

## Order RHIZOSTOMEAE

Scyphomedusae with umbrella margin cleft into lappets; without marginal tentacles; without a central mouth opening, but with numerous mouths upon eight adradial, fleshy, branched, arm-like appendages arising from the centre of the subumbrella; with rhopalia between marginal clefts.

(The treatment of the Rhizostomeae is mainly based on the more or less scattered remarks and descriptions in STIASNY'S numerous papers and does not claim to be a complete revision, though the bibliography may be rather complete.)

### Suborder *KOLPOPHORAE*

Mouth-arms dichotomous and triangular or three-winged. A network of anastomosing canals communicate with the central gastral cavity in several places between the radial canals. Rhopalar pits smooth, without radial folds. Subgenital ostia without papillae.

#### *Kampylomyariae*

Kolpophorae with subumbrellar muscles in feather-like arcs. Radial canals usually about twice as many as rhopalia (more or less than 32). Without or with faintly indicated ring canal. With four completely separated subgenital cavities. Subgenital ostia small, round. Stomach circular. Arm disk octagonal, with four primary canals. One family.

### Family *CASSIOPEIDAE*

#### Genus *Cassiopea* Péron & Lesueur 1809

Cassiopeidae with eight pinnately or irregularly branched mouth-arms with ventral mouth-openings only and large or small vesicles; ring canal absent or faintly indicated; usually with 16 rhopalar and about 16 (or more) inter-rhopalar canals.

Type-species: *C. andromeda* (Forskål).

PÉRON & LESUEUR 1809, p. 356: *Cassiopea* n.g. HAECKEL 1880, pp. 567-8: as *Cassiopea* and *Polyclonia*. MAYER 1910, p. 636: *Cassiopea*. HUMMELINCK 1933, pp. 453-502: revision of the genus.

#### *Cassiopea andromeda* (Forskål 1775)

100-120 mm wide, 20-30 mm high, flat, disk-shaped; variable number of short, blunt, marginal lappets; mouth-arms wide, flat; 4-6 flat, short side branches arise from each arm in a tree-like manner; numerous small and five or more large, club-shaped vesicles on each arm between the mouths.

