Willd., *Ges. Naturf. Freunde Berlin Neue Schriften* 2: 111 (1799); *Arthrocnemum indicum* (Willd.) Moq., *Chenop. Monogr. Enum.* 113 (1840). T: Tranquebar, India, 1797, *J. G. Klein*; holo: B.

Decumbent perennial to stout erect shrub. Articles cylindrical to obovoid, often glaucous, entire or ciliolate. Spikes terminal, smooth, cylindrical and up to 4 cm long or ovoid and up to 2 cm long. Bract-pairs truncate or deeply lobed, entire or ciliolate. Flowers coalescent or free, enclosed or with apex exposed, ascending; apex rounded or obtuse. Perianth thin or fleshy; lateral lobes large; abaxial lobe within laterals, minute or equal to them in size. Fruiting spike leathery, corky or spongy, breaking up when mature; bracts and perianth frequently swelling when wet. Fruitlets laterally compressed; perianth soft, spongy; pericarp hard, horny, adherent to perianth, eventually splitting in radial plane. Seed ovate to circular; testa membranous, very pale brown.

Widespread in mainland Australia, also as a coastal species in Malaysia and in countries bordering the Indian Ocean.

Halosarcia indica differs markedly in its anatomy from all other members of the *Salicornieae* in having only a single layer of palisade cells within which is a layer of thick-walled chlorenchymous cells that frequently become lignified.

A very variable taxon which is considered by some authors to consist of several species, partly because, except for Australia, each country contains only one of the variants; in Australia all variants occur and intergrade with each other.

The following subspecies represent the more obvious of the numerous variants.

- | | | |
|----|--|--------------------------------|
| 1 | Pericarp horny all over; testa smooth and glossy; fruitlets ± obscured | |
| 2 | Plant decumbent or prostrate; articles ± corky with age, truncate, eciliate | 23a. subsp. indica |
| 2: | Plants ± erect; articles often lobed, ± ciliolate, cortical tissue shrivelling with age | |
| 3 | Spike cylindrical or ellipsoidal; lowest ring of bracts small; vegetative articles truncate or shallowly lobed | 23b. subsp. leiostachya |
| 3: | Spike ovoid; lowest ring of bracts large and deeply lobed; vegetative articles deeply lobed | 23c. subsp. bidens |
| 1: | Pericarp crustaceous at apex, membranous below; testa faintly reticulate, dull; fruitlets not obscured by bracts | 23d. subsp. julacea |

23a. *Halosarcia indica* (Willd.) Paul G. Wilson subsp. *indica*

Illustration: P. G. Wilson, *Nuytsia* 3: 129, fig. 61 (1980).

Decumbent perennial. Articles cylindrical to barrel-shaped, becoming corky with age. Spikes cylindrical, to 2 cm long; bracts closely overlapping, eciliate, the lowest pair \pm equal to or smaller than those above it. Fruitlets: perianth spongy; pericarp hard, horny all over. Seed ovate; testa smooth, glossy.

Found on the N coast of Australia and around the tropical coasts of the Indian Ocean, on tidal mud flats. Map 440.

N.T.: near mouth of Roper R., *N. Byrnes 1616* (NT); Bing Bong Stn, *E. Paine* (NT 8513). Qld: Curtis Is., 21 Apr. 1962, *W. Macrae* (BRI); Karumba, *G. W. Trapnell 197* (BRI).

This subspecies appear to occur only as a female plant both in Australia, India and Africa.

23b. *Halosarcia indica* subsp. *leiostachya* (Benth.) Paul G. Wilson, *Nuytsia* 3: 66 (1980)

Salicornia leiostachya Benth., *Fl. Austral.* 5: 203 (1870); *Arthrocnemum leiostachyum* (Benth.) Paulsen, *Dansk Bot. Ark.* 2(8): 61 (1918). T: Kyejeron Creek, S.A. 1862, *J. P. Murray*; lecto: K, *fide* Paul G. Wilson, *loc. cit.*

Arthrocnemum benthamii Paulsen, *op. cit.* 62. T: Port Samson (Cossack), W.A., 3 Nov. 1914, *C. H. Ostenfeld 1143*; isolecto: NSW, *fide* P. G. Wilson, *loc. cit.*

Arthrocnemum brachystachyum Paulsen, *op. cit.* 64. T: Carnarvon, W.A., 31 Oct. 1914, *C. H. Ostenfeld 352*; iso: K, MEL, NSW.

Small decumbent to erect shrub. Articles cylindrical to obovoid, to 10 mm long, slightly lobed, ciliolate. Spikes ellipsoidal to cylindrical, 5–40 mm long, smooth in outline, the lowest bract-pair not exceeding those above it. Fruiting spikes leathery to corky; perianth spongy; pericarp horny all over. Seed ovate; testa smooth and glossy. *Samphire*.

Widespread in mainland Australia, along the coast and around inland salt lakes; also found in Malaysia. Map 441.

W.A.: Lake MacLeod, *A. S. George 10192* (PERTH). N.T.: Wessel Is., *P. K. Latz 3503* (CANB). S.A.: Lake Eyre North, *G. C. Cornwall 5* (AD). Qld: Waroo, *K. I. Morris 5* (BRI). Vic.: 25 km NW of Kerang, *A. C. Beaglehole 55720* (PERTH).

The Malaysian plant (which was named *Arthrocnemum ciliolatum*) has slender branches and slender evenly cylindrical spikes; it assumes a brown colour on drying. An almost identical plant is found on the N coast of Australia and here intergrades with the typical variant of subsp. *leiostachya*.

23c. *Halosarcia indica* subsp. *bidens* (Nees) Paul G. Wilson, *Nuytsia* 3: 67 (1980)

Arthrocnemum bidens Nees in Lehm., *Pl. Preiss.* 1: 632 (1845); *Salicornia bidens* (Nees) Benth., *Fl. Austral.* 5: 204 (1870). T: Swan River, W.A., Sept. 1839, *L. Preiss 1261*; iso: K, MEL.

Illustration: P. G. Wilson, *op. cit.* 99, fig. 31E–F.

Robust shrub to 2 m high. Articles thick, obovoid, 5–10 mm long; lobes prominent, keeled towards apex, usually ciliolate. Spikes ovoid, grey with age, the lowest bract-pair larger and more deeply lobed than those above. Fruitlets: perianth spongy; pericarp hard, horny all over. Seed ovate; testa smooth and glossy.

Found in north-western Vic., southern S.A. and southern W.A., in moderately saline areas both coastal and inland. Map 442.

W.A.: Wyola, *T. E. H. Aplin 694* (PERTH). N.T.: c. 9 km S of Mt Wedge Homestead, *D. J. Nelson 103* (AD, NSW, NT). S.A.: Goolwa Barrage, *Hj. Eichler 17122* (AD). Vic.: 16 km NNW of Underbool, *A. C. Beaglehole 40385* (PERTH).

23d. Halosarcia indica subsp. **julacea** Paul G. Wilson, *Nuytsia* 3: 69 (1980)

T: near Derby, W.A., July 1975, V. Semeniuk 174005; holo: PERTH; iso: CANB, K.

Illustrations: P. G. Wilson, *op. cit.* 130–131, figs 62–63.

Decumbent perennial. Articles narrowly cylindrical, 4–10 mm long, bluntly lobed, eciliate. Spikes cylindrical, 2–5 cm long, 4–5 mm diam., bract-pairs truncate, entire. Fruiting spike with swollen articles and bulging fruitlets; perianth firm and pithy, separating into lateral halves; pericarp crustaceous at apex, membranous toward base. Seed sub-circular, c. 1.5 mm diam.; testa irregularly wrinkled, faintly reticulate, straw-coloured.

Found in coastal tropical Australia on tidal mud flats. Map 443.

W.A.: Wyndham, A. C. *Beauglehole* 47043 (PERTH). N.T.: Melville Is., G. Stocker 677 (NT). Qld: St Lawrence, W. Macnae (BRI).

27. TEGICORNIA

Tegicornia Paul G. Wilson, *Nuytsia* 3: 25 (1980), from the Greek *teges* (a mat) and *cornia*, alluding to its relationship with *Salicornia*.

Type: *T. uniflora* Paul G. Wilson

Glabrous herbaceous perennials, dioecious. Branches appearing jointed with the opposite leaves enveloping the stem in a succulent, sheath; sclereids absent from palisade tissue. Leaf blades small. Flowers solitary, sessile, in axil of stem leaves. Perianth succulent, free from leaf, united to near summit; orifice apical, 3-lobed. Male flower: stamen 1, abaxial; pistillode minute. Female flower: staminode apparently absent; ovary erect; stigmas 2, narrowly lanceolate, papillose. Seed vertical; testa crustaceous; embryo curved; perisperm copious, lateral.

A monotypic genus endemic in W.A.

P.G. Wilson, *Tegicornia*, *Nuytsia* 3: 25–28 (1980).

This account is based on the revision by P.G. Wilson, *loc. cit.*

Tegicornia uniflora Paul G. Wilson, *Nuytsia* 3: 25 (1980)

T: between Stirling Range and Porongurup Range, W.A., 30 Oct. 1975, P.G. Wilson 11626 (♀); holo: PERTH; iso: AD, BRI, CANB, K, MEL, NSW.

Illustrations: P.G. Wilson, *op. cit.* 26, fig. 7; 84–85, figs 16–17; 104–105, figs 36–37.

Prostrate perennial herb. Articles when young narrowly obovoid, to 15 mm long, glossy; lobes rounded, entire. Perianth dorsiventrally compressed, oblong (male) or broadly obovate (female), c. 3 mm high, succulent in the lateral wing-like margins. Fruiting perianth patelliform (circular in face view) with succulent margins, c. 3 mm high; pericarp succulent, fused to perianth. Seed vertical, usually radially orientated, broadly ovate, c. 2 mm long; testa crustaceous, prominently ribbed over embryo, reddish brown. Fig. 52E.

Found in inland southern W.A. in somewhat saline loam subject to periodic inundation. Map 444.

W.A.: 40 km NE of Ongerup, K. Newbey 4014 (PERTH); Chillinup Road S of Stirling Range, Oct. 1975, N.G. Marchant (PERTH).

There is a considerable population of a plant near Truslove, 60 km N of Esperance, W.A., with a similar habit and general appearance to *T. uniflora* but with somewhat deformed and variable flowers. Its floral morphology is intermediate between *Tegicornia* and *Halosarcia*; most of the seeds abort before reaching maturity. This plant appears to be a stable hybrid involving the two genera.

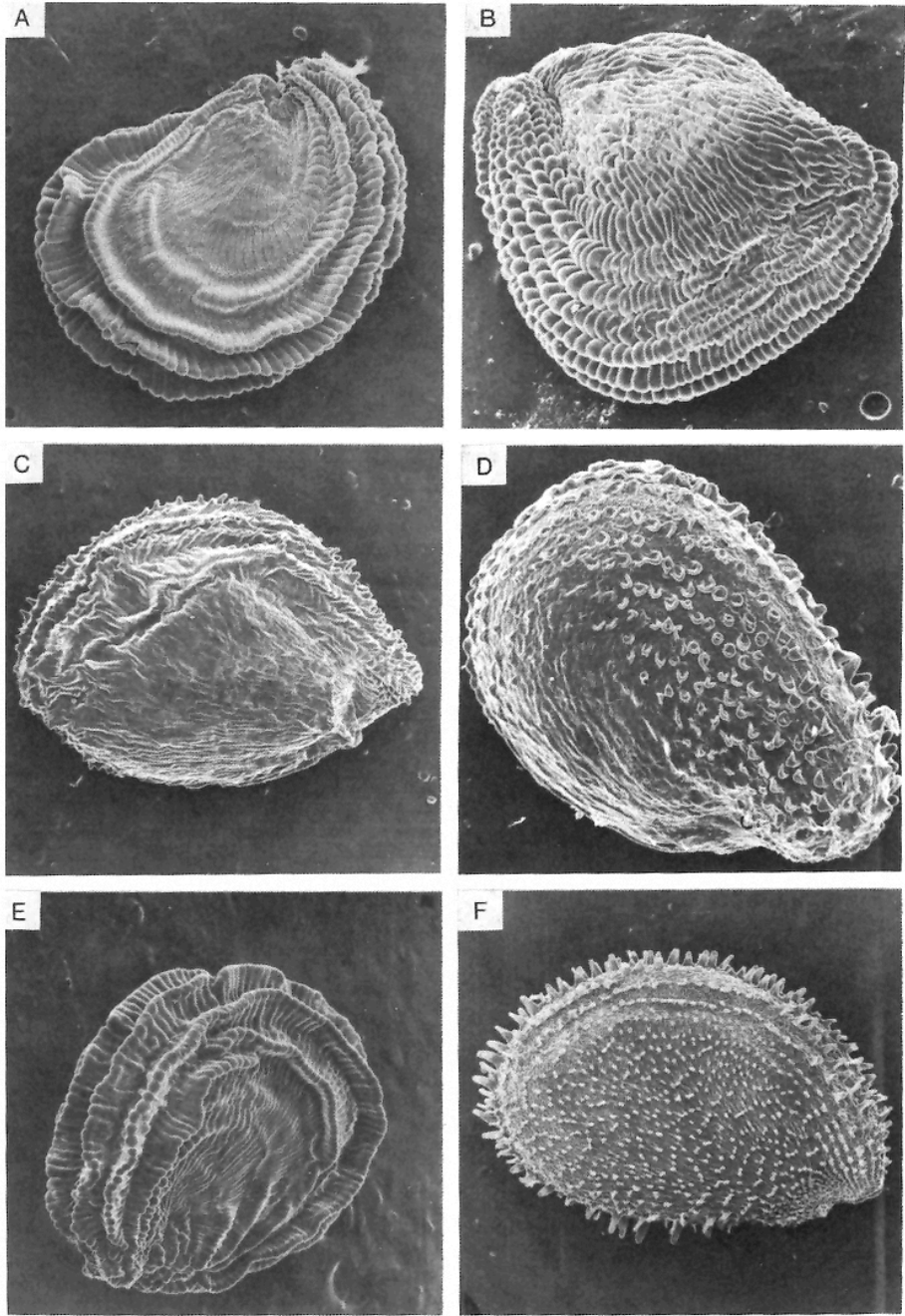


Figure 52. Seeds. **A–D**, *Halosarcia*. **A**, *H. lepidosperma* $\times 45$ (R. Saffrey 6216, PERTH). **B**, *H. lylei* $\times 60$ (A. George 8650, PERTH). **C**, *H. flabelliformis* $\times 37$ (R. Chinnock 2985, PERTH). **D**, *H. auriculata* $\times 55$ (A. Beaglehole 48279, PERTH). **E**, *Tegicornia uniflora* $\times 35$ (A. George 14238, PERTH). **F**, *Tecticornia australasica* $\times 35$ (C. Kalkman BW 6226). Reproduced by permission from *Nuytsia* 3(1): figs 36, 44, 48, 50, 54, 64 (1980).

28. TECTICORNIA

Tecticornia J. D. Hook. in Benth. & J. D. Hook., *Gen. Pl.* 3: 65 (1880); from the Greek *stegon* (covering) and the Latin *cornu* (horn), referring to the bracts which conceal the flowers.

Type: *T. cinerea* (F. Muell.) Baillon.

Glabrous annual or short-lived perennial plants, appearing leafless. Branches of cylindrical segments of articles (internodes); segments succulent, the apex very shortly bilobed, the lobes representing the reduced opposite leaves; sclereids absent. Inflorescence a terminal or lateral spike-like thyse consisting of 3–5 flowers in the axils of opposite and decussate free or almost free bracts. Flowers sessile bisexual, vertical to spike axis and concealed within bracts. Perianth succulent, of 2 laterally placed plano-convex tepals. Stamen 1, abaxial. Ovary thin-walled; style slender, 2-lobed. Fruiting perianth; tepals free, areolate and hyaline when dry; pericarp membranous. Seed bluntly ellipsoidal to lenticular; testa coriaceous; embryo curved, on adaxial side of seed; perisperm abundant, lateral. Seed dispersed on the disintegration of spike, perianth, and pericarp.

Three species of which one is found in Malesia and northern Australia and two are endemic in Australia.

P. G. Wilson, A taxonomic revision of the genus *Tecticornia* (Chenopodiaceae), *Nuytsia* 1: 277–288 (1972).

This account is based on the revision by P. G. Wilson, *loc. cit.*

- | | | |
|----|--|----------------------------------|
| 1 | Spikes predominantly terminal; seed ovate with flat sides, shortly aculeate along upper margin | 1. <i>T. australasica</i> |
| 1: | Spikes lateral, or both terminal and lateral; seed neither flat nor aculeate | |
| 2 | Spikes lateral, sessile; seed ± plano-convex, verrulose | 2. <i>T. verrucosa</i> |
| 2: | Spikes terminal and lateral (not sessile); seed ovoid, smooth | 3. <i>T. arborea</i> |

1. *Tecticornia australasica* (Moq.) Paul G. Wilson, *Nuytsia* 1: 280 (1972)

Halocnemum australasicum Moq., *Chenop. Monogr. Enum.* 110 (1840); *Arthrocnemum australasicum* (Moq.) Moss in Moss & Adamson, *J. S. African Bot.* 20: 19 (1954); *Salicornia australasica* (Moq.) H. Eichler, *Taxon* 12: 296 (1963). T: New Holland, *collector unknown*; holo: P.

Halocnemum cinereum F. Muell., *Fragm.* 1: 140 (1859); *Salicornia cinerea* (F. Muell.) F. Muell. *Fragm.* 6: 251, 271 (1869?); *Tecticornia cinerea* (F. Muell.) Baillon, *Hist. Pl.* 9: 185 (1887). T: Sturts Creek, Central Australia, *F. Mueller*; syn: MEL.

Annual 12–40 cm high. Lower branches often procumbent, upper ones erect; internodes narrowly cylindrical, 7–15 mm long, glaucous. Spikes predominantly terminal, occasionally also lateral and sessile, narrowly ovoid and 1 cm long to narrowly cylindrical and up to 4 cm long, 5–7 mm diam. Bracts semicircular. Flowers 3–5 in each bract. Tepals laterally appressed, acute, plano-convex, united abaxially towards base otherwise free. Seed ovately discoidal, c. 1.5 mm long; testa dark-brown to black with several rows of small grey translucent tubercles on upper margin, otherwise almost smooth. Fig. 52F.

Found in coastal tropical Qld and N.T. in mud flats sometimes associated with mangroves; also in Java and New Guinea. Map 445.

N.T.: Fog Bay, *S. T. Blake 16764* (BRI); East Alligator River, *N. Byrnes 918* (NT). Qld: Karumba, *G. W. Trapnell 200* (BRI); Townsville, *N. Michael 474* (BRI).

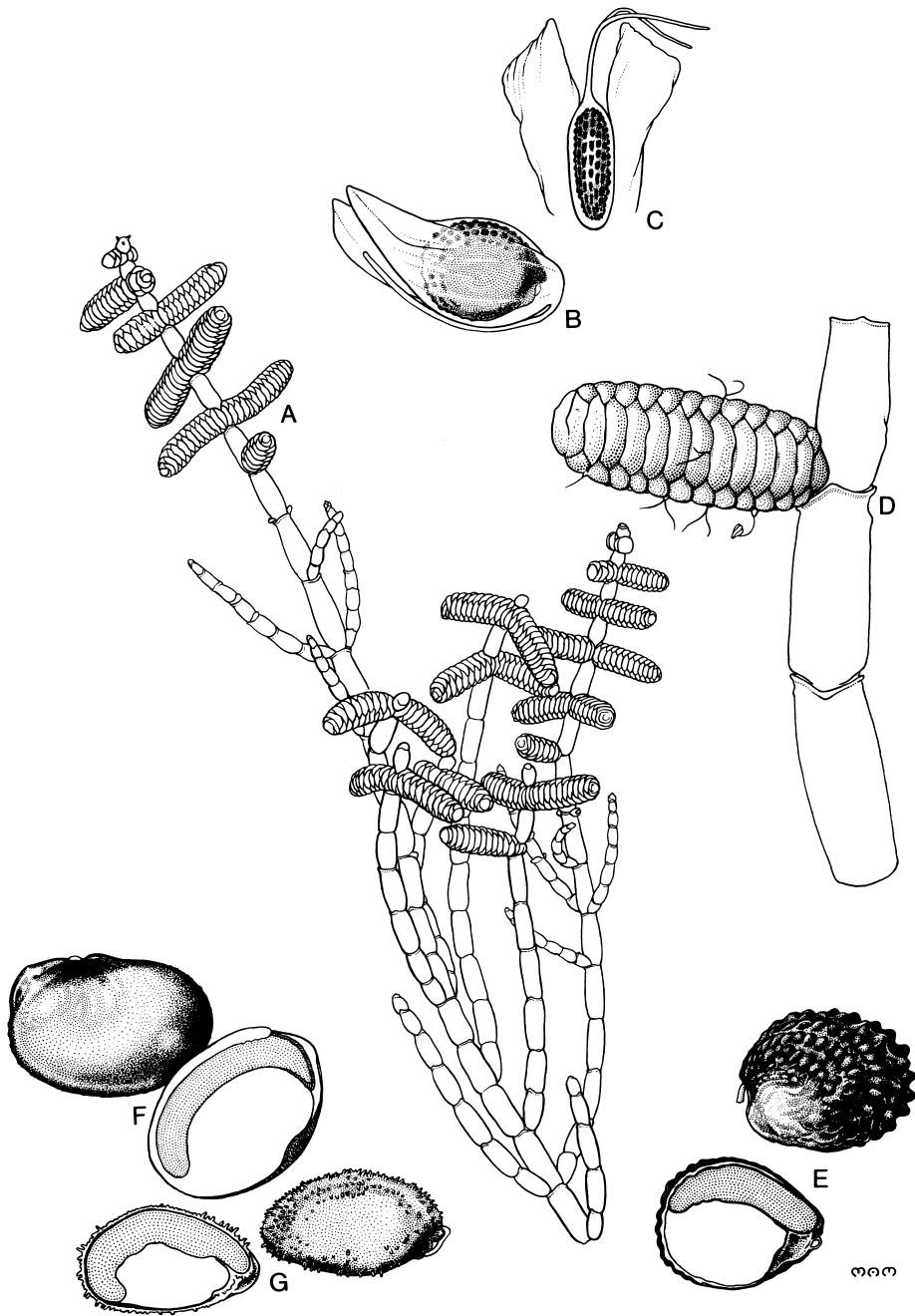


Figure 53. *Tecticornia*. A–E, *T. verrucosa*. A, habit $\times 0.7$; B, perianth surrounding seed, from side $\times 12$; C, perianth and fruit, from above $\times 12$; D, inflorescence $\times 2.5$ (A–D, Derby, W.A., V. Semeniuk, PERTH). E, seed, entire and L.S. $\times 20$ (J. Maconochie 1036, PERTH). F–G, seed, entire and L.S. $\times 20$. F, *T. arborea* (P. Wilson 8577, PERTH). G, *T. australasica* (P. Latz 3476, PERTH).

2. Tecticornia verrucosa Paul G. Wilson, *Nuytsia* 1: 284 (1972)

T: 9 miles (c. 14 km) SE of Rabbit Flat, N.T., 26 May 1970, *J. R. Maconochie 1036*; holo: PERTH; iso: K, MEL, NSW.

Annual or short-lived perennial to 40 cm high, branching at the sometimes woody base. Lower branches often decumbent; internodes cylindrical to obovoid, 10–14 mm long, glaucous. Inflorescence of opposite and decussate lateral spikes, rarely a very small terminal spike also present; spikes sessile, at right angles to branch axis, shortly cylindrical, 10–20 mm long, 6 mm diam. Flowers in triads. Tepals free below, at first slightly united above, obtuse. Seed broadly and bluntly elliptical to suborbicular, plano-convex to concavo-convex, c. 1.8 mm long, verruculose, brown to black, adherent to the transparent membranous pericarp. Fig. 53A–E.

Found in western N.T., tropical and subtropical W.A., and at one locality in south-western W.A., on coastal mud flats and inland freshwater or slightly saline clay pans. Map 446.

W.A.: Derby, *R. D. Royce 3336* (PERTH); Lake Bryde, *T. E. H. Aplin 4793* (PERTH). N.T.: c. 5 km NE of Lake Mackay, *G. Chippendale 3391* (NT).

The seed of this plant is eaten by Aborigines.

3. Tecticornia arborea Paul G. Wilson, *Nuytsia* 1: 286 (1972)

T: Glen Stn, W.A., 5 Aug. 1969, *P. G. Wilson 8577*; holo: PERTH; iso: AD, B, BRI, CANB, GH, K, L, MEL, NSW.

Erect pyramidal-shaped short-lived perennial to 150 cm high. Internodes cylindrical, 1–3 cm long, 5–12 mm diam., glaucous. Spikes terminal to main and lateral branches, cylindrical to slightly fusiform, 10–20 mm long, c. 7 mm diam. Flowers in triads. Tepals free above, at first somewhat united below, dorsiventrally flattened at apex. Seed broadly ellipsoidal, rounded at both ends, c. 1.5 mm long; testa smooth, reddish brown, glossy; embryo near upper margin of seed surrounded by copious perisperm. Pericarp eventually tearing at base and forming a loose cap to seed. *Bulli Bulli*. Fig. 53F.

Known from only a few localities in subtropical W.A., growing in fresh-water clay pans. Map 447.

W.A.: Boolathana Stn, *T. E. H. Aplin B-20* (PERTH).

The seed is eaten by Aborigines.

29. SCLEROSTEGIA

Sclerostegia Paul G. Wilson, *Nuytsia* 3: 17 (1980), from the Greek *scleros* (hard) and *stegos* (shelter), referring to the hard pericarp.

Type: *Sclerostegia tenuis* (Benth.) Paul G. Wilson

Shrubs, appearing leafless, glabrous. Branches when young of cylindrical to spherical segments or articles (internodes) that are cup-shaped to 2-lobed at apex; segments succulent, the outer portion eventually shrivelling and deciduous; sclereids absent. Inflorescence either a spike-like thyrse consisting of triads of flowers (cymes) immersed in the axil of each fleshy bract, or of triads dispersed among the branch segments. Flowers dimorphic: central flower of triad bisexual, the laterals male. Perianth gamotepalous membranous or succulent. Stigmas 2, narrowly triangular. Fruit: perianth membranous, succulent or shrivelled; pericarp firmly crustaceous or woody. Seed ovoid; testa thin; embryo straight or curved, radicle inferior; cotyledons conduplicate; perisperm copious lateral.

A genus of 5 species endemic in Australia.