FORSKÅL 1775, p. 107, Pl. 31, three figs.: as *Medusa andromeda* n.sp. PÉRON & LESUEUR 1809, p. 356: as *Cassiopea* n.g. *forskalea*. ESCHSCHOLTZ 1829, p. 43: *Cassiopea andromeda*. MAYER 1910, p. 637: *C. andromeda*; (east coast of Africa; Red Sea; Indian Ocean east to the Malayan Archipelago); p. 639: as *C. andromeda* var. *zanzibarica* Chun 1896; (Zanzibar coast, E. Africa); as *C. andromeda* var. *malayensis* Maas 1903; (Malayan Archipelago); as *C. andromeda* var. *maldivensis* Browne 1905a; (Maldive Islands, Indian Ocean); p. 640: as *C. andromeda* var. *acyclobalia* Schultze 1898; (Amboina, Malayan Archipelago); as *C. polypoides* Keller 1883; (Red Sea). VANHÖFFEN 1911b, p. 322, fig. 1b: *C. andromeda*; p. 327, text-figs. 4a, 5a, 5b: as *C. cyclobalia*. LIGHT 1914b, p. 201, fig. 1: as *C. polypoides* var. *culionensis* nov. var.; Philippines; p. 203: as ?*C. polypoides*. MAYER 1915a, p. 183, fig. 3: as *C. andromeda* var. *baduensis* nov. var.; between Australia and New Guinea. BROWNE 1916a, p. 206: as *C. andromeda* var. *maldivensis*; Seychelles, Indian Ocean. BROWNE 1916b, p. 154: as *C. andromeda* var. *maldivensis*; west coast of India. MAYER 1917a, p. 207, fig. 12: as *C. andromeda* var. *baduensis*; N. Australia. STIASNY 1920, p. 222: *Cassiopeia andromeda*; Red Sea. STIASNY 1921b, p. 67: *C. cyclobalia* = *andromeda*; p. 70, Pl. 1, fig. 1, text-fig. 1: as *C. andromeda* var. *maldivensis*; Pl. 3, fig. 17, text-fig. 2: *C. andromeda*; Red Sea. STIASNY 1922b, p. 44: as *C. andromeda* var. *zanzibarica*; Zanzibar, E. Africa. STIASNY 1922c, p. 62: *Cassiopeja acyclobalia* a geographical variety of *C. andromeda*. STIASNY 1922e, p. 526: Johore Strait and Point Tello, India. STIASNY 1922f, p. 90, figs. 5, 6: as *C. andromeda* var. *malayensis*; anomalies. STIASNY 1924a, p. 488: *Cassiopeia andromeda*; Malayan Archipelago. BROWNE 1926, p. 112: *C. andromeda*; Suez Canal; p. 113: as *C. polypoides*. STIASNY 1926a, p. 245: as *C. polypoides* var. *culionensis*; Philippines. STIASNY 1929c, p. 198: *Cassiopeia andromeda*; Malayan Archipelago. STIASNY 1930a, p. 23: *Cassiopeia andromeda*; Fiji Islands. RAO 1931a, p. 40: as *C. andromeda* var. *maldivensis*; Indian Ocean. STIASNY 1931a, p. 140: *C. andromeda*; Australia; Solomon Islands; Mozambique, E. Africa; Suez Canal; Red Sea; N. of Madagascar; p. 141: as *C. andromeda* var. *maldivensis*; Maldive Islands, Indian Ocean; p. 142: as *C. polypoides* var. *culionensis*; Puerto Galera, Philippines. HUMMELINCK 1933, p. 482, fig. 35: as *C. andromeda* var. *malayensis* Maas; the original specimens examined; p. 484: *C. cyclobalia* (*acyclobalia* is a misprint) = *andromeda*; p. 485: *C. polypoides* var. *culionensis* = *andromeda*. STIASNY 1935, p. 34: Malayan Archipelago. MENON 1936, p. 3: Krusadā' Island, India. STIASNY 1937b, p. 207: Malayan Archipelago. STIASNY 1938, p. 16, Pl. 1, fig. 4: Red Sea. RANSON 1945b, p. 318: Suez Canal; Red Sea; Indochina; Zanzibar; Poulo Condore, off Thailand; Mascate. SCHÄFER 1955, pp. 241-5, figs. 2-5: Aegean Sea, migrated from the Indian Ocean through the Suez Canal. HORRIDGE 1956b, pp. 375-6, fig. 9: innervation; Red Sea. SEARLE 1957, p. 76: as *Cassiopeia* sp.; Singapore. HORRIDGE 1959, pp. 78, 80, 84, 89, fig. 4 (diagram). MAADEN 1959, p. 8: Gulf of Aqaba, Red Sea; p. 7: *C. polypoides* a valid species.

### *Cassiopea depressa* Haeckel 1880

100-120 mm wide, 15-20 mm high; exumbrella flat, without aboral concavity or dome; 144 wide, pointed, not prominent lappets; mouth-arms very wide, flat, with 6-8 short, wide-spreading main branches; numerous very small club-shaped vesicles between the mouths.

HAECKEL 1880, p. 572: *Cassiopea depressa* n.sp.; Madagascar and off coast of Mozambique, E. Africa. MAYER 1910, p. 649. STIASNY 1921b, p. 68.

*Cassiopea frondosa* (Pallas 1774)

120–260 mm wide; no concavity at centre of exumbrella; always 12 rhopalia; 60 short, nearly straight-edged marginal lappets; mouth-arms  $\frac{3}{4}$  the length of bell radius; scattered uniformly between the mouths are 30–40 small, leaf-shaped vesicles.