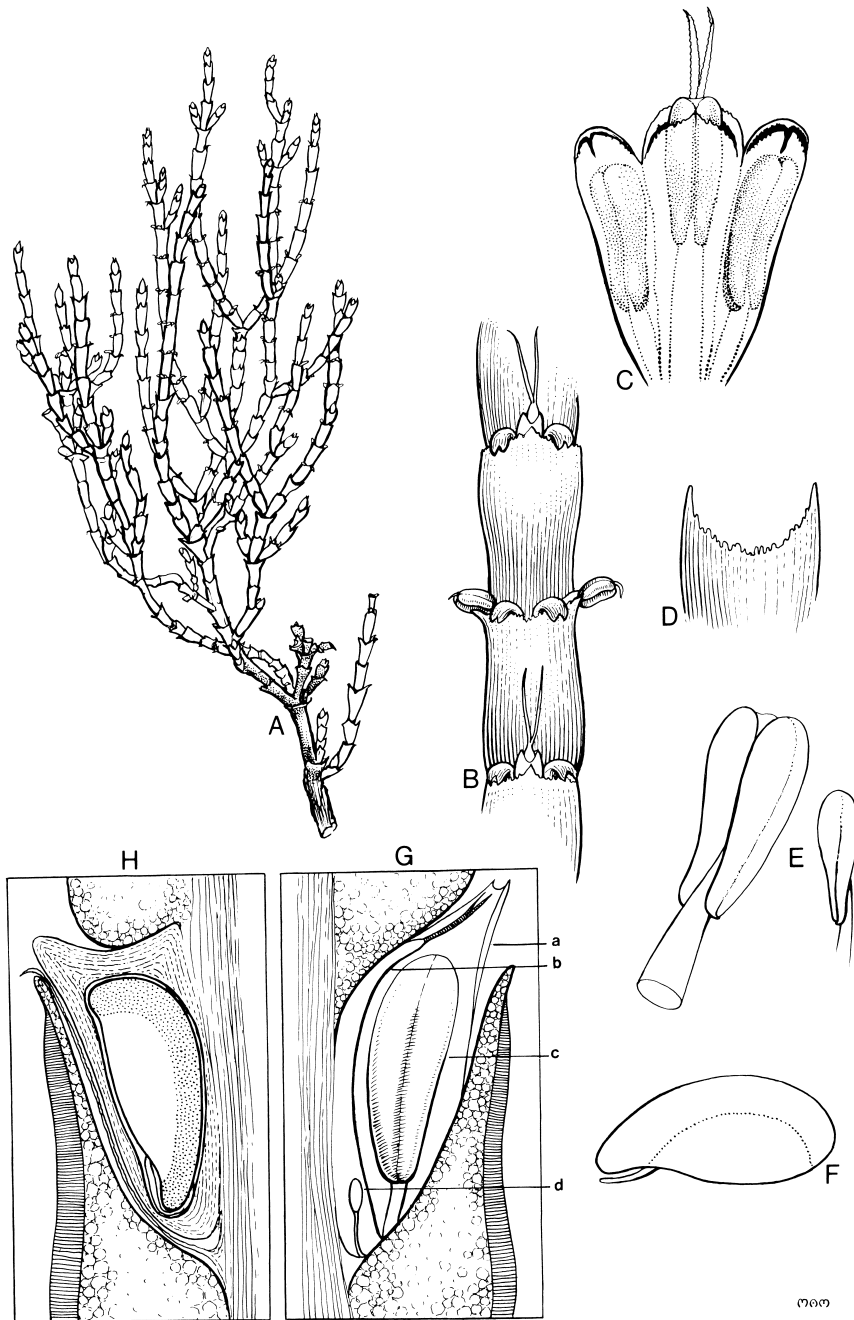


Figure 54. *Sclerostegia medullosa*. **A**, flowering branch $\times 1$; **B**, portion of branch showing triads of flowers $\times 5$; **C**, abaxial view of triad with central hermaphrodite and lateral male flowers $\times 30$; **D**, apex of article showing denticulate margin $\times 5$; **E**, stamens $\times 20$ & $\times 10$; **F**, seed $\times 15$; **G**, L.S. flower (**a**, perianth; **b**, ovary wall; **c**, stamen, **d**, ovule) $\times 20$; **H**, L.S. fruit $\times 15$ (D. Symon 11313, ADW). Reproduced by permission from *Nuytsia* 3(1): fig. 15 (1980).

P.G. Wilson, *Sclerostegia*, *Nuytsia* 3: 17–25 (1980).

This account is based on the revision by P. G. Wilson, *loc. cit.*

- | | | |
|----|---|-----------------------------------|
| 1 | Flowers in spikes with opposite bracts free from each other | 1. <i>S. disarticulata</i> |
| 1: | Flowers in spikes with opposite bracts united, or the flowers in axils along the branches | |
| 2 | Perianth succulent; style hard and protruding in fruit (especially when dry) | 2. <i>S. arbuscula</i> |
| 2: | Perianth membranous; style not protruding | |
| 3 | Fertile and vegetative articles alike, cylindrical; leaf lobes markedly denticulate | 5. <i>S. medullosa</i> |
| 3: | Fertile and vegetative articles either dissimilar or the former not cylindrical; leaf lobes entire or almost so | |
| 4 | Fertile articles obovoid, in fruit globular to obovoid, dry and pithy; pericarp crustaceous, not embedded in woody axis | 3. <i>S. moniliformis</i> |
| 4: | Fertile articles obovoid to cylindrical, in fruit becoming thick and woody, pericarp woody and embedded in woody axis | 4. <i>S. tenuis</i> |

1. *Sclerostegia disarticulata* Paul G. Wilson, *Nuytsia* 3: 19 (1980)

T: N end of Mongers Lake, W.A., 6 Aug. 1969, P. G. Wilson 8603; holotype: PERTH; isotype: CANB, K.

Illustrations: P. G. Wilson, *op. cit.* 80, fig. 12; 102, fig. 34.

Divaricately-branched rounded shrub to 1.5 m high. Articles barrel-shaped to obovoid, 3–6 mm long, dull to bright green, often black when dry. Spikes narrowly cylindrical, mostly 5–10 mm long and 3–4 mm diam; opposite bracts free from each other, rarely slightly united. Flowers vertical to spike axis, intimately fused to each other; apex (outer exposed surface) of triad truncate, triangular; lateral (male) flowers small, central (bisexual) flower large. Fruit: pericarp broadly obovoid, c. 1.7 mm long, horny all over, surrounded by thin succulent perianth. Seed ovoid, c. 1.5 mm long. Mature spike breaking into separate bracts and triads, the latter composed of the fruit fused to the small male flowers; pericarp eventually splitting longitudinally to release seed.

Found in central and southern Australia (probably in all mainland States although not recorded from Vic. or Qld), in areas of low rainfall, usually in strongly alkaline or slightly saline soil. Map 448.

W.A.: c. 3 km E of Norseman, J. S. Beard 5204 (PERTH). N.T.: Henbury Stn, T. S. Henshall 789 (NT). S.A.: 3 km S of Leigh Creek, H. J. Eichler 12982 (AD). N.S.W.: 29 km W of White Cliffs, E. F. Constable 4600 (NSW).

2. *Sclerostegia arbuscula* (R.Br.) Paul G. Wilson, *Nuytsia* 3: 20 (1980)

Salicornia arbuscula R.Br., *Prodr.* 411 (1810); *Arthrocnemum arbuscula* (R.Br.) Moq., *Chenopod. Monogr. Enum.* 113 (1840); *Halocnemum arbuscula* (R.Br.) Bailey, *Syn. Queensland Fl.* 409 (1883); *Pachycornia arbuscula* (R.Br.) A. J. Scott, *Bot. J. Linn. Soc.* 75: 369 (1977). T: Port Dalrymple, [Tas.], Jan 1804, R. Brown; lectotype: BM, *vide* P. G. Wilson, *loc. cit.*

Illustrations: P. G. Wilson, *op. cit.* 81, fig. 13A–D; 103, fig. 35.

Much-branched shrub to 2 m high with ascending branches. Articles obovoid, c. 5 mm long, shortly lobed. Spikes of 2–6 articles, succulent; bracts united in opposite pairs and almost enclosing flowers. Flowers ascending, intimately fused to each other; lateral (male) flowers smaller than central (bisexual) flower. Fruit: perianth shrivelled, weak; pericarp thick, hard, deltoid in lateral view and passing into hard persistent exerted style. Seed elliptic, c. 1.5 mm long. Mature spike persisting for some time and eventually breaking up into its separate articles.

Found principally in coastal areas of southern N.S.W., Vic., Tas., S.A., and south-eastern W.A., frequently in marshes subject to occasional inundation by sea. Map 449.

W.A.: Israelite Bay, *P. G. Wilson 1007a* (PERTH). S.A.: Point Riley, *B. Copley 1300* (AD). N.S.W.: Currarong, 20 June 1970, *L. A. S. Johnson* (NSW). Vic.: Griffith Is., *A. C. Beaglehole 19487* (PERTH). Tas.: Ralph Bay, *F. H. Lang 138* (HO).

3. *Sclerostegia moniliformis* Paul G. Wilson, *Nuytsia* 3: 22 (1980)

T.: W bank of Lake King near causeway, W.A., 29 Sept. 1970, *P. G. Wilson 9983*; holotype: PERTH; isotype: AD, CANB, K, MEL, NSW.

Illustration: P. G. Wilson, *op. cit.* 81, fig. 13E–H.

Much-branched shrub c. 1 m high. Articles obovoid, c. 5 mm long. Spikes continuing vegetatively, of 1 or 2, rarely to 6, articles; bracts similar to vegetative articles, enclosing flowers. Flowers almost erect, dorsiventrally flattened distally, coalescent to each other in lower two-thirds; perianth membranous. Fruiting spike dry, sometimes moniliform; bracts broadly obovoid to spherical, pithy, 5–6 mm diam., completely obscuring flowers; perianth membranous; pericarp crustaceous, adhering to spike axis; style weak, not exerted. Seed ovoid, c. 1.5 mm long. Bracts of mature spike eventually disintegrating and sloughing off with enclosed fruit.

Found in south-western W.A. in moderately saline areas that are periodically waterlogged. Map 450.

W.A.: Lake King, *A. S. George 9355* (PERTH); c. 11.5 km E of Point Malcolm, *R. Hnatiuk 761203* (PERTH).

4. *Sclerostegia tenuis* (Benth.) Paul G. Wilson, *Nuytsia* 3: 22 (1980)

Salicornia tenuis Benth., *Fl. Austral.* 5: 204 (1870); *Pachycornia tenuis* (Benth.) J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 43: 363 (1919). T: Howitt's Expedition; lectotype: MEL 71381, *vide* J. M. Black, *loc. cit.*; isotype: K.

Salicornia donaldsonii Ewart & J. White, *J. Roy. Soc. New South Wales* 42: 194 (1909); *Arthrocnemum donaldsonii* (Ewart & J. White) C. Gardner, *Enum. Pl. Austral. Occ.* 39 (1930). T: Cowcowing, W.A., Sept. 1904, *M. Koch 1147*; holotype: MEL; isotype: K, *vide* P. G. Wilson, *loc. cit.*

Illustration: P. G. Wilson, *op. cit.* 82, fig. 14; G. M. Cunningham *et al.*, *Pl. W. New South Wales* 277 (1982) as *Pachycornia tenuis*.

Divaricately-branched shrub to 0.6 m high. Branchlets slender; articles narrowly turbinate to cylindrical, c. 10 mm long, pale green; apical lobes with a broad scarious entire margin. Spikes slender, c. 20 mm long, of 5–10 articles, usually continuing growth vegetatively for at least 1–2 cm; bracts similar to, but shorter than, vegetative articles, completely enclosing flowers. Flowers erect, c. 4 mm long, dorsiventrally flattened distally, coalescent to each other in lower two-thirds; perianth membranous. Fruiting spike narrowly ellipsoidal, woody, covered by shrivelled remains of bracts, or these soft, pithy and persistent; perianth membranous; pericarp thick and woody, eventually embedded in the growing woody spike axis; style not exerted. Seed narrowly ovoid, 2.5–3 mm long, eventually released after death and decay of branch.

Occurs inland in all mainland States, in heavy somewhat saline soil. Map 451.

W.A.: Mongers Lake, *R. Watson 5* (PERTH). N.T.: Finke R., *B. G. Briggs 1258* (NSW). S.A.: 80 km S of Kingoonya, *M. Fagg 371* (AD). Qld: Dynevor Lakes, *M. E. Phillips 475* (PERTH). Vic.: c. 5 km NE of Lake Wallawalla, *A. C. Beaglehole 40677* (PERTH).

5. *Sclerostegia medullosa* Paul G. Wilson, *Nuytsia* 3: 24 (1980)

T: Theldarpa – Yandama Stn, S.A., 2 June 1955, *L. A. S. Johnson & E.F. Constable*; holotype: NSW 40039; isotype: PERTH.

Illustration: P. G. Wilson, *op. cit.* 83, fig. 15.

Much-branched shrub to 1 m high. Articles cylindrical, 4–5 mm long, 2–3 mm diam., papillose when dry, becoming pithy with age; lobes acute denticulate. Flowering articles identical to and interspersed amongst vegetative. Flowers vertical, dorsiventrally flattened distally, united in lower two-thirds; perianth membranous. Fruiting articles cylindrical,

pithy; perianth membranous; pericarp hard and brittle, c. 2.5 mm long, adherent to woody axis. Seed ellipsoidal, c. 2.5 mm long. Fruit released on decay of surrounding bract-tissue. Fig. 54.

Found in south-western Qld, western N.S.W. and central S.A., in heavy soil on floodplains. Map 452.

S.A.: c. 11 km NE of Woomera, *M. Lazarides 8401* (PERTH). Qld: Whynot Stn, *L. S. Smith 6069* (BRI). N.S.W.: NW of Tibooburra, *S. Jacobs 3434* (NSW).

30. PACHYCORNIA

Pachycornia J. D. Hook. in Benth. & J. D. Hook., *Gen. Pl.* 3: 65 (1880); from the Greek *pachy* (thick) and the Latin *cornu* (a horn), referring to the thick leaf lobes.

Type: *P. triandra* (F. Muell.) J. Black.

Dwarf shrubs with cylindrical succulent stems; sclereids absent. Leaves opposite, represented by short fleshy spurs apparently decurrent along internode. Inflorescence a spike-like thyrse consisting of triads of flowers in the axils of opposite decurrent bracts. Flowers dimorphic, the lateral male and the central bisexual. Perianth gamotepalous, membranous, scarcely changed in fruit. Stamen 1, abaxial in central flower. Stigmas narrowly triangular. Fruit: pericarp hard, fused to and sunken into woody spike axis. Seed orbicular; testa thin; embryo annular; perisperm central.

A monotypic genus endemic in Australia.

P. G. Wilson, *Pachychornia*, *Nuytsia* 3: 16–17 (1980).

This account is based on the revision by P. G. Wilson, *loc. cit.*

Pachycornia triandra (F. Muell.) J. Black, *Fl. S. Australia* 206 (1924)

Arthrocnemum triandrum F. Muell., *Fragm.* 1: 139 (1859); *Salicornia robusta* F. Muell., *Fragm.* 6: 251 (1868) *nom. illeg.*; *P. robusta* (F. Muell.) Baillon, *Hist. Pl.* 9: 184 (1887) *nom. illeg.*; *S. triandra* (F. Muell.) Druce, *Rep. Bot. Exch. Club Brit. Isles 1916*, Suppl. 2: 644 (1917). T: close above the junction of the Darling on the Murray and on the lower Darling as far down the Murray as Lake Victoria, Dec. 1853, *F. Mueller*; lecto: MEL 71400, *fide* P. G. Wilson, *loc. cit.*

Illustration: P.G. Wilson, *op. cit.* 79, fig. 11.

Divaricately-branched bright green shrub c. 50 cm high. Internodes 1–2 cm long with thick rigid acute lobes c. 3 mm long ciliolate towards their base; opposite ciliolate grooves arising at junction of lobes and running length of internode. Spikes broadly ovoid, 1–2 cm long; bracts congested; lobes acicular, divaricate. Flowers steeply ascending, c. 4 mm long. Perianth dorsiventrally compressed, membranous. Fruiting spike scarcely accrescent; axis and base of bracts thick and woody; perianth membranous; pericarp thick and horny, fused to and apparently sunken into woody axis. Seed released after decay of spike.

Occurs in dry inland areas of Australia from western N.S.W. and far north-western Vic., west to central-southern W.A., found in heavy slightly saline soil. Map 453.

W.A.: Balgo Downs, *H. Demarz 5230* (PERTH). N.T.: c. 3 km N of Rodinga, *P. K. Latz 1853* (PERTH). S.A.: Lake Gardner, *J. Z. Weber 3330* (PERTH). N.S.W.: Wentworth, Sept. 1912, *H. B. Williamson* (MEL). Vic.: Merbein, May 1937, *J. H. Willis* (MEL).



436. *Halosarcia entrochoma*
 439. *Halosarcia calyptrata*
 442. *Halosarcia indica*
 subsp. *bidens*
 445. *Tecticornia australasica*
 448. *Sclerostegia disarticulata*

437. *Halosarcia chartacea*
 440. *Halosarcia indica*
 subsp. *indica*
 443. *Halosarcia indica*
 subsp. *julacea*
 446. *Tecticornia verrucosa*
 449. *Sclerostegia arbuscula*

438. *Halosarcia cupuliformis*
 441. *Halosarcia indica*
 subsp. *leiostachya*
 444. *Tecticornia uniflora*
 447. *Tecticornia arborea*
 450. *Sclerostegia moniliformis*

Trib. V. SUAEDAEAE

Trib. *Suaedeae* Moq., *Ann. Sci. Nat.* ser. 2, 4: 215 (1834).

Type: *Sueda* Forsskal ex Scop.

Flowers in few-flowered axillary clusters with very small scale-like bracteoles. Perianth little changed in fruit. Ovary superior or semi-inferior; Embryo in a plane spiral; perisperm absent or scanty.

One genus in Australia.

31. SUAEDA

Suaeda Forsskal ex Scop., *Introd. Hist. Nat.* 333 (1777) *nom. cons.*, from the Arabic name for *Suaeda aegyptiaca*.

Type: *S. vera* Forsskal ex J. Gmelin

Suaeda sect. *Chenopodina* Moq., *Chenop. Monogr. Enum.* 124 (1840); *Chenopodina* (Moq.) Moq., in DC., *Prodr.* 13(2): 159 (1849), *nom. illeg.* (includes type of *Suaeda*).

Herbs or small shrubs, glabrous to sparsely puberulous. Leaves alternate, narrow, succulent, entire. Flowers in axillary clusters of 1–3 or more, subtended by 2 or 3 small scarious scale-like bracteoles. Perianth succulent, slightly to deeply 5-lobed, unchanged or becoming enlarged and sometimes crustaceous in fruit. Stamens 5, hypogynous or attached to perianth tube. Ovary free from or rarely united to perianth, hemispherical to conical. Pericarp membranous or slightly succulent. Seed horizontal or erect, lenticular; embryo in a plane spiral; perisperm slight or absent; testa crustaceous or membranous.

A genus of over 100 species, most of which are found in the Northern Hemisphere. Five species occur in Australia of which two are endemic and three introduced.

G. Bentham, *Suaeda*, *Fl. Austral.* 5: 205–206 (1870); P. W. Ball in Tutin *et al.*, *Suaeda* Forskal ex Scop., *Fl. Europaea* 1: 103–104 (1964).

- | | | |
|----|---|-----------------------------------|
| 1 | Flower clusters borne on petioles slightly above leaf axils | 1. <i>S. cf. linifolia</i> |
| 1: | Flowers borne in leaf axils | |
| 2 | Ovary adnate to lower half of perianth; seed erect | 2. <i>S. aegyptiaca</i> |
| 2: | Ovary free from perianth; seeds horizontal or both horizontal and erect | |
| 3 | Leaves with pellucid margin, acute; perianth lobes becoming inflated; seed both horizontal and erect | 3. <i>S. baccifera</i> |
| 3: | Seeds without pellucid margin, obtuse to acute; perianth rounded on back but not inflated; seeds all horizontal | |
| 4 | Seeds 2–4 mm diam. with translucent membranous testa | 4. <i>S. arbusculoides</i> |
| 4: | Seeds 1 mm diam. with glossy, reddish brown crustaceous testa | 5. <i>S. australis</i> |

1.Suaeda linifolia* Pallas, *Illust. Plant.* 47 (1803)**

T: from Lake Elton, U.S.S.R.; *n.v.*

Erect annual to 75 cm high, minutely and sparsely puberulous on young branches, otherwise glabrous. Leaves narrowly oblong-elliptic, acute, to 12 mm long and 2 mm wide. Flower clusters and lateral branches arising on petiole shortly above leaf axil. Fruiting perianth globose, c. 1.5 mm diam., lobed to a third or half (only minutely lobed in female flowers); lobes (in bisexual flowers) erect, hooded, slightly horned near apex, membranous on margin. Ovary conical with truncate concave apex; stigmas 3, minute, sessile or on a minute style. Seed erect, broadly ovate, 1.5 mm long, biconvex; testa crustaceous, granular, black.

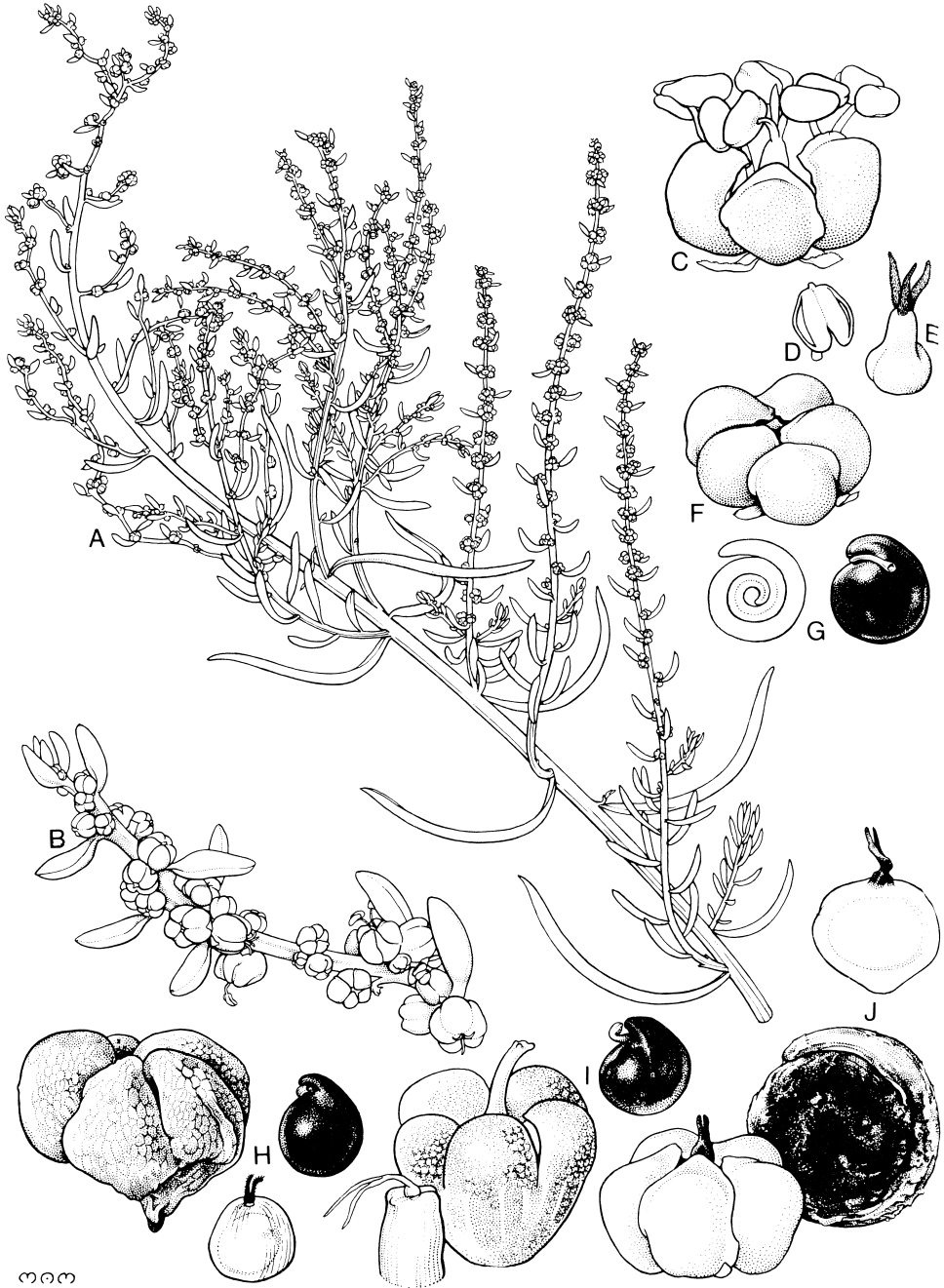


Figure 55. *Suaeda*. A–G, *S. australis*. A, branch $\times 1.2$; B, flowering branch $\times 2.5$; C, flower $\times 5$; D, anther $\times 5$; E, ovary $\times 5$; F, fruiting perianth $\times 5$; G, seed and embryo $\times 5$ (A–G, P. Wilson 11841, PERTH). H–J, fruiting perianth, ovary and seed $\times 5$. H, *S. aegyptica* (P. Wilson 10264, PERTH). I, *S. baccifera* (C. Moore 5671, CANB). J, *S. arbusculoides* (G. Craig 391, PERTH).

Found in north-western Vic. as a roadside weed in slightly saline soil. Native to the U.S.S.R. Map 454.

Vic.: Irymple, near Mildura, 10 Feb. 1978, *J. H. Browne* (CANB, NSW); Red Cliffs, 1 Apr. 1968, *T. S. Henshall* (MEL).

Suaeda linifolia is one of a number of closely related Eurasian species. The precise identity of the plant found in Australia is uncertain.

2.**Suaeda aegyptiaca* (Hasselq.) Zoh., *J. Linn. Soc., Bot.* 55: 635 (1957)

Chenopodium aegyptiacum Hasselq., *It. Palaest.* 460 (1757) *n.v.*; *Enchylaena aegyptiaca* (Hasselq.) Sprengel, *Syst. Veg.* 1: 923 (1824). T: from Egypt; *n.v.*

Suaeda baccata Forsskal ex J. Gmelin, *Syst. Nat.* 13th edn, 2: 503 (1791); [*S. baccata* Forsskal, *Fl. Aegypt.-Arab.* 69 (1775), *nom. inval.*] T: from Egypt; *n.v.*

Decumbent to erect annual or perennial branching from base, glabrous, or sparsely puberulous when young. Leaves semiterete, incurved, obtuse, c. 10 mm long, 1 mm wide. Flowers bisexual, in axillary clusters forming long, dense, spike-like inflorescences. Fruiting perianth turbinate, connate in basal half to the semi-inferior ovary; lobes spongy-baccate, inflated; free portion of ovary narrowly conical, truncate; stigmas 3, slender, c. 0.5 mm long, white when dry; style minute. Seed erect, broadly ovate, c. 1.5 mm long; testa glossy, black. Fig. 55H.

Found near Port Pirie and Port Wakefield, S.A., in salt marshes; native to north Africa and Arabia. Map 455.

S.A.: Port Pirie, 14 Mar. 1944, *collector unknown* (ADW 5200); between 53 and 54 mile posts on Port Wakefield Road, *B. Copley 1284* (AD).

This species is generally referred to as an annual herb but evidently lives for ten or more years in S.A.

3.**Suaeda baccifera* Pallas, *Ill. Pl.* 48 (1803)

T: Samara River, U.S.S.R.; *n.v.*

Illustration: G. M. Cunningham *et al.*, *Pl. W. New South Wales* 280 (1982) as *Suaeda* sp.

Procumbent to sub-erect annual or short-lived perennial, to 0.5 m high, glaucescent, glabrous. Leaves narrowly oblong (plano-convex) to semiterete, acute, sometimes bristle-tipped, 8–15 mm long, c. 1.5 mm wide, pellucid on margin, congested on lateral branches. Flowers bisexual and female, in axillary clusters forming slender, dense inflorescences with somewhat flexuose branches. Fruiting perianth depressed-globular, to 3.5 mm diam., lobed to near base; segments hooded, eventually inflated and fungoid, retaining shape on drying; ovary free, narrowly conical with truncate apex. Seed erect or horizontal, circular to broadly oval, biconvex, c. 1 mm wide; testa crustaceous, glossy, dark reddish brown to black. Fig 55 I.

Found principally near the Murray R. in south-western N.S.W. and north-western Vic., but also near Melbourne and in south-western W.A. Native to U.S.S.R. Grows in heavy slightly saline soil in disturbed situations. Map 456.

W.A.: Highbury, 4 Aug. 1971, *T. Stokes* (PERTH). N.S.W.: Deniliquin district, 1950, *G. A. Crawford* (NSW 36687). Vic.: Kow Swamp W of Gunbower, *H. I. Aston 532* (MEL).

The earliest Australian collection is that of Crawford dated 1950.

4. *Suaeda arbusculoides* L.S. Smith, *Contr. Queensland Herb.* 6: 1 (1969)

T: mouth of Pine River, Qld, 26 May 1961, *L.S. Smith 11387*; holo: BRI.

Decumbent to erect shrub to 1 m high, glabrous. Branches flexuose when young. Leaves narrowly fusiform but flat above, acute, 10–20 mm long. Flowers bisexual, in axillary clusters of 1–3. Perianth depressed-globose, in fruit c. 3 mm diam., basal $\frac{2}{3}$ lobed;

segments fleshy, suborbicular. Ovary hemispherical; stigmas 2 or 3. Seed horizontal, circular, 2–4 mm diam.; testa membranous, transparent; perisperm absent. Fig. 55J.

Endemic in Australia, around the tropical coast from Roebourne in W.A. to Moreton Bay in Qld, on inner margin of mangrove flats. Map 457.

W.A.: Port Warrender, *K. F. Kenneally* 5253 (PERTH). N.T.: Peron Is., *T. S. Henshall* 858 (NT). Qld: Four Ways Creek, *P. R. Sharpe & R. M. Dowling* 2207 (BRI).

This species is distinctive in having a large seed with membranous testa.

5. *Suaeda australis* (R. Br.) Moq., *Ann. Sci. Nat.* ser. 1, 23: 318 (1831)

Chenopodium australe R.Br., *Prodr.* 407 (1810); *Schoberia australis* (R.Br.) C. Meyer ex Steudel, *Nom. Bot.* 2nd edn, 2: 532 (1841); *Chenopodina australis* (R.Br.) Moq. in A.DC., *Prodr.* 13(2): 78, 163 (1849); *Lerchea maritima* var. *australis* (R.Br.) Kuntze, *Revis. Gen. Pl.* 2: 549 (1891); *Suaeda maritima* var. *australis* (R. Br.) Domin, *Biblioth. Bot.* 89: 72 (1921). T: Fowlers Bay, [S.A.], 29 Jan. 1802, *R. Brown*; n.v.

Chenopodium insulare J. Black, *Trans. Roy. Soc. S. Australia* 69: 309 (1945). T: South Pearson Is., S.A., 3 Jan. 1923, *T.G.B. Osborn*; holotype: AD.

[*Suaeda maritima* auct. non (L.) Dumort. s. str.: J. D. Hooker, *Fl. Nov.-Zel.* 1: 214 (1853)]

[*Chenopodina maritima* auct. non (L.) Moq. s. str.: J. D. Hooker, *Fl. Tasman.* xlvii (1859)]

Illustration: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 89 (1889) as *Suaeda maritima*.

Rounded perennial branching from base, glabrous. Leaves slender and semiterete, c. 30 mm long, to thick and fusiform, c. 10 mm long, acute or obtuse, succulent, without a pellucid margin. Flowers bisexual, in axillary clusters. Fruiting perianth divided to near base, depressed-spherical, c. 3 mm diam.; lobes succulent, rounded on back; ovary free, depressed-globular, passing into a stout style, c. 0.5 mm long; stigmas 2 or 3, slender. Seed horizontal, lenticular, c. 1 mm diam.; testa smooth, glossy, reddish brown; perisperm slight on upper and lower side of embryo. Fig. 55A–G.

Found around the west, south and east coasts of Australia, from the Abrolhos Islands in W.A. to near Townsville in Qld; also sometimes inland in wet, somewhat saline areas. Map 458.

W.A.: Wooded Is., *A.S. George* 11321 (PERTH). S.A.: North Pearson Is., *R.L. Specht* 2148 (AD). Qld: Mangrove Is., *D.R. Stoddart* 4516 (BRI). N.S.W.: Lake Burrill, *M. Gray* 6679 (CANB). Tas.: 15 km NW of Launceston, *K. Paijmans* 2726 (CANB).

A very variable species that has sometimes been treated as a variant of *S. maritima* (L.) Dumort., a polymorphic Northern Hemisphere annual. Some populations near the Murray River in south-eastern S.A. and neighbouring N.S.W. and Vic. correspond closely to *S. maritima* and may represent an introduction of that species.

Trib. VI. SALSOLEAE

Trib. *Salsoleae* Moq., *Ann. Sci. Nat.* ser. 2, 4: 209 (1834).

Type: *Salsola* L.

Flowers axillary, subtended by prominent often rigid bracteoles. Perianth glumaceous, hard and often winged in fruit. Ovary superior. Embryo in a conical spiral (in Australian species); perisperm absent.

Represented by one genus in Australia.

32. SALSOLA

Salsola L., *Sp. Pl.* 1: 222 (1753); *Gen. Pl.* 5th edn, 104 (1754); from the Latin *sal* (salt) with reference to the salty taste of *Halogeton sativus* (L.) C. Meyer, a species once included in *Salsola*.

Type: *S. soda* L.

Herbs or shrubs. Leaves alternate, sessile, entire. Flowers bisexual, usually solitary in leaf-axil, sessile, 2-bracteolate. Tepals 5, lanceolate, scarious, each usually developing a transverse scarious wing in fruit. Stamens 5; anthers sometimes bearing scarious or bladder-shaped appendages. Ovary subglobular; stigmas 2, sessile or on a long style. Utricle dry, included in the scarious perianth. Seed orbicular, horizontal; testa membranous; embryo in a conical spiral; perisperm absent, filaments strap-shaped, attached to the outer surface of an annular or shallowly cup-shaped disc.

A genus of over 100 species in Europe, Asia, and Africa, introduced into America and Australia.

G. Bentham, *Salsola*, *Fl. Austral.* 5: 206–208 (1870), V. P. Botschantzev, The genus *Salsola*; a concise history of its development and dispersal, *Bot. Zurn. (Moscow & Lenin-grad)* 54: 989–1001 (1969); V. P. Botschantzev, A synopsis of *Salsola* (Chenopodiaceae) from South and South-West Africa, *Kew Bull.* 29: 597–614 (1974); P. Aellen in T. G. Tutin *et al.*, *Salsola* L., *Fl. Europaea* 1: 104–107 (1964); P. Aellen in Hegi, *Ill. Fl. Mitt.-Eur.* 2nd edn, 3(2) 739–746 (1961).

****Salsola kali* L., *Sp. Pl.* 1: 222 (1753)**

T: from Europe; *n.v.*

S. australis R.Br., *Prodr.* 411 (1810). T: Petrel Bay, Isle St. Francis, [S.A.], 8 Feb. 1802, P. Good & F. Bauer; lecto: BM, *n.v.*, *fide* V. P. Botschantzev, *Kew Bull.* 29: 614 (1974).

S. macrophylla R.Br., *Prodr.* 411 (1810). T: Thirsty Sound, [Qld], R. Brown; holo: BM, *n.v.*

?*S. brachypteris* Moq., *Chenop. Monogr. Enum.* 147 (1840); *S. kali* var. *brachypteris* (Moq.) Benth., *Fl. Austral.* 5: 208 (1807). T: Java. C. P. Belannger; *n.v.*

S. kali var. *leptophylla* Benth., *Fl. Austral.* 5: 207 (1870). T: Qld and N.S.W., *no collectors cited; n.v.*

S. kali var. *strobilifera* Benth., *Fl. Austral.* 5: 207 (1870); *S. australis* var. *strobilifera* (Benth.) Domin, *Biblioth. Bot.* 89: 74 (1921). T: Darling desert and Mount Murchison; *no collectors cited; n.v.*

S. ruthenica Iljin, *Sorn. Rastitel'n. SSSR* 2: 137 (1934) *n.v.*; *S. kali* subsp. *ruthenica* (Iljin) Soó in Soó & Jäv., *Magyar Növ. Kez.* 2: 786 (1951); *n.v.*

Illustrations: F. Mueller, *Iconogr. Austral. Salsolac. Pl.* t. 90 (1889); G. M. Cunningham *et al.*, *Pl. W. New South Wales* 279 (1982).

Erect rounded annual to 60 cm high, succulent when fresh, glabrous or hispid, often verrucose, sometimes woolly in axils. Leaves linear-subulate, decurrent, 10–30 mm long, 2–3 mm wide, semiterete, broad and slightly clasping at base. Floral leaves and bracteoles similar to foliage leaves or much broader at base, equal to or exceeding flowers. Flowers in open or condensed spikes. Tepals 3–4 mm long, free, oblong, obtuse to acute, at first membranous but becoming cartilaginous, developing unequal obovate to reniform horizontal scarious wings 2–5 mm wide or these represented by pectinate protuberances. Utricle hemispherical, truncate above; pericarp crustaceous above otherwise membranous. *Prickly Saltwort, Soft Buckbush, Roly-poly.* Fig. 56

Widespread in Australia excluding Tas.; found particularly in dry or somewhat saline areas. Considered by Botschantzev (1969, 1974) to be an introduction from Eurasia. Map 459.

W.A.: Depuch Is., R. D. Royce 7100 (PERTH). N.T.: Yuendumu, T. S. Henshall 2884 (NT). Qld: Poeppl Corner, D. E. Boyland 246 (BRI). N.S.W.: Guerilla Bay, M. Gray 6493 (CANB). Vic.: Port Melbourne, 31 Mar. 1926, F. A. Rodway (NSW).

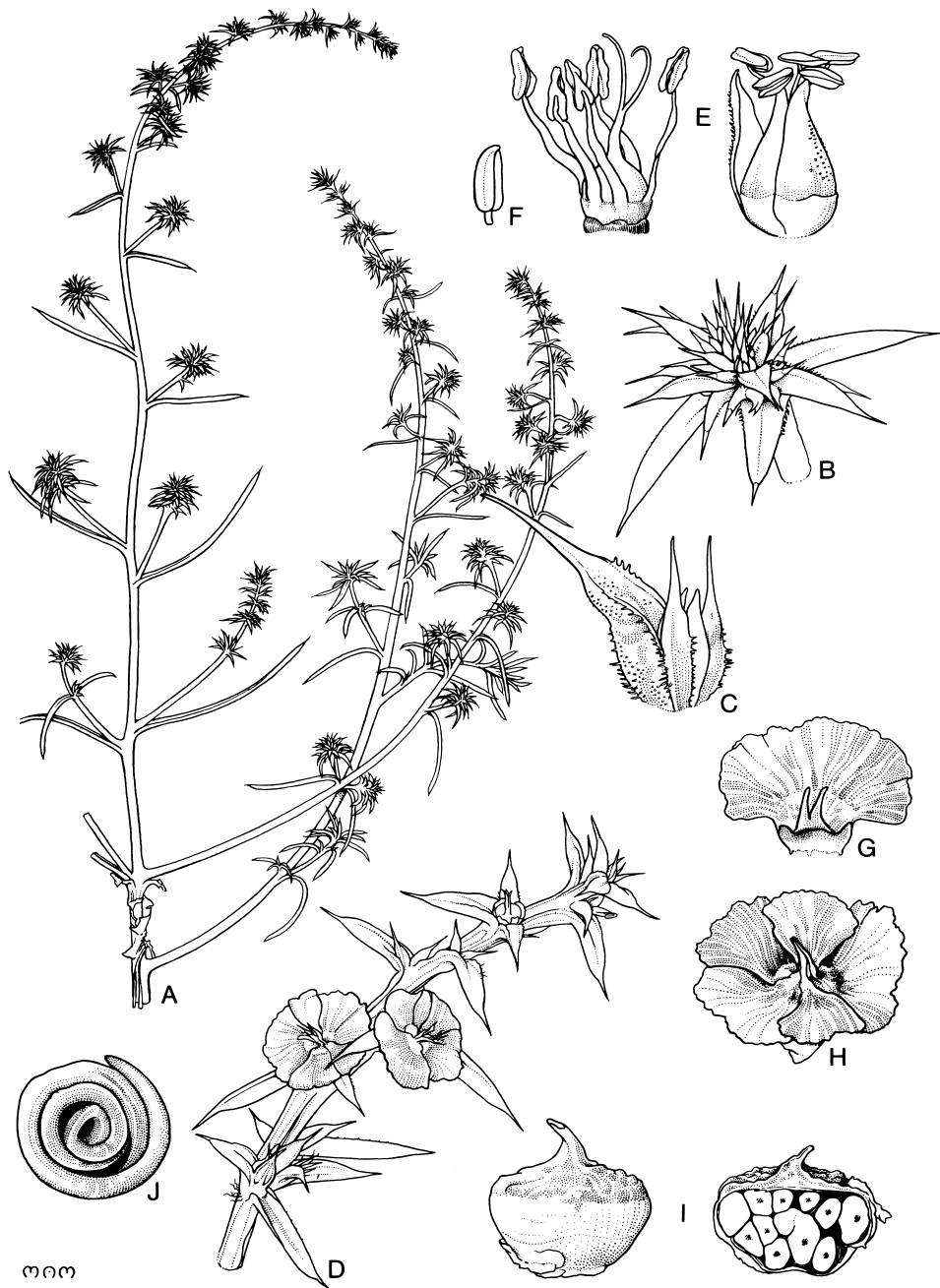


Figure 56. *Salsola kali*. A, branch $\times 1$; B, terminal glomerule $\times 5$; C, bud in bract and bracteoles $\times 15$ (A–C, Meekatharra, W.A., A. Mitchell, PERTH). D, branch $\times 2.5$; E, flower, with and without tepals $\times 15$; F, anther $\times 20$; G, fruiting tepal $\times 7$; H, fruiting perianth $\times 5$; I, fruit, entire and L.S. $\times 15$; J, seed $\times 15$ (D–J, Meckering, W.A., P. Wilson, PERTH).

A polymorphic species. Australian material was considered by Aellen (1971 in sched.) to belong to the following taxa: *S. kali* subsp. *tragus* (L.) Nyman, *S. kali* subsp. *austro-africana* Aellen, and *S. kali* subsp. *ruthenica* (Iljin) Soó. Botschantzev, *op. cit.*, (1969, 1974), recognised the first of these as a distinct species, *S. tragus* L., and the other two as synonyms of *S. australis* R.Br. *Salsola kali* in the strict sense is not found in Australia. According to Aellen (1961, 1964) subsp. *tragus* may be distinguished from subsp. *ruthenica* by the bracteoles being swollen and connate at the base and the tepals having small or no wings. These distinctions are not readily observable in Australian material, most of which is best placed in *S. kali* subsp. *ruthenica*. (Fig. 56D–J).

The name *S. kali* var. *strobilifera* has frequently been applied to collections in which the fruits are congested in globular to ovoid spikes (Fig. 56A–C). Aellen (1971 in sched.) considered that this variant was a monstrosity that arose independently in different subspecies. Strobiliferous collections are certainly polymorphic and most also have branches with the normal flower arrangement. It is unclear whether or not a distinct taxon is involved.

Excluded names

Atriplex chamaeclada Diels, *Feddes Repert.* 16: 194 (1919)

Rumicastrum chamaecladum (Diels) Ulbr., *Nat. Pflanzenfam.* 2nd edn, 16c: 519 (1934). T: near Warrungup, Stirling Range, W.A., 5 Oct. 1901, L. Diels 4655, *n.v.* (destroyed).

This is a member of the Portulacaceae.

Kochia decaptera F. Muell., *Fragm.* 9: 75 (1875)

K. triptera var. *pentaptera* J. Black, *Fl. S. Australia* 199 (1924). T: in the desert N of Fowlers Bay, S.A., 1874, E. Giles; holo: MEL.

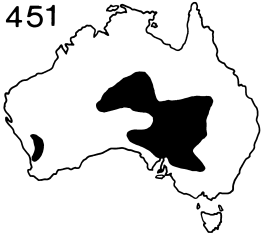
A species of either *Abutilon* or *Sida* (Malvaceae).

Threlkeldia haloragoides F. Muell. ex Benth., *Fl. Austral.* 5: 198 (1870)

T: south-western W.A., *J. Drummond* 55, *n.v.* and *J. Drummond* 5: 438 *n.v.*

This is *Cypselocarpus haloragoides* (F. Muell. ex Benth.) F. Muell., *Fragm.* 8: 36 (1873), the only genus in the Gyrostemonaceae.

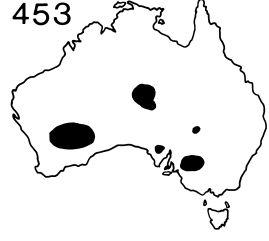
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451. *Sclerostegia tenuis*
 454. *Suaeda linifolia*
 457. *Suaeda arbusculoides*

452. *Sclerostegia medullosa*
 455. *Suaeda aegyptiaca*
 458. *Suaeda australis*

453. *Pachycornia triandra*
 456. *Suaeda baccifera*
 459. *Salsola kali*

APPENDIX

New taxa, combinations and lectotypifications

New taxa, combinations and lectotypifications occurring in this volume of the *Flora of Australia* are formally published here. The families are arranged in the same order as in the text; taxa are alphabetic within families. For economy the entries are brief; the treatment in the main text is more comprehensive. The date of publication of this Volume will be given in Volume 25.

NYCTAGINACEAE

H. J. Hewson & R. D. Meikle

Boerhavia burbridgeana Hewson, sp. nov.

Suffrutex vel herba perennis, diffusus vel prostratus, cum pilis glanduliferis sparsis. Inflorescentia axillaris et terminalis, saepe composita et aliquantum fracti-flexa; monas basica inflorescentiae flos solitarius vel glomerulus pauciflorus. Pedunculus filiformis, ad 1.5 cm longus. Stamina 1 vel 2. Fig. 2C–D.

T: junction of Neville Ck and Calder R., W.A., 5 May 1983, *K. F. Keneally 8711*; holo: PERTH.

Occurs in northern W.A. and its offshore islands, and in northern N.T.

Named in honour of Nancy T. Burbidge (1912–1977), a prominent Australian botanist, who first recognised this as a distinct species.

Boerhavia coccinea Miller, *Gard. Dict.* 8th edn, 4 (1768)

T: cultivated Chelsea Physic Garden, from Jamaica, 1730, *W. Houstoun*; neo (here nominated): BM.

Miller described this species from plants grown in the Chelsea Physic Garden. The plants were cultivated from seeds collected by *W. Houstoun* in Jamaica. No authentic material has survived and it is necessary to neotypify the species.

Boerhavia dominii Meikle & Hewson, sp. nov.

Herba perennis, prostrata vel decumbens, glabra vel cum pilis glanduliferis. Inflorescentia axillaris et terminalis, saepe composita; monas basica inflorescentiae plerumque umbella pauciflora. Pedunculus crassus, 2–16 cm longus. Pedicelli graciles, ad 10 mm longi. Stamina 24. Fig. 3H–K.

T: Kangaroo Hills Stn, Qld, 2 Apr. 1965, *M. Lazarides 7122*; holo: CANB.

Occurs in northern W.A., N.T., S.A., Qld, N.S.W. and Vic.

Named in honour of Karel Domin (1882–1953) a Czech botanist who visited Australia early this Century; Domin attempted to resolve some of the confusion in the genus in Australia.

Boerhavia gardneri Hewson, sp. nov.

Herba perennis, prostrata, cum pilis glanduliferis. Inflorescentia terminalis, erecta, repetite ramosa, diffusa, cymosa; monas basica inflorescentiae plerumque flos solitarius. Pedicelli graciles, ad 15 mm longi. Stamina 2–4.

T: Python Pool, W.A., 14 Oct. 1941, *C. A. Gardner 6275*; holo: PERTH.

Occurs in north-western W.A., northern N.T. and adjacent offshore islands.

Named in honour of Charles A. Gardner (1896–1970), Government Botanist of Western Australia 1929–1960, who collected the type.

Boerhavia paludosa (Domin) Meikle, stat. nov.

B. diffusa var. *paludosa* Domin, *Biblioth. Bot.* 89: 92, t. 21, figs 6, 7 (1926). T: Rolling Downs, Hughenden, Richmond to Cloncurry, Qld, Feb.–Mar. 1910, *K. Domin*; syn: PR; Pentland, Qld, Mar. 1910, *K. Domin*; lecto (here chosen): PR.

Boerhavia repleta Hewson, sp. nov.

Herba annua vel perennis, prostrata vel serpens, cum pilis glandiferis. Inflorescentia lateralis vel terminalis plerumque composita; monas basica inflorescentiae umbella biflora. Pedunculus ad 5 mm longus. Pedicelli filiformes, 5–10 mm longi. Stamina 2 vel 3. Fructus obconicus; costae latae et planae; sulci profundi et angusti. Figs 2A–B.

T: 102 miles (c. 163 km) S of Wiluna on road to Leonora, W.A., 22 Mar. 1968, *S. G. M. Carr 505*; holo: PERTH.

Occurs in central W.A., central N.T. and central western Qld.

Named from the Latin *repletus* (filled), in reference to the wide ribs which give the fruits an inflated appearance.

AIZOACEAE

A. Prescott

Trianthema oxycalyptra F. Muell., *Fragm.* 1: 173 (1859)

T: banks of Sturt Creek, [?W.A.], 1856, *F. Mueller*; lecto (here chosen): MEL 99967.

Trianthema oxycalyptra var. **sessiliflora** F. Muell., *Fragm.* 1: 174 (1859)

T: banks of Sturt Creek, [?W.A.], 1856, *F. Mueller*; neo (here nominated): MEL.

When Mueller described *T. oxycalyptra* he cited the collection ‘in deserto ad flumen Sturt’s Creek’ but cited no collections for var. *sessiliflora* or var. *pedunculata*, described at the same time. The above lectotype and neotype are chosen to fix the application of the names and to allow var. *pedunculata* to be placed in synonymy under var. *oxycalyptra* as a *nom. illeg.*

Trianthema triquetra var. **clavata** (J. Black) H. Eichler, *Suppl. J. M. Black’s Fl. S. Australia 2nd edn*, 136 (1965)

T. crystallina var. *clavata* J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 47: 369 (1923). T: between Hergott and Innamincka, S.A., June 1916, *R. Cockburn*; lecto (here chosen): AD.

The lectotype is one of three collections cited by Black. It is the least fragmentary of the specimens, agrees well with Black’s description and was probably used for drawings on the herbarium sheet.

CHENOPODIACEAE

G. A. Parr-Smith

Atriplex nana Parr-Smith, sp. nov.

Fruticulus ad 20 cm altus, dioecius. Folia anguste elliptica, acuta, 5–14 (plerumque 7–8) mm longa, plerumque navicularia, integra, indumento crasso-lepidoto. Flores masculi in spico ad 10 mm longo congesti. Flores feminei 1–3, axillares. Fructus bracteolae breviter pedicellatae; pedicellus cylindricus, 1–2 mm longus; valvae liberae, late deltoideae, c. 6 mm longae, saepe leviter cordatae; appendiculae vesicoideae ad centro valvae affixae, plerumque dentatae vel tuberculatae, interdum hippocrepiformae.

T: 8.3 miles (c. 13.3 km) S of Wiluna, near Mt Sir Samuel, W.A., *G. A. Parr-Smith 1159a*; holotype: CANB, iso: PERTH.

Name from the Latin *nanus* (dwarf), referring to the relatively small size of the plant.

Atriplex paludosa R. Br. subsp. *moquiniana* (Webb ex Moq.) Parr-Smith, comb. et stat. nov.

A. moquiniana Webb ex Moq. in DC., *Prodr.* 13(2): 97 (1849). T: south-western W.A., *J. Drummond s.n.*; holotype: P, photo seen.

Atriplex vesicaria Heward ex Benth., *Fl. Austral.* 5: 172 (1870)

T: 'Queensland. In the interior, *Mitchell*. N.S.Wales. Molle's plains, *A. Cunningham*; Murray and Darling desert, Victorian Expedition, *F. Mueller*. S. Australia. Crystal Brook, *F. Mueller*; Gawler Ranges, *Sullivan*.'; lectotype (here chosen): Molles Plains, N.S.W., July 1817, *A. Cunningham 388*; lectotype: K, iso: BM, MEL.

Atriplex vesicaria Heward ex Benth. subsp. **vesicaria**

A. paludosa var. *obovata* Moq., *Chenop. Monog. Enum.* 66 (1840); Moq. in A. DC., *Prodr.* 13(2): 102 (1849). T: none cited in 1840; in 1849 '*Cunningh.! Drummond!*'; lectotype (here chosen): Molles Plains, July 1817, *A. Cunningham 385*; BM, iso: K.

Atriplex vesicaria subsp. **appendiculata** (Benth.) Parr-Smith, comb. et stat. nov.

A. paludosa var. *appendiculata* Benth., *Fl. Austral.* 5: 170 (1870). T: 'NW of the head of the Great Bight. *Delisser. n.v.*

Cited as *A. vesicaria* 'southwestern' by G. A. Parr-Smith in Barker & Greenslade, *Evolution of the Flora and Fauna of Arid Australia* 291 (1982).

Atriplex vesicaria subsp. **calvicola** Parr-Smith, subsp. nov.

Atriplex vesicaria subsp. *variabilis* affinis a qua imprimis foliis late orbicularibus rotundatis vel emarginatis 8–10 mm longis, et bracteolis attenuatis integris, differt.