PALLAS 1774, pp. 29, 30, Pl. 2, figs. 1–3: as *Medusa frondosa* n.sp. PÉRON & LESUEUR 1809, p. 357: as *Cassiopea pallasii*. LAMARCK 1816, p. 512: *Cassiopea frondosa*. L. AGASSIZ 1860, Pls. 13, 13a: as *Polyclonia* n.g. *frondosa*. HAECKEL 1880, p. 568: *P. frondosa*. MAYER 1910, p. 647, Pl. 69, figs. 1–3, Pl. 72: *C. frondosa*; West Indies; Florida. VANHÖFFEN 1911b, p. 321: as *P. frondosa*. VANHÖFFEN 1913a, p. 430: as *P. frondosa*; West Indies. MAYER 1914a, pp. 16, 18, 22: Tortugas, Florida. STIASNY 1921b, p. 69. STIASNY 1922f, p. 85: as *Cassiopeia frondosa*; Curaçao. ?RAO 1931a, p. 40: ?*C. frondosa*; Arabia. BOONE 1933, p. 45, Pl. 8: Cuba. HUMMELINCK 1933, pp. 454–67: discussion and description; pp. 480 ff.: revision of Stiasny's material; pp. 487–93, figs. 1–13, 37, 39, 40: comparison between *C. frondosa* and *xamachana*; Bonaire, West Indies. SMITH 1937, pp. 17–52, one Pl., 20 text-figs., tab. 1–4: Tortugas, Florida. HEDGPETH 1954, p. 278: Gulf of Mexico. KRAMP 1955b, p. 165: = *P. frondosa* Haeckel 1880.

*Cassiopea medusa* Light 1914

260 mm wide, flat with a thickened central disk; 17 rhopalia, seven irregular and indistinct velar lappets between successive rhopalia; mouth-arms 170 mm in length, with numerous small lateral branches in their proximal portion, distally with three main branches which are again subdivided; numerous appendages from small, inconspicuous to very large, cylindrical up to 110 mm long.

LIGHT 1914b, p. 204, figs. 2, 3: *Cassiopea medusa* n.sp.; Philippines. STIASNY 1921b, p. 69: doubtful species. STIASNY 1926a, p. 244: new material; the species is retained; Philippines. HUMMELINCK 1933, p. 484: revision of the original material; the species retained. CHU & CUTRESS 1954, p. 9: cause of dermatitis; Hawaii.

*Cassiopea mertensi* Brandt 1838

100–120 mm wide, 30–40 mm high; bell evenly rounded without an aboral concavity; 128 small, tongue-shaped, prominently projecting lappets; mouth-arms cylindrical,  $1\frac{1}{2}$  times as long as bell radius, branched tree-like; numerous large club-shaped vesicles.

BRANDT 1838a, p. 396, Pls. 20–3: *Cassiopea mertensii* n.sp.; Caroline Islands, tropical Pacific. MAYER 1910, p. 649. VANHÖFFEN 1911b, p. 323, figs. 1c, 2, 3, 4b. STIASNY 1921b, p. 68

*Cassiopea ndrosia* Agassiz & Mayer 1899

50 mm wide, with shallow concavity at centre of exumbrella; 18–22 rhopalia; lappets very indistinct, four in each octant; mouth-arms cylindrical,

1½ times as long as bell radius, branched tree-like; numerous small, flattened, expanded, leaf-shaped vesicles between mouths; no ribbon-like filaments.

AGASSIZ & MAYER 1899, p. 175, Pl. 14, text-figs. 45, 46: *Cassiopea ndrosia* n.sp.; Fiji Islands, South Pacific. MAYER 1910, p. 650. STIASNY 1921b, p. 68. STIASNY 1933a, pp. 913-22, fig. 1: Australia. RANSON 1945b, p. 318: New Caledonia, Pacific.

#### *Cassiopea ornata* Haeckel 1880

100-120 mm wide, flat; five lappets in each octant, blunt, indistinctly separated; mouth-arms cylindrical, slender, somewhat longer than bell radius, not broad and flat as in *C. andromeda*; only small, club-shaped vesicles between the mouths.