T: Hard loam plain, with travertine limestone, NW corner of Koonamore Vegetation Reserve, Koonamore Stn, S.A., 3 May 1982, *M. Crisp 429*; holotype: PERTH, iso: CANB.

Named from the Latin *calx* (lime) and *cola* (an inhabitant), in allusion to its preferred habitat. Cited as *A. vesicaria* 'limestone form' by G. A. Parr-Smith, *loc. cit.*

Atriplex vesicaria subsp. **incompta** Parr-Smith, subsp. nov.

Folia elliptica vel obovata apice rotundata, 8–15 mm longa, integra. Bracteolae fructiferae sessiles vel breviter pedicellatae; valvae cordato-triangulares vel orbiculares, integrae, sine appendicibus vesicoideis.

T: edge of Yarra Yarra Lake, W.A., 17 Sept. 1971, *G. A. Parr-Smith 1152*; holotype: CANB.

Named from the Latin *incomptus* (unadorned), referring to the consistent lack of appendages on the fruiting bracteoles. Cited as *A. vesicaria* 'bladderless form' by G. A. Parr-Smith, *loc. cit.*

***Atriplex vesicaria* subsp. *macrocystidia* Parr-Smith, subsp. nov.**

Folia obovata, rotundata vel obtusa, 10–30 mm longa, integra. Bracteolae fructiferae sessiles vel breviter pedicellatae; valvae late orbiculares, obtusae vel leviter mucronatae, ad 9 mm longae et 12 mm latae, versus basim connatae, integrae vel versus apicem paucidentatae; appendices vesicoideae valvis fere aequales, prope basim valvarum adnatae, plerumque infra valvarum connatae.

T: Oak Park, c. 32 km S of Yunta, S.A., 2 Oct. 1971, *N. N. Donner 3725*; holotype: AD, isotype: PERTH.

Named from the Greek *macro* (large) and Greek-Latin *cystidium* (cystidium), in reference to the large bladders on the fruiting bracteoles. Cited as *A. vesicaria* 'large bladder' by G. A. Parr-Smith, *loc. cit.*

***Atriplex vesicaria* subsp. *minor* (Aellen) Parr-Smith, comb. et stat. nov.**

A. hymenotheca var. *minor* Aellen, *Bot. Jahrb. Syst.* 68: 387 (1938). T: Booroobran, N.S.W., 1910. F. A. G. Fisher; isotype: NSW.

***Atriplex vesicaria* subsp. *sphaerocarpa* Parr-Smith, subsp. nov.**

Folia anguste elliptica vel ovata, obtusa vel leviter retusa, plerumque integra; lamina 8–15 mm longa; petiolus c. 2 mm longus. Flores feminei nigri. Bracteolae fructiferae pedicello 2–3 mm longo autem ut videtur sessiles; valvae super semen connatae, late orbiculares vel rhomboideae (ut videtur globosae), acutae vel mucronatae, ad 10 mm longae et latae, integrae vel sparse dentatae; appendices vesicoideae valvis superantes, ad valvas omnino adnatae.

T: North Lake Gairdner, Wirramirra–Coondambo netting, 100 km W of Woomera, S.A., 6 Aug. 1971, *B. G. Lay 317*; holotype: AD.

Named from the Greek *sphaera* (a sphere) and *carpos* (fruit), referring to the globose nature of the bracteoles and fused appendages. Cited as *A. vesicaria* 'hills form' by G. A. Parr-Smith, *loc. cit.*

***Atriplex vesicaria* subsp. *variabilis* Parr-Smith, subsp. nov.**

Folia anguste elliptica, acuta vel obtusa, 10–15 mm longa. Bracteolae fructiferae sessiles; valvae orbiculares, ad basim liberae, 7–11 mm longae, integrae vel versus apicem prominente bidentatae; appendices vesicoideae bracteolis breviores vel absentes.

T: 9 miles (c. 14 km) S of White Cliffs on road to Wilcannia, N.S.W., 12 July 1971, *G. A. Parr-Smith 1117v*; holotype: CANB.

Named from the Latin *variabilis*, referring to the very variable nature of the subspecies. Cited as *A. vesicaria* 'Small Bladder form' by G. A. Parr-Smith, *loc. cit.*

Acknowledgement: I am indebted to Mr Paul Wilson (PERTH) for his considerable assistance in preparing this Appendix.

CHENOPODIACEAE

Paul G. Wilson

Atriplex sect. **Dialysex** Moq., *Chenop. Monogr. Enum.* 64 (1840)Lectotype (here chosen): *A. cinerea* Poir.

Seven species were included by Moquin in this section, of which five are endemic in Australia and two in America. I have selected the first species listed by him as the type.

Atriplex sect. **Spongiocarpus** F. Buxb., *Verh.-Zool. Bot. Ges. Wien* 76: 44 (1927)Lectotype (here chosen): *A. spongiosa* F. Muell.

Five species were included by Buxbaum in this section, namely *A. spongiosa* F. Muell., *A. holocarpa* F. Muell., *A. lindleyi* Moq., *A. inflata* F. Muell. and *A. lampifer* F. Buxb., the last being a synonym of *A. lindleyi* subsp. *inflata* (F. Muell.) Paul G. Wilson.

Atriplex amnicola Paul G. Wilson, sp. nov.

Frutex effusus ad 1.5 m altus, dioecius. Folia breviter petiolata; lamina anguste elliptica, anguste oblonga, vel anguste hastata, lobis basalibus divaricatis, 10–25 mm longa, integra vel remote denticulata. Glomeruli florum masculorum c. 5 mm diam. in spicis terminalibus dispositi. Flores feminei axillares vel in spicis brevibus terminalibus dispositi. Bracteolae ovoideae vel flabellatae marginibus connatis, 4–6 mm latae, omnino durae vel marginibus herbaceae; appendiculae absentibus.

T: Yalgoo, W.A., 10 Oct. 1945, C. A. Gardner 7751a; holo: PERTH.

Found in the central west area of W.A.

The specific epithet, from the Latin *amnis* (river) and *-cola* (an inhabitant), refers to one of the preferred habitats.

Atriplex codonocarpa Paul G. Wilson, sp. nov.

Herba annua c. 30 cm alta, monoecia. Folia papyracea; lamina rhomboidea vel suborbicularis vel late obovata, 1.5–3 cm longa, acuta vel obtusa, grosse sinuato-dentata; petiolus gracilis lamina 2-plo brevior. Flores in glomerulis axillaribus. Bracteolae fructiferae sessiles vel raro tenuiter pedicellatae, connatae, spongiosae, turbinatae vel campanulatae, 5–10 mm longae; apex horizontalis, in centro apiculatus, in margine alatus; ala horizontalis integra vel sinuata 7–15 mm diam.

T: W margin, Lake Barlee, W.A., c. 29°10'S, 119°06'E, 26 Aug. 1970, P. G. Wilson 8861; holo: PERTH, iso: CANB, MEL.

Found in the western half of W. A. south of Roebourne but absent from the wetter SW of the State.

The specific epithet, from the Greek *codon* (dell) and *carpos* (fruit), alludes to the bell-shaped appearance of the bracteoles.

Atriplex flabelliformis Paul G. Wilson, sp. nov.

Herba perennis usque ad 35 cm altam, monoecia. Folia papyracea, anguste-elliptica vel elliptica, c. 10 mm longa, integra vel leviter sinuata, sessilia vel breviter petiolata. Flores in glomerulis axillaribus vel in spicis brevibus. Bracteolae fructiferae sessiles vel breviter pedicellatae, flabelliformes vel campanulatae; dimidium inferius tubus cylindricus formans, tubo tuberculato vel tenuiter papilloso; lobi applanati, late deltoidei vel flabelliformes, reticulati, sinuato-dentati, 1.5 mm long., 3.5 mm lat.

T: Well 39, Canning Stock Route, W.A., c. 21°46'S, 125°39'E, 5 May 1979, A. S. George 15612; holo: PERTH, iso: CANB, NT.

Found in the Great Sandy Desert of W.A. and the Tanami Desert of N.T.

The Latin epithet *flabelliformis* (fan-shaped) refers to the shape of the bracteoles.

Atriplex humifusa Paul G. Wilson, sp. nov.

Herba perennis, effusa, prostrata vel erecta, monoica. Folia papyracea, subsessilia, elliptica, late elliptica, vel obovata, 8–30 mm longa, obtusa, vel rotundata, integra vel repando-dentata. Flores masculi in glomerulis axillaribus vel in spicis brevibus terminalibus positi. Flores feminei in axillis distalibus dispositi. Bracteolae fructiferae subsessiles vel breviter pedicellatae; valvae liberae, tenues, applanatae, deltoideae vel cordatae, 4–6 mm longae et latae, acutae, integrae vel sparse denticulatae, reticulatae.

T: 2.5 miles (c. 4 km) NW of Kunoth Well, Hamilton Downs Stn, N.T., 31 May 1973, D. J. Nelson 2272; holo: PERTH, iso: CANB, NT.

Found in southern N.T. and neighbouring areas of Qld.

The specific epithet, Latin for spreading or procumbent, refers to the habit of the plant.

Atriplex infrequens Paul G. Wilson, nom. nov.

Atriplex microcarpa Benth., *Fl. Austral.* 5: 176 (1870) *nom. illeg.*, non *A. microcarpa* (Benth.) Moq. ex D. Dietr., *Syn. Pl.* 5: 536 (1852).

Atriplex leptocarpa var. *acuminata* J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 46: 68 (1922)

T: 'Tarcoola; Ooldea'; lecto (here chosen): Tarcoola, 22 Sept. 1920, E. H. Ising; AD.

Atriplex lindleyi Moq. in A. DC., *Prodr.* 13(2): 100 (1849) 1: 282 (1838) *nom. illeg. non* Tineo (1827). T: Interior of New

A. halimoides Lindley in T. Mitch., *Three Exped. Australia Holland, 1835*, T. L. Mitchell; holo: CGE.

This species, as here circumscribed, consists of a number of variants which grade into each other. These variants are here segregated into 4 not clearly demarcated subspecies.

Atriplex lindleyi Moq. subsp. **lindleyi**

The type of *Atriplex lindleyi* was evidently collected by Mitchell in central N.S.W. near the Darling River, c. 20 km N of Greenoughs Hill. It has elliptic, acute leaves and spongy bracteoles with dorsal and ventral wings and a prominent central apex. This type collection is intermediate in morphology between *A. lindleyi* subsp. *inflata* and *A. lindleyi* subsp. *conduplicata*.

Atriplex lindleyi subsp. **conduplicata** (F. Muell.) Paul G. Wilson, comb. et stat. nov.

A. conduplicata F. Muell., *Austral. J. Pharm.* 1: 429 (1886)

T: 'In the vicinity of the Darling-River and some of its tributaries; C. King, L. Singleton'.

I have been unable to find any syntype associated with this name, but Mueller's description is clearly diagnostic.

Atriplex lindleyi subsp. **inflata** (F. Muell.) Paul G. Wilson, comb. et stat. nov.

A. inflata F. Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 75 (1858); *Blackiella inflata* (F. Muell.) Aellen, *Bot. Jahrb. Syst.* 68: 426 (1938). T: 'Eastern subtropical Australia. Sir Thomas Mitchell. Frequent in the desert on Lake Torrens, the Murray, Darling, Murrumbidgee, Dawson and Burnett River'; lecto (here chosen): in the Murray Desert, *without collector*; MEL 607091.

Mueller's concept of *Atriplex inflata* appears to have encompassed material correctly referred to *A. lindleyi* subsp. *lindleyi*, subsp. *conduplicata*, and subsp. *inflata* sensu *lectotypica*. One of the syntype specimens in herb. K, referable to the first of these subspecies, was collected by T. L. Mitchell and may, in fact, be a duplicate of the holotype of *A. lindleyi* in herb. CBG, but since the Kew specimen is not numbered this suggestion cannot be verified (if it were correct then the name *A. inflata* would be illegitimate being superfluous). Another probable syntype of *A. inflata* is a specimen (MEL 607089) collected by C. Wilhelmi 'near Lake Hindmarsh' (probably near Lake Hamilton); this collection (which is also the type of *Pachypharynx acuminata* Aellen, 1938) is actually a galled specimen of *A. paludosa* subsp. *cordata* (Benth.) Aellen. The name *Atriplex inflata* is here lectotypified in the sense of the plant with subglobose fruiting bracteoles with a curved upper surface and a very narrow horizontal wing.

***Atriplex lindleyi* subsp. *quadripartita* Paul G. Wilson, subsp. nov.**

A. lindleyi var. *quadripartita* J. Black, *Fl. S. Australia* 2nd edn, 300 (1948) *nom. inval.*

Bracteolae fructiferae spongiosae dorsiventraliter compressae; tubus 5 mm altus, apice in alam profunde 4-lobatam transcenti, lobo dorsali et lobo ventrali erectis late oblongis vel semiorbicularibus c. 5 mm altis, lobis lateralibus minoribus divaricatis; lobi apicales liberi, parvi, c. 1 mm alti.

T: 1.0 km SW of Kalabitty Homestead, S.A., 26 July 1976, *L. D. Williams* 8393; holo: AD.

Found in S.A., on the W side of the northern Flinders Range and E to western N.S.W.

The varietal epithet, from the Latin *quadri-* (four-) and *partitus* (parted, divided), refers to the 4-lobed appearance of the united bracteoles.

***Atriplex obconica* Paul G. Wilson, sp. nov.**

Herba annua rotundata, c. 30 cm alta, monoica. Folia papyracea; lamina late obovata vel rhomboidea, 10–15 mm longa, sinuato-dentata, petiolo 2-plo longior. Flores in glomerulis axillaribus. Bracteolae fructiferae connatae, subcampanulatae, alatae, sessiles; tubus obconicus, dorsi-ventraliter compressus, c. 3 mm longus, leviter inflatus, fibrosus; ala horizontalis, circularis, vel undulata, reticulata, fere circularis, leviter sinuata vel profunde divisa, alas 2 semicirculares formantes. Fig. 20D.

T: S end of Wilkinson Lake East, S.A., 27 Sept. 1971; *B. Lay* 512; holo: AD.

Found in northern and central S.A. in the North-western and Lake Eyre regions.

The specific epithet, from the Latin *conicus* (conical) with the prefix *ob-* (reversed), refers to the shape of the fruiting bracteoles.

***Atriplex pseudocampanulata* Aellen, *Bot. Jahrb. Syst.* 68: 365 (1937)**

T: Mildura, Vic., Oct. 1928, *H. B. Williamson*; lecto (here chosen): K *n.v.*; iso: MEL 607121.

Under the above name Aellen listed two varieties, viz. var. *inappendiculata* (R. Anderson) Aellen and var. *appendiculata* Aellen; he did not indicate which of these represented the typical variety and he did not cite a type for the species. I have selected a type so as to make var. *appendiculata* nomenclaturally the same as var. *pseudocampanulata*; the former varietal name therefore becomes illegitimate.

A. pseudocampanulata var. *appendiculata* Aellen, *op. cit.* 366, *nom. illeg.* T: 'Vic Mildura, 1928, *H. B. Williamson* (Kew). N.S.W.: Zara via Hay, 1904, *Miss E. Officer* (Wien).'; lecto (here chosen): Mildura, Oct. 1928, *H. B. Williamson*; K *n.v.*; iso: MEL 607121.

A. pseudocampanulata var. *inappendiculata* (R. Anderson) Aellen, *op. cit.* 366; *A. campanulata* var. *inappendiculata* R. Anderson, *Proc. Linn. Soc. New South Wales* 55: 497 (1930) non Aellen (1937). T: 'Murrumburrah Town Clerk, 5/1911; Zara Station, *Miss E. Officer*, 5/1905'; lecto (here chosen): Murrumburrah, N.S.W., May 1911, *Town Clerk*; NSW 151164.

Atriplex rhagodioides F. Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 74 (1858).

T: 'In the saline desert on the River Murray and Darling and Lake Torrens'; lecto (here chosen): Murray Desert, *F. Mueller*; MEL 607127.

Mueller's concept of the above species evidently also included material now referred to *A. incrassata* F. Muell. and *A. nummularia* Lindley. It is here lectotypified so as to apply the name to the plant found in the Murray River region of S.A. and neighbouring areas of N.S.W. and Vic.

Atriplex semilunaris Aellen, *Bot. Jahrb. Syst.* 68: 382 (1937)

T: five collections, all from W.A.; lecto (here chosen): banks of Ashburton River, Munderoo, W.A., 11 Oct. 1905, A. Morrison 15119; K n.v.; iso: PERTH.

Atriplex spinulosa Paul G. Wilson, sp. nov.

Herba annua rotundata c. 20 cm alta monoica. Folia papyracea; lamina late-elliptica vel rhomboidea, 10–15 mm longa, obtusa, sinuato-dentata; petiolus c. 5 mm longus. Flores masculi in glomerulis terminalibus spiciformibus positi. Flores feminei axillares vel floribus masculis immixti. Bracteolae fructiferae sessiles vel breviter pedicellatae, rhomboideae, c. 2.5 mm longae et latae; pars inferior connata campanulata biconvexa, spinis 5–12 in quoquo superficiebus; pars superior applanata acute lobata.

T: $\frac{3}{4}$ mile (c 1.2 km) N of Nullagine on Marble Bar Road (near Great Northern Highway), W.A., 6 Aug. 1974, G. W. Carr 4666 & A. C. Beauglehole 48444; holo: PERTH.

Only known from near Nullagine in the Pilbara region of north-west W.A.

This species may be readily recognised by the spines that arise from the fruiting bracteoles. In vegetative appearance it is similar to *A. semibaccata* with which it may hybridise, since the two specimens of a collection from Nullagine (*A. C. Beauglehole* 48447, PERTH) are intermediate in appearance between those two species but are sterile.

The Latin specific epithet refers to the spiny nature of the bracteoles.

Atriplex spongiosa F. Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 74 (1858)

T: 'On salt flats at Lake Torrens; also on Hooker's Creek and Sturt's Creek, in North-western Australia'; lecto (here chosen): Sturt Creek, W.A., *F. Mueller*; MEL 607132.

The name *Atriplex spongiosa* is sometimes used in the broad sense to include plants which at their extremes are of two variants; one with broad, petiolate leaves and spherical to obovoid fruiting bracteoles and the other with elliptic, almost sessile leaves and ellipsoidal to spherical fruiting bracteoles. The original description of *A. spongiosa* encompasses both variants; the lectotype from Sturt Creek is of the latter while the plant with broad leaves is regarded as a distinct species — *Atriplex holocarpa* F. Muell.

Dissocarpus biflorus var. **cephalocarpus** (F. Muell.) A. J. Scott, *Feddes Repert.* 89: 118 (1978)

Sclerolaena biflora var. *cephalocarpa* F. Muell., *Fragm.* 8: 38 (1873). T: 'Hanc varietatem sinum Broad Sound versus reperit *Ed Bowman*, et inter Roman et Barcoo *C. W. Birch*.'; lecto (here chosen): between the Barcoo and the Roma, Qld, 1871, *C. W. Birch*; MEL 101425.

Dissocarpus fontinalis Paul G. Wilson, sp. nov.

Suffrutex c. 60 cm altus. Rami graciles arcte lanati. Folia gracilia semiteretia, c. 10 mm longa, lanata. Flores sessiles lanati, 5-lobati, 8–12 in glomerulis densis axillaribus connati; stamina 5. Perianthia fructifera, connata, lignosa, lanuginosa; aliquot projecturae spinosae applanatae e tubo ortae. Semen horizontale. Fig. 40A–B.

T: Giddi Giddina, S.A., 28°46'S, 135°12'E, 21 Sept. 1966, *South Australia Pastoral Board*; holo: AD97633177, iso: AD97845040.

Found in north-eastern S.A. and neighbouring areas in Qld and N.S.W.

This species resembles *Dissocarpus paradoxus* (R. Br.) Ulbr.; it differs principally in not having tepaline spines arising from the back of the perianth lobes, but rather has many flattened, spine-like processes which arise irregularly from the fused bases of the perianths.

The Latin specific epithet alludes to the plant's preferred habitat — near springs or creeks.

Dissocarpus latifolius (J. Black) Paul G. Wilson, comb. et stat. nov.

Bassia paradoxa var. *latifolia* J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 46: 567 (1922). T: Strzelecki Creek, S.A., 29 Sept. 1916, S. A. White; holo AD.

Enchylaena lanata Paul G. Wilson, sp. nov.

Suffrutex rotundatus 15–60 cm altus. Rami arcte lanati. Folia anguste fusiformia, c. 10 mm longa, modice villosa. Perianthium fructiferum globosum vel cupulatum, c. 5 mm diam., pubescens, sursum in ala erecta undulata c. 1 mm alta productum; fissura-radicularis verticalis, in tubo et ala extensa. Fig. 36D–F.

T: 5 km E of Karonie, W.A., 1 Sept. 1968; *Paul G. Wilson 7596*; holo: PERTH; iso: CANB, K, NSW.

Found in inland south-western W.A.

Enchylaena lanata differs markedly from *E. tomentosa* R. Br. in having a hairy perianth. The perianth always has a short erect undulate wing whereas in *E. tomentosa* the wing is either absent or represented by a very short inflexed enation.

The epithet, from the Latin *lanatus* (woolly), refers to the indumentum on the perianth.

Enchylaena pubescens Moq. in A. DC., *Prodr.* 13(2): 128 (1849)

T: 'in Nova-Hollandia (h. Hook.!) secus Swan-river (Drummond?)'; lecto (here chosen): subtropical New Holland, 2 Apr. 1846, *T. L. Mitchell* 53; K.

I have not seen the Drummond specimen referred to by Moquin. The Mitchell collection has woolly insect galls and is evidently a diseased specimen of *Enchylaena tomentosa* R. Br.; it was annotated by Moquin.

Enchylaena tomentosa var. **glabra** Benth., *Fl. Austral.* 5: 182 (1870)

T: 'Bay of Inlets, *Banks and Solander*; Brisbane river, *F. Mueller*; Darling river, *Victorian Expedition*; between Stokes Range and Cooper's Creek, *Wheeler*.'; lecto (here chosen): Brisbane River, July 1855, *F. Mueller*; MEL.

Eremophea Paul G. Wilson, gen. nov.

Fruticosi, dense tomentosi pilis stellatis et dendriticis. Folia alterna sessilia, integra, carnosa, foliis floralibus saepe aggregatis. Flores in quoque axilla 1 vel 3, bisexuales; perianthium 5-lobatum; stamina 5. Perianthium fructiferum lignosum in ramo immersum; spini duri, e lobis perianthii orti. Semen erectum; perispermium centrale.

T: *E. aggregata* Paul G. Wilson

Two species endemic in Australia.

This genus appears to be most closely related to the genera *Sclerolaena* and *Dissocarpus*. From the former it may be distinguished by the spines which arise from the base of the perianth lobes (not alternate to them) and from the latter by the erect seeds and by the fruits, whether solitary or in triads, being borne directly on the branches and embedded

in its axis, not as axillary infructescences. From both genera, *Eremophea* may be distinguished by its stellate and dendritic indumentum.

The name is derived from the Greek *eremia* (desert) and *philius* (loving), in reference to the preferred habitat of some populations of *E. spinosa*. Gender: feminine.

Eremophea aggregata Paul G. Wilson, sp. nov.

Folia gracilia semiteretia, 10–20 mm longa, divaricata. Flores in cymis axillaribus trifloribus dispositi, in inflorescentiis globosis aggregatis. Perianthium fructiferum cylindricum, c. 4 mm longum; spinae erectae c. 2.5 mm longae e basi loborum ortae. Fig. 39.

T: 1 km W of White Bluff, Yaringa Stn, W.A., 13 Nov. 1982, R. J. Cranfield 2580; holotype: PERTH, iso: CANB, K.

Known only from the type locality between Geraldton and Carnarvon, W.A.

Eremophea aggregata superficially resembles *Dissocarpus paradoxus* (R. Br.) Ulbr. It differs from that species in having flowers in groups of three with each triad subtended by a single leaf, while the triads themselves are clustered in leafy infructescences along the branch. In *D. paradoxus* the flowers are arranged in leafless axillary glomerules.

Eremophea spinosa (Ewart & O. B. Davies) Paul G. Wilson, comb. nov.

Bassia spinosa Ewart & O. B. Davies, *Fl. Northern Territory* 95 (1917); *Bassia eremaea* Ising, *Trans. Roy. Soc. S. Australia* 88: 93 (1964), *nom. illeg.* (superfluous name). T: Bundooma, E. Reichenbach; holotype: AD.

The nature of the masses formed by the aggregated fruits in *Eremophea spinosa* has been the subject of some discussion. G. Chippendale, *Trans. Roy. Soc. S. Australia* 83: 199 (1960), stated that they were insect galls, an observation repeated by Ising, *loc. cit.* Ising noted that in these masses, which were present in the type material, he found 'irregular tunnelling in which was an empty case or shell of the vacated insect'. Recent examination of a number of these clusters from several collections has shown them to contain several mature seeds, with no evidence of insect attack. The swellings on the branches appear to be a response to the development of the fruits which thereby become embedded.

Ising described *Bassia eremaea* as a new species since he considered the name *B. spinosa* to be based on a monstrosity and therefore illegitimate according to the edition of the *International Code of Botanical Nomenclature* current in 1964. The relevant Article was deleted at the 1975 International Botanical Congress. The name *Bassia spinosa* is therefore legitimate whether or not the woody infructescences on the type specimen are considered galls.

The spines on the fruiting perianth arise at the base of the perianth lobes (as they do in *Dissocarpus*) but very early become fused into two groups to form a stout adaxial 3-pronged spine and a smaller abaxial 2-pronged spine. Their tepaline origin is thus very soon obscured.

Osteocarpum acropterum (F. Muell. & Tate) Volkens, *Nat. Pflanzenfam.* 3(1a): 72 (1893)

Babbagia acroptera F. Muell. & Tate, *Trans. & Proc. Roy. Soc. S. Australia* 6: 108 (1883). T: 'On loamy soils, from the slopes of the Aroona-Range to Lake Torrens, R. Tate. Near Mount Murchison, Dr. Beckler; between Stokes Range and Cooper's Creek, Howitt.'; lectotype (here chosen): Lake Torrens Plain, S.A., Aug. 1883, R. Tate; MEL 102306.

Osteocarpum acropterum* var. *deminutum (J. Black) Paul G. Wilson, comb. nov.

Babbagia acroptera var. *deminuta* J. Black, *Trans. & Proc. Roy. Soc. S. Australia* 46: 568 (1922). T: Port Augusta West, S.A., 29 Sept. 1920, J. M. Black; holotype: AD.

Osteocarpum diptero carpum (F. Muell.) Volken, *Nat. Pflanzenfam.* 3(1a): 72 (1893)

Babbagia diptero carpa F. Muell., *Rep. Pl. Babbage's Exped.* 21 (1859).

T: 'Stuart's Creek, Elizabeth Creek, Weelpederoona'; lecto (here chosen): Stuarts Creek, *Babbage's expedition*; MEL 102307.

Osteocarpum salsuginosum F. Muell., *Trans. & Proc. Philos. Inst. Victoria* 2: 77 (1858)

T: 'On the saline plains of Lake Torrens, the Darling and Murray River. Also in eastern subtropical Australia, found by *Sir Thomas Mitchell*'; lecto (here chosen): Cudnaka, Lake Torrens, S.A., *F. Mueller*; MEL 102303.

Roycea divaricata Paul G. Wilson, sp. nov.

Frutex c. 0.6 m altus. Rami divaricati, spinescentes, sparse pubescentes mox glabri, nigri. Folia alterna, dense fasciculata in ramis principalibus, anguste triangulares, c. 2 mm long, appressa, carinata, carnosa, ad basin calcarata, glabra (vel in statu juvenili sparse pubescentes); in ramis nanis dense congesta, late ovata, 0.5–1 mm longa. Flores in ramis nanis positi, bisexuales. Tepala libera, late ovata, 1.5 mm longa, extus sparse pubescentia, marginis membranaceis. Filamenta staminalia sparse pubescentia. Ovarium anguste ovoideum, sericeum. Fructus depresso-sphericus, c. 3 mm altus; pericarpium crustaceum. Semen obliquum.

T: 11 km N of Koorda on road to Mollerin, W.A., 13 Mar. 1968; *P. G. Wilson 6465*; holo: PERTH; iso: CANB.

Found in semi-arid inland areas of south-western W.A.

The specific epithet refers to the spreading branches.

Sclerolaena alata Paul G. Wilson, sp. nov.

Herba perennis erectus, c. 20 cm altus. Rami graciles modice appresse-hirsuti. Folia alterna, sessilia, linearia, c. 5 mm longa, 0.6 mm lata, carnosa, sparse appresso-hirsuta. Flores solitarii axillares; perianthium modice appresso-hirsutum, parte inferiore carnosum, superiore membranaceum 5-lobatum; stylus gracilis, sparse hirsutus. Perianthium fructiferum sparse appresso-hirsutum; tubus lignosus, turbinatus, 10-costatus, c. 2.5 mm altus, basi truncatus concavus; alae 4+2, intertepalinae, oblongae, c. 2.5 mm longae, apice laceratae ad summum tubi horizontaliter radiatae; stylus validus c. 1.5 mm longus. Semen horizontale, crassum; embryo circularis, radícula centrifuga. Fig. 48 I.

T: Nookawarra Stn, 57.4 miles (c. 92 km) N of Murgoo–Wooleen–Boolarly Junction, W.A., c. 26°18'S, 116°54'E, 26 Aug. 1974, *A. M. Ashby 5054*; holo: PERTH; iso: AD, CANB, K.

Found in inland W.A. between 24° and 27°S latitude.

Sclerolaena alata is similar in appearance to *S. tridens* (F. Muell.) Domin but the flowers are 5-merous (not 3-merous) and the spines of the perianth have a 4+2 arrangement (not 2+2) with the neighbouring pair of smaller spines being positioned opposite the radicle. The two species have quite different indumenta.

Named from the Latin *alatus* (winged) in reference to the winged spines of the fruit.

Sclerolaena cuneata Paul G. Wilson, sp. nov.

Herba perennis rotundatus praeter axillos foliorum glaber. Folia tenuia teretia 10–20 mm longa carnosa. Flores solitarii; perianthium tepalis lanato-ciliatis aliter glabrum; stamina 5. Perianthium fructiferum lignosum, glabrum; tubus oblongo-obcuneatus, dorsiventraliter compressus, c. 3 mm longus, basi rotundatus obliquus; spinae 3 (raro 4), ± horizontales, graciles, 8–15 mm longae, eorum 2 laterales, et 1 abaxialis; limbus arcte incurvus. Semen et radícula erecta. Fig. 47K.

T: Mount Stuart, E of Tibooburra, N.S.W., 21 Oct. 1949; *E. F. Constable*; holo: NSW 10492.

Widespread in inland Australia excluding Victoria.

This species has been confused with *Sclerolaena divaricata* (R. Br.) Smith, but the latter has only three stamens and has its lateral spines in line with each other. *Sclerolaena cuneata* is most closely related to *S. glabra* (F. Muell.) Domin and *S. blakei* (Ising) A. J. Scott. *S. glabra* has a similar fruit but its 2 radicular spines are both very short and are curved adaxially, and it has 5 stamens. *S. blakei* has a differently shaped perianth tube and has the longer of the radicular spines down-curved.

There is some regional variation in this widespread species. In N.S.W. and S.A. the larger of the radicular spines is usually curved towards the branch whereas in W.A., it is straight although slightly deflected adaxially. In Qld the fruits are smaller and have more slender spines than in plants found elsewhere.

The Latin epithet *cuneatus* (wedge-shaped), refers to the shape of the fruit.

Sclerolaena deserticola Paul G. Wilson, nom. et stat. nov.

Bassia quinquecuspis var. *lanata* Ising, *Trans. Roy. Soc. S. Australia* 88: 97 (1964). T: 24 miles (c. 38 km) S of Barrow Creek township, N.T., 3 Sept. 1955, R. A. Perry 5353; holo: CANB; iso: NSW, NT.

The epithet, from the Latin *desertum* (desert) and the suffix *-cola* (growing in), refers to the habitat of the plant.

Sclerolaena fusiformis Paul G. Wilson, sp. nov.

Herba perennis rotundatus, ad 20 cm altus, praeter axillos foliorum glaber. Folia fusiformia, 3–5 mm longa. Flores solitarii. Stamina 3. Perianthium fructiferum glabrum; tubus breviter cylindraceus, leviter dorsiventraliter compressus, c. 1.5 mm altus et latus, leviter costatus, basi parum obliqua circulari; limbus parvulus parum concavus; spinae 2+2, graciles, spinis abaxialibus lateraliter dispositis ascendentibus 6–8 mm longis, spinis abaxialibus contiguus collateralibus c. 1 mm et 0.5 mm longis inter spinas laterales positus. Semen et radícula erecta. Fig. 46H.

T: 14 km NE of Southern Cross on road to Koolyanobbing, W.A., 12 Mar. 1968, P. G. Wilson 6433; holo: PERTH; iso: NSW.

Found in the central southern area of W.A., around Kalgoorlie.

This species has been confused with *Sclerolaena drummondii* (Benth.) Domin, but the latter has flattened hirsute leaves, 5 stamens, and fruiting perianths in which the pair of radicular spines is adjacent to one of the large lateral spines.

The Latin specific epithet refers to the spindle-shaped leaves.

Sclerolaena medicaginoidea Paul G. Wilson, sp. nov.

Frutex ad 0.5 m altus, praeter axillos foliorum glaber, dioicus. Folia anguste fusiformia, 5–8 mm longa, carnosae. Flores solitarii, unisexuales, congesti. Perianthium urceolatum membranaceum glabrum. Stamina 5. Infructescentia condensata, spicata. Perianthium fructiferum persistens, urceolatum, dorsiventraliter compressum, 3.5–5 mm altum, 2.5–4 mm latum, papyraceum glabrum, limbo erecto; basis verticaliter affixa; spinae 5–9, divaricatae vel curvatae, 3–5 mm longae, 1 adaxiali, ceterum lateralibus et abaxialibus. Semen depressum; radícula ascendens. Fig. 47H.

T: Yinnietarra Stn, W.A., Sept. 1970, D. G. Wilcox 162; holo: PERTH.

Occurs in W.A. c. 300 km NE of Carnarvon on gneissic plain in slightly saline soil.

The condensed spikes and papery fruiting perianths of this species are remarkable. The mature infructescences break away and eventually disarticulate between the fruitlets.

The specific epithet, from the genus *Medicago* with the suffix *-oides* (resembling), refers to the superficial resemblance of the fruit to those of some species of *Medicago*.

Sclerolaena napiformis Paul G. Wilson, sp. nov.

Herba perennis erectus, c. 30 cm altus. Ramuli graciles, sparse gossypini. Folia linearia, 10–15 mm longa, sparse appresso-hirsuta. Flores solitarii. Stamina 5. Perianthium fructiferum sparse hirtellum; tubus late turbinatus, c. 3 mm altus, apice 3 mm latus, lignosus; basis applanata horizontalis circularis, c. 1.2 mm diam.; apex leviter convexus; limbus inconspicuus; spinae 4+2 radiatim, divaricatae; spinae majores 4, 2.5–4 mm longae; spinae minores 2, ad 1 mm longae, e calcari brevi ortae. Semen horizontale; radicula adscendens.

T: Jerilderie, 4 miles (c. 6.4 km) along Coree road, N.S.W., 6 Nov. 1965, *E. D'Arny* 424; holo: CANB; iso: NSW.

The Latin specific epithet alludes to the turnip-shape of the fruiting perianth.

Sclerolaena diacantha var. *longispina* Benth., *Fl. Austral.* 5: 195 (1870).

T: 'Darling desert, Victorian Expedition; Murray River, *F. Mueller*; Wimmera, Dallachy; Gawler ranges, Sullivan; towards Spencer's gulf, Warburton'; lecto (here chosen): Gawler Ranges, S.A., *Sullivan*; MEL 101468.

The syntypes of *Sclerolaena diacantha* var. *longispina* belong to three species, viz. *S. diacantha* (Nees) Benth., *S. obliquispis* (R Anderson) Ulbr., and *S. patentispis*. The variety is here lectotypified so as to make it a synonym of the last of these.

Sclerolaena tetragona Paul G. Wilson, sp. nov.

Herba perennis erecta, ad 30 cm alta. Folia erecta, sessilia, linearia, c. 10 mm longa, carnosa, villosa. Flores solitarii axillares; perianthium sparse villosum, 4-lobatum. Perianthium fructiferum durum, glabrum; tubus late turbinatus, tetragonus, c. 2 mm altum, 3.5 mm latum, costis majoribus 4, costis minoribus 4, basi truncata, concava, apice pulviformi, tetragono vel 4-cuspibus. Semen horizontale; embryo circularis; radicula centrifuga. Fig. 46K.

T: 10 km W of Prairie Downs Homestead, W.A., 4 Oct. 1978, *A. A. Mitchell* 656; holo: PERTH.

Found in the central area of W.A., usually growing in rocky loam.

The specific epithet, from the Greek *tetra-* (four-) and *-gonus* (angled), refers to the tube of the fruiting perianth.

SUPPLEMENTARY GLOSSARY

accrescent: increasing in size with age, as the calyx of some plants after flowering.

cupuliform: nearly hemispherical, cupola-shaped.

diaphanous: extremely thin and transparent.

fimbriate: fringed along the margin.

glochid: a barbed hair or bristle.

indurated: hardened.

lignified: converted into wood.

mammillate: having small nipple-shaped projections.

moniliform: *of hairs*, constricted between the cells like a string of beads; *of fruits*, constricted between the seeds.

pruinose: having a whitish, waxy, powdery bloom on the surface.

scabridulous: slightly rough; diminutive of scabrous.

turbinate: top-shaped, obconical.

uncinate: terminating in a hooked point.

Abbreviations and Contractions

Author abbreviations follow the *Draft Index of Authors Abbreviations compiled at the Herbarium, Royal Botanic Gardens, Kew* (HMSO, London, 1980).

Journal titles are abbreviated in accordance with G. H. M. Lawrence *et al.*, *Botanico-Periodicum-Huntianum* (Hunt Botanical Library, Pittsburgh, 1968).

Other literature is abbreviated in accordance with F. A. Stafleu & R. S. Cowan, *Taxonomic Literature*, 2nd edn (Bohn, Scheltema & Holkema, Utrecht, 1976–), except that upper case initial letters are used for proper names and significant words. The *Flora of Australia* is abbreviated to *Fl. Australia*.

Abbreviations of herbaria are in accordance with P. K. Holmgren, N. H. Holmgren & E. K. Schofield, *Index Herbariorum* Part I, 7th edn (Bohn, Scheltema & Holkema, Utrecht, 1981). Those most commonly cited in the *Flora* are:

AD	State Herbarium of South Australia, Adelaide
ADW	Waite Agricultural Research Institute, Adelaide
BM	British Museum (Natural History), London
BRI	Queensland Herbarium, Brisbane
CANB	Herbarium Australiense, Canberra
CBG	National Botanic Gardens, Canberra
DNA	Northern Territory Herbarium, Darwin
HO	Tasmanian Herbarium, Hobart
K	Royal Botanic Gardens, Kew
MEL	National Herbarium of Victoria, Melbourne
NSW	National Herbarium of New South Wales, Sydney
NT	Northern Territory Herbarium, Alice Springs
PERTH	Western Australian Herbarium, Perth
QRS	Queensland Research Station, Atherton

Abbreviations of Australian States and Territories and nearby countries as used in statements of distribution and citation of collections

A.C.T.	Australian Capital Territory
N. Caled.	New Caledonia
N.S.W.	New South Wales
N.T.	Northern Territory
N.Z.	New Zealand
P.N.G.	Papua New Guinea
Qld	Queensland
S.A.	South Australia
Tas.	Tasmania
Vic.	Victoria
W.A.	Western Australia

General abbreviations

alt.	altitude
app.	appendix
<i>auct.</i>	<i>auctoris</i> (of an author or authors)
c.	<i>circa</i> (about)
Ck	Creek
cm	centimetre
col.	colour

coll.	collector
comb.	<i>combinatio</i> /combination
cult.	cultivated
Dept	Department
diam.	diameter
E	east
ed.	editor
edn	edition
<i>et al.</i>	<i>et alii</i> / and others
eds	editors
fam.	<i>familia</i> /family
f.	<i>forma</i> /form
fig./figs	figure/figures (in other works)
Fig.	Figure (referring to a Figure in this Volume of the <i>Flora</i>)
gen.	<i>genus</i> /genus
holo	holotype
Hwy	Highway
Is.	Island
iso	isotype
km	kilometre
lat.	latitude
lecto	lectotype
<i>loc. cit.</i>	<i>loco citato</i> (in the same work and page as just cited)
<i>loc. id.</i>	<i>loco idem</i> (in the same place as just cited)
long.	longitude
L.S.	longitudinal section
m	metre
mm	millimetre
Mt	Mount
Mtn	Mountain
Mtns	Mountains
N	north
<i>n</i>	haploid chromosome number
<i>2n</i>	diploid chromosome number
Nat.	National
<i>nom. cons.</i>	<i>nomen conservandum</i> (conserved name)
<i>nom. illeg.</i>	<i>nomen illegitimum</i> (illegitimate name)
<i>nom. inval.</i>	<i>nomen invalidum</i> (name not validly published)
<i>nom. nud.</i>	<i>nomen nudum</i>
<i>nom. rej.</i>	<i>nomen rejiciendum</i> (rejected name)
nov.	<i>novus</i> /new
n. ser.	new series
<i>n.v.</i>	<i>non vidi</i> (not seen)
<i>op. cit.</i>	<i>opere citato</i> (in the work cited above)
p./pp.	page/pages
<i>p.p.</i>	<i>pro parte</i> (in part)
R.	River
Ra.	Range
S	south
sect.	<i>sectio</i> /section
ser.	<i>series</i> /series
<i>s. lat.</i>	<i>sensu lato</i> (in a wide sense)
<i>s.n.</i>	<i>sine numero</i> (without number)
sp./spp.	species (singular/plural)
<i>s. str.</i>	<i>sensu stricto</i> (in a narrow sense)

Abbreviations and Contractions

stat.	<i>status/status</i>
Stn	(pastoral) Station
subg.	subgenus
subsp.	subspecies
suppl.	supplement
syn	syntype
synon.	synonym
T	Type (collection)
t.	<i>tabula</i> (plate)
trib.	<i>tribus/tribe</i>
T.S.	transverse section
var.	<i>varietas/variety</i>
W	west
<i>x</i>	basic chromosome number

Symbols

†	taxon included in key but not treated further in text
*	naturalised taxon
[]	misapplied name or <i>nomen invalidum</i>

Publication date of previous volumes

Volume 1	22 August 1981
Volume 8	9 December 1982
Volume 22	17 May 1984
Volume 29	27 July 1982

For the publication date of Volume 4, see Volume 25.

INDEX

Accepted names are in roman, synonyms in *italic*.

Principal page references are in **bold**, figures in *italic*.

- Abutilon 316
Acanthocereus (Engelm. ex A. Berger) Britton & Rose 75, **76**
 pentagonus (L.) Britton & Rose **76**
Aizoaceae **19**, 319
Aizoon glabrum Luehm. ex Ewart 46
 intermedium (Diels) Ewart 46
 kochii Wagner 48
 pubescens Ecklon & Zeyher 50
 quadrifidum (F. Muell.) F. Muell. 45
 rodwayi Ewart 48
 secundum L.f. 52
 zygophylloides F. Muell. 46
Amaranthus enervis (F. Muell.) F. Muell. ex Benth. 175
 tenuis Benth. 175
Ambrina carinata (R. Br.) Moq. 150
 var. parvifolia Moq. 150
 pumilio (R. Br.) Moq. 150
 spathulata Moq. 147
Ancistrostigma cypseleoides Fenzl 54
Angled Ice-plant 23
Angled Pigface 26
Angular Pigface 26
Anisacantha R. Br. 236
 anisacanthoides (F. Muell.) Druce 248
 bicornis (Lindley) F. Muell. 272
 bicuspis F. Muell. 273
 birchii F. Muell. 264
 brevicuspis F. Muell. 248
 diacantha Nees 254
 divaricata R. Br. 236, 259
 drummondii Benth. 252
 echinopsila F. Muell. 248
 erinacea Moq. 259
 var. longicuspis F. Muell. 266
 glabra (F. Muell.) Benth. 259
 gracilicuspis F. Muell. 262
 hispidia S. Moore 252
 kentropsidea F. Muell. 254
 lanata (Moq.) F. Muell. 272
 lanicuspis F. Muell. 269
 muricata Moq. 261
 var. villosa Benth. 262
Anisacantha *continued*
 quinquecuspis F. Muell. 262
 tricuspis F. Muell. 261
Aptenia N. E. Br. **20**
 cordifolia (L.f.) Schwantes 20, **21**, 22, 29
Arthrocnemum
 arbuscula (R. Br.) Moq. 306
 australasicum (Moq.) Moss 302
 benthamii Paulsen 299
 bidens Nees 299
 brachystachyum Paulsen 299
 ciliolatum 299
 donaldsonii (Ewart & J. White) C. Gardner 307
 halocnemoides Nees 284
 var. pergranulatum J. Black 287
 var. pterygospermum J. Black 290
 heptiflorum Moss 278
 heptiflorum Moss ex Fourc. 280
 indicum (Willd.) Moq. 298
 leiostachyum (Benth.) Paulsen 299
 lylei (Ewart & J. White) J. Black 291
 pruinatum Paulsen 293
 triandrum F. Muell. 308
Atriplex L. 81, **84**, 132
 sect. Atriplex **91**
 sect. Austrobione Ulbr. 101
 sect. Dialysex Moq. **120**, **322**
 sect. Dichospermum Dumort. 91
 sect. Elachophylla Ulbr. 101
 sect. Halimoides Ulbr. 94
 sect. Hymenotheca Ulbr. 120
 sect. Lobativalvis Ulbr. 101
 sect. Nummularia Ulbr. 120
 sect. Podiceps Ulbr. 101
 sect. Schizotheca C. Meyer 91
 sect. Semibaccatae (Standley) Ulbr. **101**
 sect. Spongiocarpus F. Buxb. **94**, **322**
 sect. Spongiosa Ulbr. 94
 sect. Teutlioides Ulbr. 120
 sect. Teutliopsis Dumort. **91**
 sect. Theleophyton (Moq.) Benth. 84, 132
 ser. Austrohalimus Ulbr. 120
 ser. Glomeratae Benth. 101
 ser. Leptocarpa Ulbr. 101

INDEX

Atriplex *continued*

- ser. *Morrisia* Ulbr. 101
- ser. *Oleraceae* Benth. 91
- ser. *Paniculatae* Benth. 120
- ser. *Parvilobae* Benth. 94
- ser. *Stipitata* Ulbr. 120
- ser. *Theleophyton* (Moq.) Benth. 84, 132
- ser. *Velutinella* Ulbr. 101
- ser. *Vesicariae* Benth. 120
- subg. *Atriplex* **90**
- subg. *Blackiella* (Aellen) Maire 84, 94
- subg. *Theleophyton* (Moq.) Volkens 84, **132**
- XIII. *Semibaccatae* Standley 101
- acutibractea R. Anderson 92, **101**, 102, 108
 - subsp. *acutibractea* **102**, 103
 - subsp. *karoniensis* Aellen **102**, 103
 - subsp. *whyallensis* Aellen 102
- acutiloba R. Anderson 93, **118**, 125
 - var. *eu-acutiloba* Aellen 118
 - var. *velutinelliformis* Aellen 118
- annicola Paul G. Wilson **129**, 133, **322**
- angulata Benth. 92, **105**, 106, 107, 111
 - var. *campanulatiformis* Aellen 105
- australasica Moq. 92, **94**, 103
- billardierei (Moq.) J. D. Hook. 93, **132**, 145
- bunburyana F. Muell. 93, **121**, 125
- campanulata* Benth. 106
 - var. *adnata* J. Black 106
 - var. *inappendiculata* Aellen 106
 - var. *inappendiculata* R. Anderson 105, 324
 - var. *multiappendiculata* Aellen 106
- capensis auct. non* Moq. 129
- cephalantha* Aellen 129
- chamaeclada* Diels **316**
- chrySTALLINA* J. D. Hook. 132
- cinerea Poir. 93, 120, 127, **129**, 130, 131, 133, 322
 - f. *appendiculata* Aellen 129
 - subsp. *globulosa* Aellen 129
 - subsp. *humilis* (F. Muell.) Aellen 120
 - subsp. *incrassata* (F. Muell.) Aellen 131
 - subsp. *isatidea* (Moq.) Aellen 128
 - subsp. *rhagodioides* (F. Muell.) Aellen 131
 - subsp. *rhagodioides auct. non* (F. Muell.) Aellen 129
 - var. *adscendens* (Nees) H. Eichler 129
 - var. *brachythea* (Moq.) Aellen 128
 - var. *elaeagnoides* (Moq.) Moq. 129
 - var. *macrotheca* Aellen 128
 - var. *palmata* Aellen 129
- codonocarpa Paul G. Wilson **97**, 103, **322**
- conduplicata* F. Muell. 98, 99, 323

Atriplex *continued*

- cordifolia* J. Black 93, **117**, 118, 119
- cornigera* Domin **114**, 119
- crassipes* J. Black 92, **104**, 105, 107
 - var. *appendiculata* Aellen **104**, 106, 111
 - var. *crassipes* **104**, 111
 - var. *inappendiculata* Aellen 104
- cryptocarpa* Aellen **104**, 111
- crystallinum* J. D. Hook. 132
- decumbens* R. Br. ex Schultes 101
- denticulata* Moq. 109
- drummondii* Moq. 127
- earleyae* Aellen 92, 105, **106**, 111
 - var. *inappendiculata* Aellen 105
 - var. *multiappendiculata* (Aellen) Aellen 106
- eichleri* Aellen **106**, 111
- elachophylla* F. Muell. 93, 101, **113**, 114, 119
 - var. *tenuis* (Bailey) R. Anderson ex Ulbr. 113
- elaeagnoides* Moq. 129
- exilifolia* F. Muell. 92, **102**, 103
- fasciculiflora* Aellen 102
- fissivalvis* F. Muell. 92, **112**, 119
- flabelliformis* Paul G. Wilson **114**, 119, **322**
- flagellaris* Wootton & Standley 109
- glomulifera* Nees 154
- halimoides* Lindley 94, 98, 323
 - var. *conduplicata* (F. Muell.) F. Muell. & Tate 98, 99
 - var. *deplanata* F. Muell. 97
 - var. *monumentalis* C. Sprenger 130
 - halimus* var. *adscendens* Nees 129
 - var. *erecta* Nees 128
- halimus auct. non* L. 129
- hastata* L. 91
 - var. *salina* Wallr. ex Gren. 91
- hastata auct. non* L. 91
- hochreutineri* R. Anderson & Aellen ex Aellen 112
- holocarpa* F. Muell. 92, **96**, 103, 322, 325
 - var. *spongiosa* (F. Muell.) Maiden & E. Betche 96
- hortensis* L. 84, 85, **91**, 95
- humifusa* Paul G. Wilson 92, **110**, 111, **323**
- humilis* F. Muell. **120**, 125
- hymenotheca* Moq. 93, 120, **122**, 125
 - var. *minor* Aellen 124, 321
- hypoleuca* Nees **128**, 133
- incrassata* F. Muell. 93, **131**, 133, 325
- inflata* F. Muell. 97, 99, 322, 323, 324
- infrequens* Paul G. Wilson **109**, 111, **323**
- intermedia* R. Anderson 105, **107**, 108, 111
- isatidea* Moq. 93, 120, **128**, 133

INDEX

Atriplex *continued*

- isatidea
 var. *brachytheca* Moq. 128
kochiana Maiden 94, **100**, 103
lampifer F. Buxb. 99, 322
latalvalve T. Durand & B. D. Jackson 117
leptocarpa F. Muell. 92, 101, **107**, 108, 111
 f. *gracilis* Aellen 107
 f. *minor* R. Anderson 108
 f. *turbinata* R. Anderson 107
 var. *acuminata* J. Black 102, 323
 var. *armata* Aellen 107
 var. *inermis* Aellen 107
 var. *minor* (R. Anderson) J. Black 108
 var. *turbinata* (R. Anderson) J. Black 107
limbata Benth. 92, **108**, 111
 var. *sexifida* J. Black 108
lindleyi Moq. 94, 98, 99, 322, **323**, 324
 subsp. *conduplicata* (F. Muell.) Paul G. Wilson 92, 98, **99**, 100, 103, **323**, 324
 subsp. *inflata* (F. Muell.) Paul G. Wilson 92, 98, **99**, 103, 322, **323**, 324
 subsp. *lindleyi* 92, **98**, 100, 103, **323**, 324
 subsp. *quadripartita* Paul G. Wilson 97, **99**, 103, **324**
 var. *quadripartita* J. Black 99, 324
lobaticarpa (F. Muell.) Domin 117
lobativalvis F. Muell. 93, 101, **117**, 119
 var. *biarcuata* Aellen 117
macropterocarpa (Aellen) H. Eichler 92, 97, **100**, 103
microcarpa Benth. 323
microcarpa (Benth.) Moq. ex D. Dietr. 109, 323
moquiniana Webb ex Moq. 128, 320
morrisii R. Anderson 101, **116**, 119
muelleri Benth. 92, **113**, 119
 var. *lobaticarpa* F. Muell. 117
 var. *stipitata* (F. Muell.) Aellen 104
nana Parr-Smith 93, **126**, 133, **320**
nessorhina S. Jacobs 93, **120**, 125
neurivalvis Domin 109, 110
nitens Schkuhr. 91
nummularia Lindley 93, 120, **130**, 131, 325
 subsp. *erosa* Aellen 130
 subsp. *nummularia* **130**, 133
 subsp. *omissa* Aellen **130**, 133
 subsp. *spathulata* Aellen **131**, 133
 var. *monumentalis* (C. Sprenger) Rodigas 130
obconica Paul G. Wilson 92, **97**, 103, **324**
paludosa R. Br. **126**
 subsp. *baudinii* (Moq.) Aellen **127**, 133
 subsp. *cordata* (Benth.) Aellen 93, **127**, 133, 324