HAECKEL 1880, p. 570, Pl. 37, figs. 1-8: *Cassiopea ornata* n.sp.; Palao Islands, Pacific; New Guinea; Australia. MAYER 1910, p. 648: *C. ornata*; p. 648: as *C. ornata* var. *digitata* Maas; (Malayan Archipelago). STIASNY 1922b, p. 42: *Cassiopeia ornata*; Palao Islands. STIASNY 1923b, p. 226: *C. ornata* Stiasny 1922 ? = *C. picta*. HUMMELINCK 1933, p. 483, fig. 36: examination of the original specimen of *C. ornata* var. *digitata*. UCHIDA 1947a, p. 317: Palao Islands; Saipan Island, Central Pacific. UCHIDA 1954, pp. 209-19: Japan.

#### *Cassiopea picta* Vanhöffen 1888

Doubtful species.

VANHÖFFEN 1888, p. 26, Pl. 2, figs. 1, 2: *Cassiopeia picta* n.sp.; Red Sea. MAYER 1910, p. 649: as *Cassiopea depressa* var. *picta*. STIASNY 1921b, p. 68: ? = *C. ornata*. STIASNY 1923b, p. 226: as *Cassiopeia picta*; original specimens examined and found to be unrecognizable. BROWNE 1926, p. 113. MAADEN 1959, p. 7: *C. picta*, a valid species.

#### *Cassiopea vanderhorsti* Stiasny 1922

Up to 170 mm wide; flatly rounded, with a low central dome; 14 to 18 (usually 16) rhopalia; three to five (usually three) velar lappets in each octant; (it is very difficult to determine the number of velar lappets, as they are very short and have nearly coalesced with each other; the incisions on the margin are often faintly developed, occasionally lacking in some areas of the margin); mouth-arms pinnately dichotomous, about ¾ of the length of diameter, with numerous small and a few large vesicles; a sinuous swelling on the distal third of the rhopalar canals.

STIASNY 1922f, p. 85, figs. 2-4, 7: *Cassiopea vanderhorsti* n.sp.; Curaçao, West Indies. HUMMELINCK 1933, p. 480, fig. 48: examination of the original specimens; as *C. xamachana* var. *vanderhorsti*.

#### *Cassiopea xamachana* R. P. Bigelow 1892

Usually 150 mm wide, flat and with rounded edges, well-marked central concavity; five lappets in each octant, short and blunt; mouth-arms, about 1¼ times the length of bell radius, triangular in cross-section, aboral surface

broad and flat, with 10-15 alternate primary branches, with numerous large, ribbon-shaped filaments.