Atriplex *continued*

- paludosa*
 subsp. *graciliflora* Aellen 121
 subsp. *moquiniana* (Webb ex Moq.) Parr-Smith **128**, 133, **320**
 subsp. *paludosa* 126, **127**, 133
 subsp. *tridentata* Aellen 127
 var. *acuticordata* Aellen 127
 var. *appendiculata* Benth. 123, 320
 var. *baudinii* Moq. 127
 var. *cordata* Benth. 127
 var. *cordivalvis* Aellen 127
 var. *obovata* Moq. 123, 320
papillata J. H. Willis 93, **116**, 119
patula L. 94
 var. *angustifolia* Rodway 132
 var. *gunnii* Aellen 94
 var. *hastata* auct. non (L.) A. Gray 91
 var. *littoralis* Rodway 132
 var. *serratifolia* Aellen 94
patula auct. non L. 94
prostrata Boucher ex DC. **91**, 95
prostrata R. Br. 101
 var. *microcarpa* F. Muell. ex Maiden & Betche 109
pseudocampanulata Aellen 104, **105**, 106, 111, **324**
 var. *appendiculata* Aellen 105, 324
 var. *inappendiculata* (R. Anderson) Aellen 105, 324
pterocarpa Ewart & Rees 96
pumilio R. Br. 92, **101**, 102, 103
quadrivalvata Diels 92, **112**
 var. *quadrivalvata* **112**, 119
 var. *sessilifolia* (Ising) Ising **112**, 119
quinii F. Muell. 93, **121**, 125
reniformis R. Br. 127
rhagodioides F. Muell. 93, **131**, 133, **325**
rhagodioides auct. non. F. Muell. 129
rosea var. *stipitata* F. Muell. 104
rosea auct. non L. 113
semibaccata R. Br. 101, **109**, 110, 111, 325
 f. *tenuis* Bailey 113
 var. *appendiculata* Aellen 109
 var. *biformis* Aellen 109
 var. *gracilis* Aellen 109
 var. *microcarpa* (Maiden & Betche) Aellen 109
semilunaris Aellen 93, **116**, 119, **325**
 var. *gracilis* Aellen 116
sessilifolia Ising 112
spinibractea R. Anderson **110**, 119
spinibractum R. Anderson 110

INDEX

- Atriplex continued*
- spinulosa* Paul G. Wilson **117**, 119, **325**
 - spongiivalvis* Aellen 102
 - spongiosa* F. Muell. 92, 94, **96**, 97, 103, 322, **325**
 - var. *holocarpa* (F. Muell.) J. Black 96
 - stipitata* Benth. 93, 120, **121**, 125
 - sturtii* S. Jacobs **108**, 111
 - suberecta* I. Verd. 93, **113**, 119
 - turbinata* (R. Anderson) Aellen 92, 105, **107**, 108, 111
 - varia* Ewart & O. Davies 113
 - velutinella* F. Muell. 93, 101, **118**, 125
 - f. *appendiculata* Aellen 118
 - f. *inappendiculata* Aellen 118
 - subsp. *levibractea* Aellen 118
 - subsp. *tomentosa* Aellen 118
 - vesicaria* Heward ex Benth. 93, 120, **122**, **320**
 - subsp. *appendiculata* (Benth.) Parr-Smith **123**, 125, **320**
 - subsp. *calcicola* Parr-Smith **123**, 125, **320**
 - subsp. *incompta* Parr-Smith **124**, 125, **320**
 - subsp. *macrocytidia* Parr-Smith **124**, 125, **321**
 - subsp. *minor* (Aellen) Parr-Smith **124**, 125, **321**
 - subsp. *sphaerocarpa* Parr-Smith **124**, 125, **321**
 - subsp. *variabilis* Parr-Smith **123**, 125, **321**
 - subsp. *vesicaria* **123**, 125, **320**
- Austrobassia* Ulbr. 236
- sect. *Orthospermae* Ulbr. 236
 - sect. *Stelligerae* Ulbr. 275
 - sect. *Ventricosae* Ulbr. 236
 - brachyptera* (F. Muell.) Ulbr. 276
 - convexula* (R. Anderson) Ulbr. 264
 - costata* (R. Anderson) Ulbr. 264
 - decurrans* (J. Black) Ulbr. 272
 - intricata* (R. Anderson) Ulbr. 260
 - longicuspis* (F. Muell.) Ulbr. 266
 - luehmannii* (F. Muell.) Ulbr. 185
 - parallelicuspis* (R. Anderson) Ulbr. 256
 - parviflora* (R. Anderson) Ulbr. 267
 - sclerolaenoides* (F. Muell.) Ulbr. 224
 - stelligera* (F. Muell.) Ulbr. 276
 - tatei* (F. Muell.) Ulbr. 258
 - ventricosa* (J. Black) Ulbr. 236, 269
- Austrocylindropuntia* Backeb. 65
- cylindrica* (Lam.) Backeb. 69
 - exaltata* (A. Berger) Backeb. 65
- Babbagia* 232
- Babbagia* F. Muell. 231
- acroptera* F. Muell. & Tate 232, 274, 327
 - var. *deminuta* J. Black 325, 327
- Babbagia continued*
- dipterocarpa* F. Muell. 231, 235, 328
 - pentaptera* F. Muell. & Tate 235
 - scleroptera* F. Muell. 236
 - Ball-leaf Bluebush 204
 - Barbados Gooseberry 64
 - Barbed-wire Cactus 78
 - Barilla 129
 - Barrier Saltbush 215
 - Bassia* All. **177**
 - auct. non* All. 236
 - sect. *Anisacantha* (R. Br.) Volkens 236
 - sect. *Asterocarpa* (F. Muell.) Ising 275
 - sect. *Dissocarpus* (F. Muell.) Volkens 226
 - sect. *Echinopsilon* (Moq.) Volkens 177
 - sect. *Eriochiton* R. Anderson 222
 - sect. *Kochia* (Roth) Kuntze 177
 - sect. *Maireana* (Moq.) Volkens 179
 - sect. *Platyacantha* F. Muell. ex R. Anderson 236
 - sect. *Spinosissimae* Ising 179
 - sect. *Trachycarpus* C. White 236
 - sect. *Willemetia* (Maerklin) Kuntze 177
 - aellenii* Ising 274
 - albolanata* Ising 220
 - andersonii* Ising 259
 - anisacanthoides* (F. Muell.) R. Anderson 248
 - articulata* J. Black 260
 - astracantha* F. Muell. 222
 - astrocarpa* F. Muell. 222
 - beaugleholei* Ising 254
 - bicornis* (Lindley) F. Muell. 272
 - var. *horrida* (Domin) C. White 272
 - bicuspis* (F. Muell.) F. Muell. 273
 - biflora* (R. Br.) F. Muell. 228
 - var. *biflora* 228
 - var. *cephalocarpa* (F. Muell.) R. Anderson 228
 - var. *villosa* Ising 229
 - birchii* (F. Muell.) F. Muell. 264
 - blackiana* Ising 270
 - blakei* Ising 258
 - brachyptera* (F. Muell.) R. Anderson 276
 - brevicuspis* (F. Muell.) F. Muell. 248
 - brevifolia* Ising 250
 - burbidgeae* Ising 255
 - calcarata* Ising 247
 - caput-casuarii* J. H. Willis 274
 - carnosa* (Moq.) F. Muell. 193
 - chippendalei* Ising 266
 - clavata* Ising 274
 - clelandii* Ising 273

INDEX

Bassia *continued*

constricta Ising 255
convexula R. Anderson 264, 265
copleyi Ising 274
cornishiana F. Muell. 266
costata R. Anderson 264
crenata Ising 255
cristata Ising 274
cucullata Ising 266, 267
dallachyana (Benth.) F. Muell. 196
decurrens J. Black 272
densiflora W. Fitzg. 268
diacantha (Nees) F. Muell. 254
divaricata (R. Br.) F. Muell. 259
drummondii (Benth.) F. Muell. 252
 var. *hispida* (S. Moore) R. Anderson 252
echinopsila (F. Muell.) F. Muell. 248
eichleri Ising 254
enchylaenoides F. Muell. 189
eremaea Ising 226, 327
eriacantha (F. Muell.) R. Anderson 256
eriochiton Tate 224
eurotioides (F. Muell.) F. Muell. 243
everistiana Ising 269
filiformis Ising 264
forrestiana F. Muell. 270
gardneri Ising 254
georgei Ising 274
glabra (F. Muell.) F. Muell. 259
globosa Ising 274
holtiana Ising 254
hostilis Diels 250
hyssopifolia (Pallas) Kuntze 177, 191
inchoata J. Black 231
intricata R. Anderson 260
 var. *hirsuta* J. Black 274
johnsonii Ising 265
lanata Ising 274
lanicuspis (F. Muell.) F. Muell. 269
lanuginosa C. White 193
limbata J. Black 253
litoral Diels 249
longicuspis F. Muell. 266
longifolia W. Fitzg. 247
luehmannii F. Muell. 179, 185
micrantha (Benth.) F. Muell. 194
microcarpa R. Anderson 249
minuta Ising 268
muelleri (Benth.) F. Muell. 266
muricata (L.) Asch. 177
murrayae Ising 275
nitida Ising 275

Bassia *continued*

obconica Ising 264
obliquicuspis R. Anderson 252, 253
oppositicuspis Ising 275
paradoxa (R. Br.) F. Muell. 229
 var. *latifolia* J. Black 229, 326
parallelicuspis R. Anderson 256
parviflora R. Anderson 267
 var. *costata* (R. Anderson) Ewart 264
patenticuspis R. Anderson 250, 252
quinquecuspis (F. Muell.) F. Muell. 262
 var. *lanata* Ising 226, 329
 var. *semiglabra* Ising 262
 var. *villosa* (Benth.) J. Black 262
ramsayae J. H. Willis 275
ramulosa C. White 265
recurvicuspis W. Fitzg. 249
salsuginosa (F. Muell.) F. Muell. 232
sclerolaenoides (F. Muell.) F. Muell. 224
scoparia (L.) A. J. Scott 179
scrymgeouriae Ising 275
spinosa Ewart & O. B. Davies 226, 327
stelligera (F. Muell.) F. Muell. 276
stylosa Ising 270
symoniana Ising 247
tatei F. Muell. 258
tetracuspis C. White 250
tricornis (Benth.) F. Muell. 221
tricuspis (F. Muell.) R. Anderson 261
tridens F. Muell. 236, 267
tubata R. Anderson 261
uniflora (R. Br.) F. Muell. 253
 var. *incongruens* J. Black 255
urceolata Ising 248
ventricosa J. Black 269
villosa Wallich ex Don 189
walkeri C. White 236, 243
wilsonii Ising 254

Bassia, Hairy 276
 Three-spined 261
 Beet, Spinach 277
 Beet, Wild 277
 Beetroot 277
 Bella Sombra 2
 Berry Saltbush 110, 164, 174
 Berry, Coral 5
 Pigeon 1
 Beta L. 81, 277
 maritima L. 277
 vulgaris L. 277, 281
 subsp. *maritima* (L.) Thell. 277
 subsp. *vulgaris* 277

INDEX

- Beta *continued*
vulgaris
 var. *maritima* (L.) Moq 277
 var. *perennis* L. 277
- Bird Lime Tree 18
- Black Cotton Bush 206
- Black Crumbweed 151
- Black Roly-poly 261
- Blackiella* Aellen 84, 94
conduplicata (F. Muell.) Aellen 99
 var. *phyllocarpa* Aellen 99
inflata (F. Muell.) Aellen 99, 323
macropteroarpa Aellen 100
- Blackseed Samphire 288
- Bladder Saltbush 122
- Blakiella* 84
- Blitum* sect. *Orthosporum* (R. Br.) C. Meyer 150
atriplicinum F. Muell. 175
carinatum (R. Br.) C. A. Meyer ex Steudel 150
cristatum F. Muell. 151
glandulosum Moq. 150
 var. *parvifolium* (Moq.) Moq. 150
pumilio (R. Br.) C. A. Meyer ex Steudel 150
- Bluebush, Ball-leaf 204
- Bottle 194
- Cottony 193
- Hairy 192
- Lax 206
- Low 198, 210
- Many-winged 200
- Mulga 197, 206
- Pearl 198
- Queensland 144
- Shrubby 202
- Small-leaf 188
- Three-wing 201
- Boerhavia L. 6, 8, 10, 15
acutifolia (Choisy) J. W. Moore 13
 var. *albiflora* Fosberg var. *albiflora* 8
burbridgeana Hewson 7, 10, 17, 318
coccinea Miller 8, 10, 11, 12, 17, 318
diandra L. 13
diffusa L. 9, 13
 f. *acutifolia* (Choisy) Domin 13
 f. *crassifolia* Domin 12
 var. *acutifolia* Choisy 13
 var. *eurepens* Domin 12
 var. *paludosa* Domin 12, 319
 var. *pubescens* Choisy 13
 var. *vulgaris* Domin 13
 var. *vulvariifolia* (Poir.) Heimerl 13
 var. *xerophila* Domin 10
- Boerhavia continued*
diffusa auct. non L. 12
dominii Meikle & Hewson 8, 9, 318
elegans Choisy 13
erecta L. 6
gardneri Hewson 12, 17, 318
mutabilis R. Br. 10
mutabilis auct. non R. Br. 9
paludosa (Domin) Meikle 11, 12, 17, 319
pubescens Decne 13
pubescens R. Br. 10
repanda auct. non Willd. 15
repens L. 10
 var. *pubescens* (R. Br.) Fosberg 10
repens auct. non L. 12
repleta Hewson 7, 10, 17, 319
scandens L. 13
schomburgkiana Oliver 8, 9, 11, 17
tetrandra G. Forster 8, 11, 17
vulvariifolia Poir. 13
- Bottle Bluebush 194
- Bougainvillea *spectabilis* Willd. 6
- Bower Spinach 38
- Brigalow Burr 250
- Buckbush, Soft 314
- Bulli Bulli 304
- Burr, Brigalow 250
 Cartwheel 266
 Dog 250
 Galvanised 264
 Goathead 272
 Red 247
 Yellow 248
- Cactaceae 62
 Trib. Cacteeae 75
 Trib. Opuntieae Britton & Rose 64
 Trib. Pereskieae Britton & Rose 64
- Cactoblastis *cactorum* Berg 71
- Cactus* *compressus* Salisb. 70
cylindricus Lam. 69
dillanii Ker Gawler 72
ficus-indica L. 74
humifusus Raf. 70
microdasys Lehm. 75
monacanthos Willd. 70
opuntia L. 70
 var. *inermis* DC. 72
pentagonus L. 76
strictus Haw. 71
- Cactus, Barbed-wire 78
- Chain-link 67

INDEX

- Cactus, *continued*
 Devils-rope 67
 Harrisia 78, 80
 Leaf 64
 Snake 80
 Wheel 74
- Calpidia* Thouars 16
oblonga J. St Hill. 16
- Camphorosma L. 176
- Camuesa 74
- Carpanthea N. E. Br. **31**
pomeridiana (L.) N. E. Br. 31, **32**, 41
- Carpobrotus N. E. Br. **25**
acinaciformis auct. non (L.) L. Bolus 26
aequilateralis (Willd.) J. Black 25
aequilaterus (Haw.) N. E. Br. **25**, 29
disparilis N. E. Br. 26
edulis (L.) L. Bolus 25, **26**, 29, 35
glaucescens (Haw.) Schwantes **26**, 29
modestus S. T. Blake **27**, 29
pulleinei J. Black 28
rossii (Haw.) Schwantes **27**, 29
virescens (Haw.) Schwantes **27**, 29, 39
- Cartwheel Burr 266
- Ceodes* Forster & G. Forster 16
umbellifera Forster & G. Forster 16, 18
- Cereus Miller 62, 75
 sect. *Nyctocereus* A. Berger 80
 subg. *Acanthocereus* (Engelm. ex A. Berger)
 A. Berger 76
 subg. *Eriocereus* A. Berger 78
 subsect. *Acanthocereus* Engelm. ex A. Berger
 76
imbricatus Haw. 67
martinii Labouret 80
pentagonus (L.) Haw. 76
serpentinus Lagasca & Rodrigues 80
tortuosus James Forbes ex Otto & A. Dietr. 78
triangularis auct. non Haw. 76
undatus Haw. 76
- Cereus, Night-blooming 76, 80
- Chain-link Cactus 67
- Chenolea* sect. *Echinopsilon* (Moq.) J. D. Hook.
 177
bicornis (Lindley) F. Muell. ex Tate 272
bicuspis (F. Muell.) F. Muell. ex Tate 273
biflora (R. Br.) F. Muell. 228
blackii Ewart 208
carnosa (Moq.) Benth. 193
dallachyana Benth. 196
diacantha (Nees) F. Muell. 254
echinopsila (F. Muell.) F. Muell. 248
enchylaenoides F. Muell. 189
- Chenolea continued*
eurotioides (F. Muell.) Benth. 243
muelleri Benth. 266
paradoxa (R. Br.) F. Muell. 229
pentagona (R. Anderson) Ewart 192
quinquecuspis (F. Muell.) F. Muell. 262
salsuginosa (F. Muell.) F. Muell. 232
sclerolaenoides (F. Muell.) F. Muell. ex Benth.
 224
tricornis Benth. 221
tricuspis (F. Muell.) F. Muell. 261
villosa (F. Muell.) Ewart 189
- Chenopodiaceae **81**, 320, 322
 Trib. Beteae Moq. **277**
 Trib. Camphorosmeae Endl. **176**
 Trib. Chenopodieae **84**
 Trib. Salicornieae Dumort. **277**, 298
 Trib. Salsoleae Moq. **313**
 Trib. Suaedae Moq. **310**
- Chenopodina* (Moq.) Moq. 310
australis (R. Br.) Moq. 313
maritima auct. non (L.) Moq. 313
- Chenopodium* L. **132**, 175
 sect. Ambrina J. D. Hook. **146**
 sect. *Atriplicina* Aellen 175
 sect. Auricoma Aellen **144**
 sect. *Carinatum* Standley 150
 sect. *Chenopodiastrum* Moq. 138
 sect. *Chenopodium* **135**
 sect. Degenia Aellen 137
 sect. Desertorum Paul G. Wilson **140**
 sect. *Dysphania* (R. Br.) Aellen 153
 sect. Leprophyllum Dumort. **138**
 sect. Orthosporum R. Br. 132, **150**
 sect. *Polygonoidea* Aellen 161
 sect. *Pseudoblitum* J. D. Hook. 135
 sect. Rhagodioides Benth. **146**
 sect. *Tetrasepala* Aellen 153
 subg. Ambrosia A. J. Scott **146**
 subg. *Chenopodium* **135**
aegyptiacum Hasselq. 312
 album L. 134, 136, **138**, 145
 subsp. *hastatum* (Klinggr.) Graebner 138
 subsp. *opulifolium* (Schrader ex Koch & Ziz)
 Maire 138
 var. *hastatum* Klinggr. 138
 var. *striatiforme* (Murr) Murr 138
ambiguum R. Br. 135
 var. *majus* Moq. 137
 var. *minus* Moq. 137
 ambrosioides L. 136, 146, **147**, 157
 f. *spathulatum* (Moq.) Aellen 147

INDEX

- Chenopodium continued*
- ambrosioides
 - var. ambrosioides 147
 - var. anthelminticum (L.) A. Gray 147
 - var. suffruticosum (Willd.) Graebner 147
 - anidiophyllum Aellen 142
 - anthelminticum L. 147
 - atriplicinum (F. Muell.) F. Muell. 175
 - auricomiforme Murr & Thellung **144**, 149, 157
 - auricomum Lindley **144**, 157
 - f. subglabrum Aellen 144
 - australasicum Moq. 162
 - australe R. Br. 313
 - baccatum Labill. 170
 - biforme Nees 139
 - blackianum Aellen 158
 - ×bontei Aellen **152**
 - n-var. cristatiforme Aellen 152
 - n-var. submelanocarpum Aellen 152
 - bonus-henricus auct. non L. 94
 - brownianum Roemer & Schultes 138
 - carinatum R. Br. 132, 148, **150**, 152, 153, 157
 - f. foliosum Domin 151
 - f. leucocarpum Aellen 151
 - var. holopterum (Thellung) Aellen 150
 - var. melanocarpum J. Black 151
 - ×christii Aellen **153**
 - n-var. intermedium Aellen 153
 - n-var. semiconnatum Aellen 153
 - cochlearifolium Aellen 141
 - congestum J. D. Hook. 139
 - cristatum (F. Muell.) F. Muell. 148, **151**, 152, 153, 157
 - var. holopterum Thellung 150
 - curvispicatum Paul G. Wilson **143**, 149, 157
 - desertorum (J. Black) J. Black 140, **141**
 - subsp. anidiophyllum (Aellen) Paul G. Wilson **142**, 145
 - subsp. desertorum **141**, 145
 - subsp. microphyllum Paul G. Wilson **141**, 145
 - subsp. rectum Paul G. Wilson **142**, 145
 - subsp. virosum Paul G. Wilson **142**, 145
 - detestans Kirk **139**, 145
 - erosum R. Br. **140**, 145, 149
 - ficifolium Smith **153**
 - furfuraceum Moq. 167
 - gaudichaudianum (Moq.) Paul G. Wilson **143**, 155, 157
 - giganteum D. Don 134
 - glandulosum (Moq.) F. Muell. 150
 - glaucum L. **135**, 145
 - f. minus (Moq.) Aellen 137
- Chenopodium continued*
- glaucum
 - subsp. ambiguum (R. Br.) Murr & Thellung ex Thellung 135, 137
 - var. ambiguum (R. Br.) J. D. Hook. 135
 - var. littorale Rodway 137
 - halophilum Philippi 137
 - holopterum (Thellung) Thellung & Aellen 150
 - hubbardii Aellen **140**, 145
 - inflatum Aellen 153, 160
 - insulare J. Black 313
 - integrifolium Vorosch. 147
 - lanceolatum R. Br. 138
 - littorale Moq. 137
 - lyciooides Gand. 146
 - macrospermum J. D. Hook. 136, **137**, 145
 - subsp. halophilum (Philippi) Aellen 137
 - melanocarpum (J. Black) J. Black 148, **151**, 153, 157
 - f. leucocarpum (Aellen) Paul G. Wilson 151
 - microphyllum F. Muell. 141, 142
 - var. desertorum J. Black 141
 - multifidum L. 146, **147**, 157
 - murale L. **139**, 145, 149
 - var. biforme (Nees) Moq. 139
 - myriocephalum (Benth.) Aellen 154
 - nitrariaceum (F. Muell.) F. Muell. ex Benth. **146**, 157
 - olidum Curtis 139
 - opulifolium Schrader ex Koch & Ziz **138**, 145
 - osbornianum Aellen 159
 - plantaginellum (F. Muell.) Aellen 158
 - polygonoides (Murr) Aellen. 161, 164
 - preissii (Moq.) Diels 168
 - probstii Aellen 138
 - prostratum (Pallas) Roemer & Schultes 141
 - pseudomicrophyllum Aellen 141, 142
 - pumilio R. Br. 148, **150**, 153, 157
 - f. glandulosum (Moq.) Aellen 150
 - var. oblongifolium J. Black 150
 - rhadinostachyum F. Muell. 159
 - rubrum L. 132, 135
 - saxatile Paul G. Wilson 148, **152**, 157
 - simulans (F. Muell. & Tate ex Tate) F. Muell. & Tate ex F. Muell. 159
 - spathulatum (Moq.) Moq. 147
 - stellulatum (Benth.) Aellen 163
 - stellulatum Aellen 163
 - striatiforme Murr 138
 - sp. aff. suecicum Murr 140
 - suffruticosum Willd. 147
 - subsp. remotum Vorosch. 147
 - triandrum var. lanuginosum F. E. Havil. 141

INDEX

- Chenopodium continued*
triangulare Forsskal 138
triangulare R. Br. 163
 subsp. *convolvulinum* Murr 161
 subsp. *polygonoides* (Murr) Murr 164
 var. *angustifolium* Benth. 164
 var. *convolvulinum* (Murr) Maiden & E. Betche 161
 var. *polygonoides* Murr 164
 var. *stellulatum* Benth. 163
trigonocarpum Aellen **153**
trigonon Schultes 163
truncatum Paul G. Wilson 148, **152**, 157
ulicinum Gand. 168
viride L. **153**
vulvaria L. **139**, 145
 Clammy Goosefoot 150
 Cleistocactus burmannii Lemaire 63
 Climbing Saltbush 161
Coilocarpus Domin 236
brevicuspis (F. Muell.) Domin 236, 248
 Commicarpus Standley 10, **13**
australis Meikle 14, **15**, 17
chinensis auct. non (L.) Heimerl 15
insularum Meikle **15**, 29
scandens (L.) Standley 13
 Common Ice-plant 23
 Common Prickly Pear 72
 Conicosia N. E. Br. **30**
bijlii N. E. Br. **30**, 41
pugioniformis (L.) N. E. Br. 30
 Copper-burr 269
 Grey 254
 Tangled 259
 Coral Berry 5
 Cotton Bush 212
 Eastern 188
 Black 206
 Cottony Bluebush 193
 Creeping Pear 70
 Creeping Saltbush 110
 Crested Crumbweed 151
 Crested Goosefoot 151
 Crumbweed, Black 151
 Crested 151
 Green 151
 Red 158
 Small 150
Cryophytum aitonis (Jacq.) N. E. Br. 23
crystallinum (L.) N. E. Br. 23
nodiflorum (L.) L. Bolus 23, 24
 Curious Saltbush 229
 Cycloloma Moq. **176**
atriplicifolium (Sprengel) J. Coulter **177**, 191
platyphyllum (Michaux) Moq. 177
Cylindropuntia (Engelm.) Knuth 65, 67
arborescens (Engelm.) Knuth 65
imbricata (Haw.) Knuth 67
 Cypselocarpus haloragoides (F. Muell. ex Benth.) F. Muell. 316
Cyrilwhitea Ising 236
walkeri (C. White) Ising 243
 Deeringia amaranthoides (Lam.) Merr. 5
Demidovia tetragonoides Pallas 42
 Devils-rope Cactus 67
 Didymanthus Endl. **218**
roei Endl. **218**, 223, 237
 Disphyma N. E. Br. **36**
australe (Ait.) N. E. Br. 36
blackii Chinnock 36
clavellatum (Haw.) Chinnock 36
crassifolium (L.) L. Bolus 35, **36**, 41
 Dissocarpus F. Muell. 221, 222, 226, 326, 327
biflorus F. Muell. 222, 226, **228**
 var. *biflorus* 227, **228**, 229, 233
 var. *cephalocarpus* (F. Muell.) A. J. Scott 227, **228**, 233, **325**
 var. *villosus* (Ising) A. J. Scott **229**, 233
fontinalis Paul G. Wilson 227, **229**, 233, **325**
latifolius (J. Black) Paul G. Wilson 227, **229**, 233, **326**
paradoxus (R. Br.) Ulbr. **229**, 233, 326, 327
 var. *latifolius* (J. Black) Ulbr. 229
 Dog Burr 250
 Donald Duck Saltbush 120
 Drooping Prickly Pear 70
 Drooping Tree Pear 70
 Drosanthemum Schwantes **32**
candens (Haw.) Schwantes **32**, 41
floribundum auct. non (Haw.) Schwantes 32
hispidum (L.) Schwantes 32
Duriala Ulbr. 179
crassiloba Ulbr. ex N. Beadle 189
villosa (F. Muell.) Ulbr. 189
 Dysphania R. Br. **153**, 175
 sect. *Caudatae* A. J. Scott 153
 sect. *Tetrasepalae* (Aellen) A. J. Scott 153
benthamiana Domin 156
glandulosa Paul G. Wilson 155, **156**, 165
glomulifera (Nees) Paul G. Wilson **154**
 subsp. *eremaea* Paul G. Wilson 155, **156**, 157
 subsp. *glomulifera* 155, **156**, 157
inflata (Aellen) A. J. Scott 160
kalpari Paul G. Wilson 155, **160**, 165, 178

INDEX

- Dysphania continued*
littoralis R. Br. 153, 154, 155, 156, **158**, 165
myriocephala Benth. 154
plantaginella F. Muell. 153, 155, **158**
platycarpa Paul G. Wilson 155, **158**, 165
rhadinostachya (F. Muell.) A. J. Scott **159**
 subsp. *inflata* (Aellen) Paul G. Wilson **160**,
 165
 subsp. *rhadinostachya* 155, **160**, 165
simulans F. Muell. & Tate ex Tate **159**
sphaerosperma Paul G. Wilson 155, **159**
valida Paul G. Wilson **156**, 165
- Eastern Cotton Bush 188
- Echinopsilon* Moq. 177
anisacanthoides F. Muell. 248
brachypterus (F. Muell.) F. Muell. 276
carnosus Moq. 193
eurotioides F. Muell. 243
sclerolaenoides F. Muell. 224
stelligerus (F. Muell.) F. Muell. 276
- Echinopsis* 62
- Echinopsis multiplex* (Pfeiffer & Otto) Zucc. 63
- Einadia* Raf. **161**
hastata (R. Br.) A. J. Scott 149, **164**, 173
linifolia (R. Br.) Raf. 161, 162
nutans (R. Br.) A. J. Scott **161**
 subsp. *eremaea* Paul G. Wilson **162**, 165
 subsp. *linifolia* (R. Br.) Paul G. Wilson **162**,
 165
 subsp. *nutans* 149, **161**, 165
 subsp. *oxycarpa* (Gauba) Paul G. Wilson
 162, 165
 var. *linifolia* (R. Br.) A. J. Scott 162
polygonoides (Murr) Paul G. Wilson **164**, 173
trigonos (Schultes) Paul G. Wilson **163**
 subsp. *leiocarpa* Paul G. Wilson **163**, 173
 subsp. *stellulata* (Benth.) Paul G. Wilson
 163, 173
 subsp. *trigonos* **163**, 165
- Enchylaena* R. Br. 207, **213**
 sect. *Heterochlamys* F. Muell. 179
 aegyptiaca (Hasselq.) Sprengel 312
 brevifolia Gand. 213
 decalvans Gand. 206
 falcatula Gand. 254
 lanata Paul G. Wilson 214, **215**, 223, **326**
 marginata Benth. 194
 micrantha Benth. 194
 microphylla Moq. 207
 paradoxa R.Br. 213
 patens Gand. 213
 pubescens Moq. 213, **326**
- Enchylaena continued*
 tamariscina (Lindley) Druce 188
 tomentosa R. Br. 197, 326
 var. *glabra* Benth. **215**, 223, **326**
 var. *leptophylla* Benth. 207
 var. *tomentosa* 214, **215**, 223, 237
 var. *villosa* Benth. 215
 tomentosa R. Br. **213**
 villosa F. Muell. 179, 189
- Eremophea* Paul G. Wilson 224, **326**, 327
 aggregata Paul G. Wilson **224**, 225, 233, 326,
 327
 spinosa (Ewart & O. B. Davies) Paul G.
 Wilson 224, **226**, 233, **327**
- Eriocereus* (A. Berger) Riccob. 62, 75, **78**
 bonplandii Parm. ex Pfeiffer. 80
 martinii (Labouret) Riccob. 77, **80**, 95
 platygonus (Otto) Riccob. 78
 regelii (Weing.) Backeb. 78
 tortuosus (James Forbes ex Otto & A. Dietr.)
 Riccob. 77, **78**, 95
 sp. 78
- Eriochiton* (R. Anderson) A. J. Scott **222**
 sclerolaenoides (F. Muell.) F. Muell. ex A. J.
 Scott 196, **222**, 233
- Euxolus* *enervis* F. Muell. 175
- Fan Saltbush 105
- Fat Hen 138
 Green 139
- Fig, Hottentot 26
 Indian 74
- Fishweed 140, 163
- Fissure Weed 192
- Flat-topped Saltbush 97
- Four o'clock 6
- Galenia* L. **50**
 africana L. 50
 pallens Walp. 62
 pubescens (Ecklon & Zeyher) Druce **50**
 var. *pubescens* 43, **50**, 59
 secunda (L.f.) Sond. **52**, 59
- Galvanised Burr 264
- Garden Orache 91
- Gasoul* *aitonis* (Jacq.) H. Eichler 23
 crystallinum (L.) Rothm. 23
 nodiflorum (L.) Rothm. 23
- Giant Redburr 261
- Gigaspermum repens* (Hook.) Lindb. 61
- Glaucous Goosefoot 137
- Goathead Burr 272
- Gooseberry, Barbados 64

INDEX

- Goosefoot, Clammy 150
 Crested 151
 Glaucous 137
 Keeled 151
 Nettle-leaf 139
 Nitre 146
 Purple 176
 Scented 147
 Stinking 139
 White 138
- Gracemere Pear 74
 Green Crumbweed 151
 Green Fat Hen 139
 Grey Copper-burr 254
 Grey Saltbush 129
Gunnia drummondii Benth. 49
 septifraga F. Muell. 49
 Gunniopsis Pax 42
 calcarea Chinnock 45, 47, 51
 calva Chinnock 47, 48, 51
 divisa Chinnock 44, 47, 51
 glabra (Luehm. ex Ewart) C. Gardner 46, 47, 51
 intermedia Diels 46, 47, 51
 kochii (Wagner) Chinnock 47, 48, 49, 51
 papillata Chinnock 47, 48, 49, 51
 propinqua Chinnock 50, 59
 quadrifida (F. Muell.) Pax 39, 42, 45, 47, 51
 rodwayi (Ewart) C. Gardner 47, 48, 51
 rubra Chinnock 47, 49, 59
 septifraga (F. Muell.) Chinnock 47, 49, 59
 tenuifolia Chinnock 45, 47, 51
 zygophylloides (F. Muell.) Diels 46, 47, 51
 Gyrostemonaceae 316
- Hairy Bassia 276
 Hairy Bluebush 192
Halocnemum arbuscula (R. Br.) Bailey 306
 australasicum Moq. 302
 cinereum F. Muell. 302
 Halosarcia Paul G. Wilson 282, 300
 auriculata Paul G. Wilson 293, 297, 301
 bulbosa Paul G. Wilson 294, 295, 297
 calyprata Paul G. Wilson 298, 309
 chartacea Paul G. Wilson 296, 309
 cupuliformis Paul G. Wilson 296, 309
 doleiformis Paul G. Wilson 290, 297
 entrichoma Paul G. Wilson 296, 309
 fimbriata Paul G. Wilson 286, 289
 flabelliformis Paul G. Wilson 292, 297, 301
 fontinalis Paul G. Wilson 287, 289
 halocnemoides (Nees) Paul G. Wilson 282, 284
 subsp. *catenulata* Paul G. Wilson 286, 289
 Halosarcia continued
 halocnemoides
 subsp. *caudata* Paul G. Wilson 284, 285, 289
 subsp. *halocnemoides* 284, 285, 289
 subsp. *longispicata* Paul G. Wilson 286, 289
 subsp. *tenuis* Paul G. Wilson 286, 289
 indica (Willd.) Paul G. Wilson 298
 subsp. *bidens* (Nees) Paul G. Wilson 299, 309
 subsp. *indica* 299, 309
 subsp. *julacea* Paul G. Wilson 300, 309
 subsp. *leiostachya* (Benth.) Paul G. Wilson 299, 309
 lepidosperma Paul G. Wilson 290, 297, 301
 leptoclada Paul G. Wilson 292
 subsp. *inclusa* Paul G. Wilson 292, 297
 subsp. *leptoclada* 292, 297
 ylei (Ewart & J. White) Paul G. Wilson 291, 297, 301
 nitida Paul G. Wilson 287, 289
 peltata Paul G. Wilson 293, 297
 pergranulata (J. Black) Paul G. Wilson 287
 subsp. *divaricata* Paul G. Wilson 290, 297
 subsp. *elongata* Paul G. Wilson 288, 289
 subsp. *pergranulata* 285, 288, 289
 subsp. *queenslandica* Paul G. Wilson 288
 pluriflora Paul G. Wilson 282, 287, 289
 pruinosa (Paulsen) Paul G. Wilson 293, 297
 pterygosperma (J. Black) Paul G. Wilson 290, 297
 subsp. *denticulata* Paul G. Wilson 291, 297
 subsp. *pterygosperma* 285, 291, 297
 syncarpa Paul G. Wilson 294, 297
 undulata Paul G. Wilson 294, 297
Haloxanthium Ulbr. 84
 fissivalve (F. Muell.) Ulbr. 112
 quadrivalvatum (Diels) Ulbr. 84, 112
Harrisia Britton 78
 gracilis (Miller) Britton 78
 martinii (Labouret) Britton 80
 tortuosa (James Forbes ex Otto & A. Dietr.) Britton & Rose 78
Harrisia Cactus 78, 80
 Heart-leaf Ice-plant 21
Heimerliodendron Skottsbb. 16
 brunonianum (Endl.) Skottsbb. 16, 18
 Hottentot Fig 26
 Hylocereus (A. Berger) Britton & Rose 75, 76
 triangularis (L.) Haw. 76
 undatus (Haw.) Britton & Rose 76, 95
- Iceplant, Angled 23
 Common 23
 Heart-leaf 21
 Indian Fig 74

INDEX

- Inkweed 2
 Inland Pigface 27
- Joconoxtle 74
- Karkalla 27
- Keeled Goosefoot 151
- Kentropsis* Moq. 236
 diacantha (Nees) Moq. 254
 ericantha F. Muell. 256
 glabra F. Muell. 259
 lanata Moq. 236, 272
- Kidney Saltbush 121
- Kochia Roth 177
 sect. *Austrokochia* Ulbr. 179
 sect. *Duriala* R. Anderson 179
 sect. *Maireana* (Moq.) F. Muell. 179
 amoena Diels 188
 aphylla R. Br. 212
 appressa Benth. 212
 arenaria (Maerklin) Roth 177
 astrotricha L. Johnson 198
 atkinsiana W. Fitzg. 204
 brachyptera (F. Muell.) Benth. 276
 brevifolia R. Br. 188
 brownii F. Muell. 212
 cannonii J. Black 203
 carnosa (Moq.) R. Anderson 193
 cheelii R. Anderson 185
 ciliata F. Muell. 190, 192
 concava Ising 184, 185
 coronata J. Black 192
 crassiloba R. Anderson 189
 decaptera F. Muell. 316
 decepiens Gauba 201
 dichoptera F. Muell. 193
 enchylaenoides (J. Black) J. Black 208
 eriantha F. Muell. 184, 185
 erioclada (Benth.) Gauba 201
 excavata J. Black 194
 var. *trichoptera* J. Black 194
 fimbriolata F. Muell. 247
 georgei Diels 196
 glomerifolia F. Muell. & Tate 203
 humillima F. Muell. 196
 integra Paul G. Wilson 209
 lanosa Lindley 190
 var. *minor* Benth. 190
 lobiflora F. Muell. ex Benth. 190
 lobostoma F. Muell. 202
 massonii Ewart 194
 melanocoma F. Muell. 203
- Kochia continued*
 microcarpa (Benth.) Paul G. Wilson 207
 microphylla (Moq.) F. Muell. 207
 murrayana Ewart & B. Rees 197
 oppositifolia F. Muell. 189
 ostenfeldii Paulsen 201
 ovata Ising 208
 pentagona R. Anderson 192
 pentatropis Tate 201
 planifolia F. Muell. 210
 polypterygia Diels 200
 prosthecochaeta F. Muell. 204
 pubescens auct. non Moq. 209
 pyramidata Benth. 202
 var. *lobostoma* (F. Muell.) C. Moore & E. Betche 202
 radiata Paul G. Wilson 210
 rohrlachii Paul G. Wilson 207
 scleroptera J. Black 188
 sedifolia F. Muell. 198
 var. *stellulata* J. Black 198
 spongicarpa F. Muell. 200
 stelligera (F. Muell.) Benth. 276
 stowardii S. Moore 196
 suaedifolia Paul G. Wilson 206
 tamariscina (Lindley) J. Black 188
 tamariscina auct. non (Lindley) J. Black 207
 thesioides C. Gardner 206
 thymifolia Lindley 188
 tomentosa F. Muell. 212
 f. *tenuis* Domin 207
 var. *appressa* J. Black 212
 var. *enchylaenoides* J. Black 208
 var. *humilis* (Benth.) J. Black 194
 var. *lindleyana* Domin 209
 var. *platyphylla* Ising 210
 var. *tenuifolia* (Benth.) J. Black 206
 triptera Benth. 201
 var. *erioclada* Benth. 201
 var. *pentaptera* J. Black 316
 villosa Lindley 209
 var. *aphylla* (R. Br.) C. Moore & E. Betche 212
 var. *eriantha* (F. Muell.) C. Moore & E. Betche 184
 var. *humilis* Benth. 194
 var. *lasioptera* F. Muell. 194
 var. *microcarpa* Benth. 207
 var. *tenuifolia* F. Muell. ex Benth. 206
- Kochia auct. non* Roth 179
- Lampranthus N. E. Br. 33
 albus auct. non (L. Bolus) L. Bolus 34

INDEX

Lampranthus *continued*

- caespitosus (L. Bolus) N. E. Br. 33
- glaucus (L.) N. E. Br. 33, 35, 41
- multiradiatus (Jacq.) N. E. Br. 34, 41
- tegens (F. Muell.) N. E. Br. 33, 41
- tenuifolius (L.) Schwantes 33
- Lax Bluebush 206
- Leaf Cactus 64
 - Lerchea* *maritima* var. *australis* (R. Br.) Kuntze 313
- Little Noonflower 33
- Loose-flowered Pigface 34
- Low Bluebush 198, 210

Maireana Moq. 179, 274, 275

- sect. *Asterocarpa* F. Muell. 275
- amoena (Diels) Paul G. Wilson 186, 188, 191
- aphylla (R. Br.) Paul G. Wilson 187, 212, 223
- appressa Paul G. Wilson 187, 212, 223
- astrotricha (L. Johnson) Paul G. Wilson 186, 198, 205
- atkinsiana (W. Fitzg.) Paul G. Wilson 204, 211
- brevifolia (R. Br.) Paul G. Wilson 179, 186, 188, 191
- campanulata* Paul G. Wilson 187, 200, 205
- cannonii (J. Black) Paul G. Wilson 203, 205
- carcosa (Moq.) Paul G. Wilson 186, 193, 199
- cheelii (R. Anderson) Paul G. Wilson 185, 186, 191
- ciliata (F. Muell.) Paul G. Wilson 186, 190, 192, 199
- convexa Paul G. Wilson 186, 197, 205
- coronata (J. Black) Paul G. Wilson 186, 192, 199
- decalvans (Gand.) Paul G. Wilson 187, 206, 211
- dichoptera (F. Muell.) Paul G. Wilson 186, 193, 199
- diffusa Paul G. Wilson 186, 189, 191
- enchylaenoides (F. Muell.) Paul G. Wilson 186, 189, 199
- eriantha (F. Muell.) Paul G. Wilson 184, 185, 186, 191
- eriodclada (Benth.) Paul G. Wilson 178, 187, 201, 202, 205
- eriosphaera Paul G. Wilson 186, 193, 199
- excavata (J. Black) Paul G. Wilson 186, 194, 199
- georgei (Diels) Paul G. Wilson 186, 195, 196, 199, 215
- glomerifolia (F. Muell. & Tate) Paul G. Wilson 187, 203, 211
- humillima (F. Muell.) Paul G. Wilson 186, 194, 196, 199
- integra (Paul G. Wilson) Paul G. Wilson 187, 209, 211

Maireana *continued*

- lanosa (Lindley) Paul G. Wilson 186, 190, 199
- lobiflora (F. Muell. ex Benth.) Paul G. Wilson 186, 190, 199
- luehmannii (F. Muell.) Paul G. Wilson 185, 186, 191
- marginata (Benth.) Paul G. Wilson 186, 194, 199
- melanocarpa Paul G. Wilson 187, 210, 223
- melanocoma (F. Muell.) Paul G. Wilson 187, 203, 205
- microcarpa (Benth.) Paul G. Wilson 187, 207, 211, 276
- microphylla (Moq.) Paul G. Wilson 179, 187, 207, 211
- murrayana (Ewart & B. Rees) Paul G. Wilson 186, 197, 205
- oppositifolia (F. Muell.) Paul G. Wilson 186, 189, 199, 218
- ovata (Ising) Paul G. Wilson 187, 208, 211
- pentagona (R. Anderson) Paul G. Wilson 186, 192, 199
- pentatropis (Tate) Paul G. Wilson 187, 201, 205
- planifolia (F. Muell.) Paul G. Wilson 187, 209, 210, 223
- platycarpa Paul G. Wilson 187, 203, 211
- polypterygia (Diels) Paul G. Wilson 187, 200, 205
- prosthecochaeta (F. Muell.) Paul G. Wilson 187, 204, 211
- pyramidata (Benth.) Paul G. Wilson 202, 205
- radiata (Paul G. Wilson) Paul G. Wilson 187, 210, 223
- rohrlachii (Paul G. Wilson) Paul G. Wilson 187, 207, 211
- schistocarpa Paul G. Wilson 202, 205
- sclerolaenoides* (F. Muell.) Paul G. Wilson 224
- scleroptera (J. Black) Paul G. Wilson 186, 188, 191
- sedifolia (F. Muell.) Paul G. Wilson 187, 198, 205
- spongiocarpa (F. Muell.) Paul G. Wilson 187, 200, 205
- stelligera* F. Muell. 275, 276
- stipitata Paul G. Wilson 213, 223
- suadifolia (Paul G. Wilson) Paul G. Wilson 187, 206, 211
- thesioides (C. Gardner) Paul G. Wilson 187, 206, 211
- tomentosa Moq. 179, 208
 - subsp. *tomentosa* 187, 208, 211
 - subsp. *urceolata* Paul G. Wilson 187, 209, 211
- trichoptera (J. Black) Paul G. Wilson 186, 194, 199
- triptera (Benth.) Paul G. Wilson 187, 201, 205
- turbinata Paul G. Wilson 186, 197, 205, 215

INDEX

- Maireana continued*
villosa (Lindley) Paul G. Wilson 187, **209**, 211
- Malacocera R. Anderson 220
albolanata (Ising) Chinnock **220**, 223
bilflora Ising **220**, 223
gracilis Chinnock 219, **221**, 233
tricornis (Benth.) R. Anderson 220, **221**
- Mallee Saltbush 121
- Malvaceae 316
- Mammillaria 62
- Many-winged Bluebush 200
- Marsh Saltbush 127
- Marvel of Peru 6
- Mesembrianthemum* 21
- Mesembryanthemum L. 19, **21**, 24, 30, 31, 32
abbreviatum Haw. 27
aequilaterale Willd. 25
 var. *decagynum* Haw. ex DC. 25
aequilaterum Haw. 25
aitonis Jacq. 22, **23**, 29
angulatum auct. non Thunb. 33
aurantiacum Haw. 62
australe Ait. 36
caducum auct. non Ait. 23
candens Haw. 32
capitatum Haw. 62
clavellatum Haw. 36
cordifolium L.f. 21
crassifolium L. 36
crystallinum L. 21, 22, **23**, 29
edule L. 26
 edule var. *aequilaterum* (Haw.) Moss 25
 var. *virescens* (Haw.) Moss 27
elongatum Haw. 62
equilaterum Haw. 25
floribundum auct. non Haw. 32
glaucescens Haw. 26
glaucum L. 33
laxum auct. non Haw. 34
multiradiatum Jacq. 34
nodiflorum L. 22, **23**, 29
papulosum L.f. 31
pomeridianum L. 32
praecox F. Muell. 28
rossii Haw. 27
sarmentosum Haw. 62
tegens F. Muell. 33
tenue Haw. 24
tumidulum Haw. 34
virescens Haw. 27
- Mexican Tea 147
- Micropterum Schwantes **31**
- Micropterum continued*
papulosum (L.f.) Schwantes **31**, 35, 41
schlechteri Schwantes 31
- Mirabilis L. **6**
jalapa L. **6**, 17
- Monococcus F. Muell. **4**
echinophorus F. Muell. 3, **4**, 17
- Monolepis Schrader **176**
spathulata A. Gray **176**, 191
trifida (Trevir.) Schrader 176
- Morrisiella* Aellen 101
morrissii (R. Anderson) Aellen 116
- Mueller's Saltbush 113
- Mulga Bluebush 197, 206
- Native Orache 94
- Neobassia A. J. Scott **221**
astrocarpa (F. Muell.) A. J. Scott 221, **222**, 233
proceriflora (F. Muell.) A. J. Scott **222**, 233
- Neogunnia drummondii* (Benth.) Pax & K. Hoffm. 49
septifraga (F. Muell.) Pax & K. Hoffm. 49
- Neopreissia* Ulbr. 84, 120
cinerea (Poir.) Ulbr. 129
isatidea (Moq.) Ulbr. 128
isatidea (Moq.) Ulbr. 84
- Nettle-leaf Goosefoot 139
- New Zealand Spinach 42
- Night-blooming Cereus 76, 80
- Nitre Goosefoot 146
- Nopalea* Salm-Dyck 65
cochenillifera (L.) Salm-Dyck 65, 67
dejecta (Salm-Dyck) Salm-Dyck 67
- Nyctaginaceae **5**, 318
- Nyctocereus (A. Berger) Britton & Rose **80**
serpentinus (Lagasca & Rodrigues) Britton & Rose 77, **80**, 95
- Obione* billardierei Moq. 132
- Old Man Saltbush 130
- Opuntia Miller 62, 64, **65**
 subg. *Cylindropuntia* Engelm. **67**
 subg. *Opuntia* **69**, 73
amyclea Tenore 74
arborescens Engelm. 67
aurantiaca Lindley **69**
bentonii Griff. 72
bonaerensis Speg. 69
cochenillifera (L.) Miller 65, 67
compressa (Salisb.) Macbride 70
cylindrica (Lam.) DC. 68, **69**, 73
dejecta Salm-Dyck 67
dillenii (Ker Gawler) Haw. 72

INDEX

- Opuntia continued*
elatior Miller **70**, 73
erinacea Engelm. & Bigelow 67
exaltata A. Berger 65
ferox auct. non Haw. 69
ficus-indica (L.) Miller 62, 65, 70, **74**, 95
humifusa (Raf.) Raf. 65, **70**, 72, 73
imbricata (Haw.) DC. 65, **67**, 68, 73
inermis (DC.) DC. 72
leptocaulis DC. 67
lindheimeri Engelm. **71**, 73
 var. *lindheimeri* 71
 var. *linguiformis* (Griffiths) L. Benson 71
lubrica Griffiths 75
megacantha Salm-Dyck 74
microdasys (Lehm.) Pfeiffer **75**, 95
monacantha (Willd.) Haw. 70
opuntia (L.) Coulter 70, 72
pachona Griffiths 74
paraguayensis K. Schum. 68, **69**, 73
robusta Wendl. ex Pfeiffer **74**, 79, 95
rufida Engelm. 67, 75
streptacantha Lemaire 68, **74**, 95
stricta (Haw.) Haw. **71**, 95
 var. *dillenii* (Ker Gawler) L. Benson **72**, 95
 var. *stricta* 68, **72**, 95
subulata (Muehlenpf.) Engelm. 67
sulphurea G. Don ex Loudon **72**, 95
tomentosa Salm-Dyck **75**, 79, 95
tunicata (Lehm.) Link & Otto 67
vulgaris Miller **70**, 73
vulgaris auct. non Miller 71
sp. **75**, 95
- Orache, Garden 91
 Native 94
- Orthospermum* Opiz 150
- Orthosporum* (R. Br.) T. Nees 132, 150
- Osteocarpum* F. Muell. **231**
 sect. *Babbagia* (F. Muell.) Kuntze 231
 acropterum (F. Muell. & Tate) Volkens **232**,
 236, **327**
 var. *acropterum* **232**, 234, 251
 var. *deminutum* (J. Black) Paul G. Wilson
 232, 234, **235**, 251, 274, **327**
 diptercarpum (F. Muell.) Volkens 234, **235**,
 251, **328**
 pentapterum (F. Muell. & Tate) Volkens 234,
 235, 236, 251
 salsuginosum F. Muell. 231, **232**, 234, 248,
 251, **328**
 scleropterum (F. Muell.) Volkens **236**, 251
- Pachycornia* J. D. Hook. **308**
 arbuscula (R. Br.) A. J. Scott 306
 robusta (F. Muell.) Baillon 308
 tenuis (Benth.) J. Black 307
 triandra (F. Muell.) J. Black **308**, 317
- Pachypharynx* Aellen 84
 acuminata Aellen 127, 324
 neglecta Aellen 122
- Pear, Creeping 70
 Gracemere 74
 Tiger 69
 Westwood 74
- Pearl Bluebush 198
- Pereskia* Miller **64**
 aculeata Miller **64**, 73
- Peru, Marvel of 6
- Pest Pear, Smooth 72
 Spiny 72
- Phytolacca* L. **1**
 americana L. **1**, 2, 17
 decandra L. 2
 dioica L. **2**, 3, 17
 octandra L. **2**, 3, 17
- Phytolaccaceae **1**
- Pigeon Berry 2
- Pigface 19
 Angled 26
 Angular 26
 Inland 27
 Loose-flowered 34
 Round-leaved 36
- Pisonia* L. **16**
 aculeata L. **16**
 brunoniana Endl. 16, 18
 excelsa Blume 18
 grandis R. Br. 7, **18**, 29
 inermis auct. non Jacq. 18
 mooriana F. Muell. 18
 umbellifera (Forster & G. Forster) Seemann
 18, 29, 39
- Pokeweed 2
- Pop Saltbush 96
- Portulaca portulacastrum* L. 61
- Portulacaceae 316
- Prickly Pear 62
 Common 72
 Drooping 70
- Prickly Saltwort 314
- Psilocaulon* N. E. Br. **24**
 articulatum (Thunb.) N. E. Br. 24

INDEX

- Psilocaulon continued*
caducum auct. non (Ait.) N. E. Br. 23, 24
tenue (Haw.) Schwantes 22, **24**, 29
 Purple Goosefoot 176
- Queen of the Night 76
 Queensland Bluebush 144
- Redburr 247
 Giant 261
 Red Crumbweed 158
 Redondo Creeper 32
- Rhagodia R. Br. 143, **164**
acicularis Paul G. Wilson **168**, 169, 173
baccata (Labill.) Moq. 164, **170**
 subsp. *baccata* **170**, 171, 172, 173
 subsp. *dioica* (Nees) Paul G. Wilson 170, **172**, 173
 var. *angustifolia* Moq. 170
 var. *candolleana* (Moq.) Moq. 167
 var. *congesta* (J. D. Hook.) J. D. Hook. 139
 var. *linearis* (Benth.) J. Black 170
 var. *parvifolia* Moq. 167
baccata auct. non (Labill.) Moq. 167
billardierei R. Br. 164, 170
 var. *congesta* (J. D. Hook.) Benth. 139
 var. *linearis* Benth. 170
billardierei auct. non R. Br. 167
candolleana Moq. **167**, 168
 subsp. *argentea* Paul G. Wilson **167**, 173
 subsp. *candolleana* **167**, 173
chenopodioides Moq. 161
congesta (J. D. Hook.) Moq. 139
coralliocarpa S. Moore 143
crassifolia R. Br. **167**, 173
 var. *latifolia* Benth. 172
cygnorum Gand. 170
deltophylla (F. Muell.) A. J. Scott 174
dioica Nees 172
drummondii Moq. **172**, 191
eremaea Paul G. Wilson **174**, 191
gaudichaudiana Moq. 143
hastata R. Br. 164
latifolia (Benth.) Paul G. Wilson **172**
 subsp. *latifolia* **172**, 173
 subsp. *recta* Paul G. Wilson **172**, 173
linifolia R. Br. 162
nitrariacea F. Muell. 146
nutans R. Br. 161, 162
 var. *fallacina* Domin 162
 var. *oxycarpa* Gauba 162
obovata Moq. 170
parabolica R. Br. **175**, 191
- Rhagodia continued*
parabolica
 var. *reclinata* (Cunn. ex Moq.) Domin 175
parvifolia Moq. 167
preissii Moq. **168**
 subsp. *obovata* (Moq.) Paul G. Wilson **170**, 173
 subsp. *preissii* **170**, 173
prostrata A. Cunn. ex Moq. 141
radiata Nees 170
reclinata Cunn. ex Moq. 175
spinescens R. Br. **174**, 191
 var. *deltophylla* F. Muell. 174
ulicina (Gand.) Paul G. Wilson **168**, 173
- Rhipsalis 62
 River Saltbush 131
 Rivina L. **4**
 glabra L. 4
 humilis L. 3, **4**
 var. *glabra* (L.) H. Walter 4
 laevis L. 4
 Rivinia L. 4
 Roly-poly 314
 Black 261
 Round-leaved Pigface 36
 Roycea C. Gardner **216**
 divaricata Paul G. Wilson **218**, 223, **328**
 pycnophylloides C. Gardner **216**, 217, 223
 spinescens C. Gardner **216**, 217, 223
 Ruby Saltbush 215
 Rumicastrum chamaecladum (Diels) Ulbr. 316
 Ruschia Schwantes **34**
 rupicola (Engl.) Schwantes 34
 tumidula (Haw.) Schwantes **34**, 35, 41
- Sago Bush 202
 Salicornia L. 277
 arbuscula R. Br. 306
 australasica (Moq.) H. Eichler 302
 australis Sol. ex Benth. 278
 australis Sol. ex F. Muell. 278
 bidens (Nees) Benth. 299
 blackiana Ulbr. 280
 cinerea (F. Muell.) F. Muell. 302
 donaldsonii Ewart & J. White 307
 indica Willd. 298
 indica auct. non Willd. 278
 leiostachya Benth. 299
 lylei Ewart & J. White 291
 pachystachya J. Black 280
 quinqueflora Bunge ex Ung.-Sternb. 278
 robusta F. Muell. 308

INDEX

- Salicornia continued*
tenuis Benth. 307
triandra (F. Muell.) Druce 308
 Salicornieae 81
 Saloop 164
 Salsola L. 313, **314**
aphylla (R. Br.) Sprengel 212
atriplicifolia Sprengel 177
australis R. Br. 314, 316
 var. *strobilifera* (Benth.) Domin 314
brachyphylla Sprengel 188
brachypteris Moq. 314
carinata (R. Br.) Sprengel 150
hyssopifolia Pallas 177, 179
 kali L. **314**, 315, 316, 317
 subsp. *austroafricana* Aellen 316
 subsp. *ruthenica* (Iljin) So~R 314, 316
 subsp. *tragus* (L.) Nyman 316
 var. *brachypteris* (Moq.) Benth. 314
 var. *leptophylla* Benth. 314
 var. *strobilifera* Benth. 314, 316
macrophylla R.Br. 314
ruthenica Iljin 314
 soda L. 314
tragus L. 316
 Saltbush, Barrier 215
 Berry 110, 164, 174
 Bladder 122
 Climbing 161
 Creeping 110
 Curious 229
 Donald Duck 120
 Fan 105
 Flat-topped 97
 Grey 129
 Kidney 121
 Mallee 121
 Marsh 127
 Mueller's 113
 Old Man 130
 Pop 96
 Prickly 314
 River 131
 Ruby 215
 Short-wing 276
 Silver 121
 Slender-fruit 108
 Spiny 174
 Swamp 129
 Samphire 299
 Blackseed 288

Sarcocornia A. J. Scott **278**
 blackiana (Ulbr.) A. J. Scott 237, 279, **280**,
 285, 289
 globosa Paul G. Wilson 279, **280**, 289
 perennis (Miller) A. J. Scott 278
 quinqueflora (Bunge ex Ung.-Sternb.) A. J.
 Scott **278**
 subsp. *quinqueflora* 279, **280**, 281, 285
 subsp. *tasmanica* Paul G. Wilson 279, **280**,
 289
Sarcozona J. Black **28**
 bicarinata S. T. Blake **28**, 41
 praecox (F. Muell.) S. T. Blake ex H. Eichler
 28, 35, 41
 pulleinei (J. Black) J. Black 28
 Scented Goosefoot 147
 Schlumbergera 62
Schoberia australis (R. Br.) C. Meyer ex Steudel
 313
Sclerobassia Ulbr. 236
 litoralis (Diels) Ulbr. 236, 249
Scleroblitum Ulbr. **175**, 176
 atriplicinum (F. Muell.) Ulbr. **175**, 191
Sclerochlamys F. Muell. **276**
 brachyptera F. Muell. 249, 275, **276**, 281
Sclerolaena R. Br. 220, 230, 231, **236**, 238,
 274, 326
 sect. *Anisacantha* (R. Br.) Ulbr. 236
 subgen. *Anisacantha* (R. Br.) Domin 236
 aellenii (Ising) A. J. Scott 274
 alata Paul G. Wilson 246, **267**, 271, **328**
 albolanata (Ising) A. J. Scott 220
 andersonii (Ising) A. J. Scott 259
 anisacanthoides (F. Muell.) Domin 231, 236,
 244, **248**, 251, 275
 articulata (J. Black) A. J. Scott 245, **260**, 263
 astrocarpa (F. Muell.) Domin 222
 beagleholei (Ising) A. J. Scott 254
 bicornis Lindley 236, **272**
 var. *bicornis* 237, 246, **272**, 281
 var. *horrida* Domin 246, 253, **272**, 274, 281
 bicuspis (F. Muell.) Domin 246, **273**, 281
 biflora R. Br. 228
 var. *cephalocarpa* F. Muell. 228, 325
 birchii (F. Muell.) Domin 245, **264**, 271
 blackei (Ising) A. J. Scott 258
 blackiana (Ising) A. J. Scott 246, **270**, 281
 blakei (Ising) A. J. Scott 245, **258**, 259, 263,
 329
 brevifolia (Ising) A. J. Scott 244, **250**, 253,
 257
 burbidgeae (Ising) A. J. Scott 245, **255**, 257
 calcarata (Ising) A. J. Scott 231, 236, 244,
 247, 251
 caput-casuarii (J. H. Willis) A. J. Scott 274

INDEX

Sclerolaena *continued*

- clavata* (Ising) A. J. Scott 274
clelandii (Ising) A. J. Scott 246, **273**, 281
constricta (Ising) A. J. Scott 245, **255**, 257
convexula (R. Anderson) A. J. Scott 246, **264**, 271
copleyi (Ising) A. J. Scott 274
coriacea Moq. 253
cornishiana (F. Muell.) A. J. Scott 246, **266**, 271
costata (R. Anderson) A. J. Scott 246, **264**, 271
crenata (Ising) A. J. Scott 245, **255**, 257
cristata (Ising) A. J. Scott 274
cucullata (Ising) A. J. Scott 266
cuneata Paul G. Wilson 245, **259**, 260, 263, **328**, 329
decurrens (J. Black) A. J. Scott 246, **272**, 275, 281
densiflora (W. Fitzg.) A. J. Scott 246, **268**, 269, 271
deserticola Paul G. Wilson 245, **262**, 271, **329**
diacantha (Nees) Benth. 244, **254**, 255, 257, 274
 var. *longispina* Benth. 252, **330**
divaricata (R.Br.) Smith 236, 245, **259**, 263, 274, 329
drummondii (Benth.) Domin 244, **252**, 257, 274, 329
 ar. *hispidia* (S. Moore) A. J. Scott 252
eichleri (Ising) A. J. Scott 254, 255
eriacantha (F. Muell.) Ulbr. 245, **256**, 263
eurotioides (F. Muell.) A. J. Scott **243**, 244, 251
everistiana (Ising) A. J. Scott 246, **269**, 281
filiformis (Ising) A. J. Scott 264
fimbriolata (F. Muell.) A. J. Scott 244, **247**, 251
forrestiana (F. Muell.) Domin, 246, **270**, 281
fusiformis Paul G. Wilson 244, **248**, 251, 252, **329**
gardneri (Ising) A. J. Scott 254
georgei (Ising) A. J. Scott 274
glabra (F. Muell.) Domin 245, **259**, 263, 329
globosa (Ising) A. J. Scott 274
holtiana (Ising) A. J. Scott 245, **254**, 255, 256, 257
hostilis (Diels) Domin 244, **250**, 257
intricata (R. Anderson) A. J. Scott 245, **260**, 263, 275
johnsonii (Ising) A. J. Scott 246, 262, **265**, 271
lanata (Ising) A. J. Scott 274
lanicuspis (F. Muell.) F. Muell. ex Benth. 246, **269**, 274, 281
limbata (J. Black) Ulbr. 244, **253**, 257
longicuspis (F. Muell.) A. J. Scott 246, **266**, 267, 271

Sclerolaena *continued*

- medicaginooides* Paul G. Wilson 245, **258**, 263, **329**
microcarpa (R. Anderson) A. J. Scott 244, **249**, 257
minuta (Ising) A. J. Scott 246, **268**, 271
muelleri (Benth.) A. J. Scott 246, **266**, 271
muricata (Moq.) Domin **261**
 var. *birchii* (F. Muell.) Domin ex Ulbr. 264
 var. *gracilicuspis* (F. Muell.) Domin 262
 var. *lanata* (Ising) A. J. Scott 262
 var. *muricata* 245, **262**, 263, 265
 var. *semiglabra* (Ising) A. J. Scott **262**, 263
 var. *villosa* (Benth.) Ulbr. **262**, 263
murrayae (Ising) A. J. Scott 275
napiformis Paul G. Wilson 246, **268**, 271, **330**
nitida (Ising) A. J. Scott 275
obconica (Ising) A. J. Scott 264
obliquicuspis (R. Anderson) Ulbr. 244, 250, **252**, 257, 330
oppositicuspis (Ising) A. J. Scott 275
paradoxa R. Br. 229
parallelicuspis (R. Anderson) A. J. Scott 245, **256**, 263
parviflora (R. Anderson) A. J. Scott 246, 265, **267**, 268, 271, 274
patenticuspis (R. Anderson) Ulbr. 244, **250**, 253, 257, 330
ramsayae (J. H. Willis) A. J. Scott 275
ramulosa (C. White) A. J. Scott 246, **265**, 271
recurvicuspis (W. Fitzg.) Domin 236, 244, **249**, 251, 275
scrymgeouriae (Ising) A. J. Scott 275
spinosa (Ewart & O. B. Davies) A. J. Scott 226
stylosa (Ising) A. J. Scott 246, **270**, 281
symoniana (Ising) A. J. Scott 244, **247**, 251
tatei (F. Muell.) A. J. Scott 245, **258**, 263
tetracuspis (C. White) A. J. Scott 244, **250**, 257
tetragona Paul G. Wilson 244, **249**, 257, 277, **330**
tricuspis (F. Muell.) Ulbr. 245, **261**, 263
tridens (F. Muell.) Domin 236, 246, **267**, 271 328
tubata (R. Anderson) A. J. Scott 245, **261**, 263
uniflora R. Br. 236, 244, **253**, 255, 257, 274
urceolata (Ising) A. J. Scott 231, 232, 244, **248**, 251
ventricosa (J. Black) A. J. Scott 236, 246, **269**, 275, 281
walkeri (C. White) A. J. Scott 236, **243**, 244, 251, 276
wilsonii (Ising) A. J. Scott 254
 sp. 275

INDEX

- Sclerostegia Paul G. Wilson **304**
 arbuscula (R. Br.) Paul G. Wilson **306**, 309
 disarticulata Paul G. Wilson **306**, 309
 medullosa Paul G. Wilson *305*, **307**, 317
 moniformis Paul G. Wilson **307**, 309
 tenuis (Benth.) Paul G. Wilson 304, **307**, 317
- Seniella* Aellen 84
spongiosa (F. Muell.) Aellen 84, 96
 f. *microcarpa* Aellen 96
 var. *amoena* Aellen 96
 var. *holocarpa* (F. Muell.) Aellen 96
 var. *xylocarpa* Aellen 96
- Sesuvium L. **61**
 portulacastrum (L.) L. *43*, **61**, 73
quadrifidum F. Muell. 45
- Short-wing Saltbush 276
- Shrubby Bluebush 202
- Sida 316
- Silver Saltbush 121
- Slender-fruit Saltbush 108
- Small Crumbweed 150
- Small-leaf Bluebush 188
- Smooth Pest Pear 72
- Smooth Tree Pear 70
- Snake Cactus 80
- Soda Bush 222
- Soft Buckbush 314
- Soft Horns 221
- Spinach Beet 277
- Spinach, Bower 38
 New Zealand 42
- Spinach-burr 269
- Spiny Pest Pear 72
- Spiny Saltbush 174
- Stelligera A. J. Scott **275**
 endecaspinis A. J. Scott 243, 275, **276**, 277, 281
- Stinking Goosefoot 139
- Suaeda Forsskal ex Scop. **310**
 sect. *Chenopodina* Moq. 310
 aegyptiaca (Hasselq.) Zoh. *311*, **312**, 317
 arbusculoides L. S. Smith *311*, **312**, 317
 australis (R. Br.) Moq. *311*, **313**, 317
baccata Forsskal 312
baccata Forsskal ex J. Gmelin 312
baccifera Pallas *311*, **312**, 317
 linifolia Pallas **310**, 312, 317
 maritima (L.) Dumort. 313
 var. *australia* (R. Br.) Domin 313
maritima auct. non (L.) Dumort 313
tamariscina Lindley 188
 vera Forsskal ex J. Gmelin 310
- Sugarbeet 277
- Swamp Saltbush 129
- Tangled Copper-burr 259
- Tar Vine 163
- Tarvine 6
- Tecticornia J. D. Hook. **302**
 arborea Paul G. Wilson *303*, **304**, 309
 australasica (Moq.) Paul G. Wilson *301*, **302**, 309
 cinerea (F. Muell.) Baillon 302
 verrucosa Paul G. Wilson *303*, **304**, 309
- Tegicornia Paul G. Wilson **300**
 uniflora Paul G. Wilson **300**, *301*, 309
- Tetragonella amplexicoma* Miq. 37
implexicoma Miq. 37
- Trubugonia L. **37**
 cristata C. Gardner ex A. Prescott **42**, *43*, 51
 decumbens Miller **38**, 39, 41, *43*
 diptera F. Muell. **40**, *43*, 51
 eremaea Ostenf. **40**, *43*, 51
expansa Murray 42
 fruticosa L. 37, **38**, 41
heterophylla Ecklon & Zeyher 38
 implexicoma (Miq.) J. D. Hook. **37**, 41, *43*
 nigrescens Ecklon & Zeyher **38**, 41
 tetragonoides (Pallas) Kuntze **42**, *43*, 51
 trigyna Banks & Sol. ex J. D. Hook. 38
zeyheri Fenzl 38
- Theleophyton* Moq. 84, 132
billardieria (Moq.) Moq. 84, 132
- Three-spined Bassia 261
- Three-wing Bluebush 201
- Threlkeldia R. Br. **230**, 231
brevicuspis (F. Muell.) F. Muell. ex Benth. 248
 diffusa R. Br. **230**, 233, 274
 var. *latifolia* Benth. 230
drupata Diels 230
haloragoides F. Muell. ex Benth. **316**
 inchoata (J. Black) J. Black **231**, 233
obliqua J. Black 231
proceriflora F. Muell. 222
salsuginosa (F. Muell.) Benth. 232
- Tiger Pear 69
- Tree Pear, Drooping 70
 Smooth 70
 Velvet 75
- Trianthema L. **52**
australia Melville 60
 compacta C. White 55, **56**, 59
crystallina var. *clavata* J. Black 58, 319

INDEX

Trianthema continued

crystallina auct. non (Forsskal) Vahl. 58
cussackiana F. Muell. 57, 59
cypseleoides (Fenzl) Benth. 54, 59
cypseleoides auct. non (Fenzl) Benth. 56
decandra acut. non L. 60
galericulata Melville 60
glaucifoliai F. Muell. 58
glossostigma F. Muell. 55, 56, 59
humillima F. Muell. 61
maidenii S. Moore 37
megasperma A. Prescott 53, 55, 59
monogyna L. 58
oxycalyptra F. Muell. 57, 319
var. *oxycalyptra* 57, 59, 319
var. *pedunculata* F. Muell. 57, 319
var. *sessiliflora* F. Muell. 57, 73, 319
patellitecta A. Prescott 54, 55, 59
pilosa F. Muell. 54, 55, 59
portulacastrum L. 52, 55, 58, 73
rhynchocalyptra F. Muell. 53, 55, 59
triquetra Willd. 58, 73

Trianthema continued

triquetra
var. *clavata* (J. Black) H. Eichler 58, 73, 319
var. *triquetra* 58
turgidifolia F. Muell. 55, 56, 59, 79
turgidifolia auct. non F. Muell. 37

Velvet Tree Pear 75

Weed, Fissure 192

Westwood Pear 74

Wheel Cactus 74

White Goosefoot 138

Wild Beet 277

Willemetia Maerklin 177

Yellow Burr 248

Zaleya Burman f. 60

decandra (L.) Burman f. 60

decandra auct. non (L.) Burman f. 60

galericulata (Melville) H Eichler 43, 60, 73

Flora of Australia — Index to families of flowering plants

	Volume		Volume		Volume
Acanthaceae	33	Campanulaceae	34	Ericaceae	9
Aceraceae	25	Cannabaceae	3	Eriocaulaceae	40
Actinidiaceae	6	Cannaceae	45	Erythroxylaceae	24
Agavaceae	46	Capparaceae	8	Eucryphiaceae	10
Aizoaceae	4	Caprifoliaceae	36	Euphorbiaceae	23
Akaniaceae	25	Cardiopteridaceae	22	Eupomatiaceae	2
Alangiaceae	22	Caryophyllaceae	5	Fabaceae	13,14,15
Alismataceae	39	Casuarinaceae	3	Fagaceae	3
Amaranthaceae	5	Celastraceae	22	Flacourtiaceae	8
Anacardiaceae	25	Centrolepidaceae	40	Flagellariaceae	40
Annonaceae	2	Cephalotaceae	10	Frankeniaceae	8
Apiaceae	27	Ceratophyllaceae	2	Fumariaceae	2
Apocynaceae	28	Chenopodiaceae	4	Gentianaceae	28
Aponogetonaceae	39	Chrysobalanaceae	10	Geraniaceae	27
Aquifoliaceae	22	Cistaceae	8	Gesneriaceae	33
Araceae	39	Clusiaceae	6	Goodeniaceae	35
Araliaceae	27	Combretaceae	18	Grossulariaceae	10
Arecaceae	39	Commelinaceae	40	Gunneraceae	18
Aristolochiaceae	2	Connaraceae	10	Gyrostemonaceae	8
Asclepiadaceae	28	Convolvulaceae	30	Haemodoraceae	45
Asteraceae	37,38	Corsiaceae	47	Haloragaceae	18
Austrobaileyaceae	2	Corynocarpaceae	22	Hamamelidaceae	3
Balanopaceae	3	Costaceae	45	Hanguanaceae	46
Balanophoraceae	22	Crassulaceae	10	Hernandiaceae	2
Basellaceae	5	Cucurbitaceae	8	Himantandraceae	2
Bataceae	8	Cunoniaceae	10	Hippocrateaceae	22
Berberidaceae	2	Cuscutaceae	30	Hydatellaceae	45
Betulaceae	3	Cymodoceaceae	39	Hydrocharitaceae	39
Bignoniaceae	33	Cyperaceae	41,42	Hydrophyllaceae	30
Bixaceae	8	Datisceae	8	Icacinaceae	22
Bombacaceae	7	Davidsoniaceae	10	Idiospermaceae	2
Boraginaceae	30	Dichapetalaceae	22	Iridaceae	46
Brassicaceae	8	Dilleniaceae	6	Juncaceae	40
Bromeliaceae	45	Dioscoreaceae	46	Juncaginaceae	39
Brunoniaceae	35	Dipsacaceae	36	Lamiaceae	31
Burmanniaceae	47	Donatiaceae	34	Lauraceae	2
Burseraceae	25	Droseraceae	8	Lecythidaceae	8
Byblidaceae	10	Ebenaceae	10	Leeaceae	24
Cabombaceae	2	Elaeagnaceae	16	Lemnaceae	39
Cactaceae	4	Elaeocarpaceae	7	Lentibulariaceae	33
Caesalpiniaceae	12	Elatinaceae	6	Liliaceae	45
Callitrichaceae	32	Epacridaceae	9	Limnocharitaceae	39

Volume	Volume	Volume			
Linaceae	24	Piperaceae	2	Surianaceae	10
Loganiaceae	28	Pittosporaceae	10	Symplocaceae	10
Loranthaceae	22	Plantaginaceae	32	Taccaceae	46
Lythraceae	18	Plumbaginaceae	5	Tamaricaceae	8
Magnoliaceae	2	Poaceae	43,44	Theaceae	6
Malpighiaceae	24	Podostemaceae	18	Thymelaeaceae	18
Malvaceae	7	Polemoniaceae	30	Tiliaceae	7
Marantaceae	45	Polygalaceae	24	Trapaceae	18
Melastomataceae	18	Polygonaceae	5	Tremandraceae	24
Meliaceae	26	Pontederiaceae	45	Triuridaceae	39
Meliantaceae	25	Portulacaceae	5	Tropaeolaceae	27
Menispermaceae	2	Posidoniaceae	39	Typhaceae	45
Menyanthaceae	30	Potamogetonaceae	39	Ulmaceae	3
Mimosaceae	11,12	Primulaceae	10	Urticaceae	3
Molluginaceae	5	Proteaceae	16,17	Valerianaceae	36
Monimiaceae	2	Punicaceae	18	Verbenaceae	30
Moraceae	3	Rafflesiaceae	22	Violaceae	8
Moringaceae	8	Ranunculaceae	2	Viscaceae	22
Musaceae	45	Resedaceae	8	Vitaceae	24
Myoporaceae	33	Restionaceae	40	Winteraceae	2
Myristicaceae	2	Rhamnaceae	24	Xanthophyllaceae	24
Myrsinaceae	10	Rhizophoraceae	22	Xanthorrhoeaceae	46
Myrtaceae	19,20,21	Rosaceae	10	Xyridaceae	40
Najadaceae	39	Rubiaceae	36	Zannichelliaceae	39
Nelumbonaceae	2	Ruppiaceae	39	Zingiberaceae	45
Nepenthaceae	8	Rutaceae	26	Zosteraceae	39
Nyctaginaceae	4	Salicaceae	8	Zygophyllaceae	26
Nymphaeaceae	2	Santalaceae	22		
Ochnaceae	6	Sapindaceae	25		
Olacaceae	22	Sapotaceae	10		
Oleaceae	32	Saxifragaceae	10		
Onagraceae	18	Scrophulariaceae	32		
Opiliaceae	22	Simaroubaceae	25		
Orchidaceae	47	Smilacaceae	46		
Orobanchaceae	33	Solanaceae	29		
Oxalidaceae	27	Sonneratiaceae	18		
Pandanaceae	39	Sparganiaceae	45		
Papaveraceae	2	Sphenocleaceae	34		
Passifloraceae	8	Stackhousiaceae	22		
Pedaliaceae	33	Stemonaceae	46		
Philydraceae	45	Sterculiaceae	7		
Phytolaccaceae	4	Stylidiaceae	34		

ISBN 0 644 03442 4
R80/770(5) Cat. No. 84 0489 7

Printed in Australia

the 1990s, the number of people in the UK who are aged 65 and over has increased from 10.5 million to 13.5 million, and the number of people aged 75 and over has increased from 4.5 million to 6.5 million (Office for National Statistics 2000).

There is a growing awareness of the need to address the needs of older people, and the need to ensure that the health care system is able to meet the needs of older people. The Department of Health (2000) has set out a strategy for the health care system to meet the needs of older people, and the Health Service Research Unit (2000) has set out a research agenda for the health care system to meet the needs of older people.

The Health Service Research Unit (2000) has identified a number of key areas for research, and the Department of Health (2000) has identified a number of key areas for research. The Health Service Research Unit (2000) has identified a number of key areas for research, and the Department of Health (2000) has identified a number of key areas for research.

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