R. P. BIGELOW 1892, p. 212: *Cassiopea xamachana* n.sp.; Jamaica, West Indies. MAYER 1910, p. 641, Pl. 69, figs. 4-8, Pls. 70-2, text-figs. 402-3: development; West Indies and Florida. VANHÖFFEN 1911b, p. 321, fig. 1a: as *Polyclonia xamachana*. VANHÖFFEN 1913a, p. 430: as *P. xamachana*; West Indies. GOLDFARB 1914, pp. 83-94, figs. 1-4, tab. 1-6: Tortugas, Florida. MAYER 1914a, pp. 5-8, 13, 18: physiology; Florida. MAYER 1914b, pp. 25-54, figs. 1-13, tab. 1-15: physiology; Florida. MAYER 1914c, pp. 55-82, one Pl., tab. 1-27: physiology; Florida. CARY 1915a, pp. 202-4: as *Cassiopea*; physiology of nervous system. CARY 1915b, pp. 611-16, figs. 1, 2: physiology. CARY 1916a, pp. 709-13: physiology. CARY 1916b, pp. 1-32, figs. 1-11, tab. 1-4: physiology; Florida. CARY 1916c, pp. 195-201, tab. 1-5: physiology. HATAI 1916, pp. 206, 207: physiology. MAYER 1916a, pp. 721-6, figs. 1, 2, tab. I, II: physiology. MAYER 1916b, pp. 212-14, tab. 7, 8: physiology of nervous system; Tortugas, Florida. HATAI 1917, p. 217: chemical composition. MAYER 1917b, pp. 1-20, figs. 1-15, tab. 1-8: physiology of nervous system; Florida. CARY 1921, pp. 121-70, figs. 1-18, tab. 1-11: physiology of nervous system; Florida. HATAI 1921, pp. 95-109, fig. 1, tab. 1-8: physiology. STIASNY 1922f, p. 85: as *Cassiopeia xamachana* and spp.; Curaçao, West Indies. BOONE 1933, p. 42, Pl. 7: Florida. HUMMELINCK 1933, pp. 467 ff.: new descriptions; as *C. xamachana* var. *bonairensis* nov. var. (figs. 14-34, 38, 41, 42, 45-7); *C. xamachana* forma *typica*, *C. xamachana* var. *tortugensis* (figs. 43, 44); comparison between *C. xamachana* and *frondosa*. RANSON 1945b, p. 318: Haiti. BERRILL 1949b, pp. 401-8: development. HEDGPETH 1954, p. 278: Gulf of Mexico. CARTHY 1958, p. 197: as *Cassiopea*; responses to stimuli. SOUTHCOTT 1959, p. 577, fig. 6.

### *Actinomyariae*

Kolpophorae with radial subumbrellar muscles. With eight rhopalar radial canals. Without a ring canal. With four more or less separated subgenital cavities. Subgenital ostia small, round. Stomach octagonal, with eight primary canals. One family.

### Family CEPHEIDAE

#### Genus *Cephea* Péron & Lesueur 1809

With numerous (more than three) inter-rhopalar radial canals in each octant; central portion of exumbrella with warts; with long, pointed filaments on the mouth-arms.

Type-species: *C. octostyla* (Forskål).

PÉRON & LESUEUR 1809, p. 360: *Cephea* n.g. HAECKEL 1880, pp. 573, 612: *Cephea* and *Stylorhiza* n.g. MAYER 1910, p. 651: synonyms; *C. octostyla* the type species.

#### *Cephea cephea* (Forskål 1775)

100-140 mm wide, a large dome at apex, the dome covered completely with

about 30 large, conical, pointed warts; 80–90 marginal lappets, in each octant 8–9 large oval velar lappets between two very small, pointed ocular lappets; upper halves of the eight, stout mouth-arms nearly coalesced at base, lower halves forked and profusely branched; more than 100 long, tapering, pointed filaments; 5–6 inter-rhopalar canals in each octant; distinguished by the very deep rhopalar clefts, the long tapering mouth-arm filaments and the brown colour.

FORSKÅL 1775, p. 108, Pl. 30: as *Medusa cephea* n.sp.; Red Sea. PÉRON & LESUEUR 1809, p. 361: as *Cephea rhizostomoidea*. HAECKEL 1880, pp. 574, 576, Pl. 36, figs. 3–6: as *C. forskalea* and *conifera*. MAYER 1910, p. 654, text-fig. 406: *Cephea cephea*; (Japan; Indian and Pacific oceans). LIGHT 1914b, p. 206: Philippines. LIGHT 1921, p. 32: Philippines. STIASNY 1921b, p. 75. STIASNY 1926b, p. 251: Australia. STIASNY 1929c, p. 200, fig. 1: Malay Archipelago. BOONE 1938, p. 48: Marquesas Islands, Pacific. STIASNY 1938, p. 18, Pl. 2, figs. 5, 6, text-figs. A, B: Red Sea. RANSON 1945b, p. 318: Gambier and Touamotou, Pacific. UCHIDA 1947a, p. 342: Japan. UCHIDA 1954, pp. 209–19: Japan. YAMAZI 1958, p. 139: Tanabe Bay, Japan.

#### *Cephea coerulea* Vanhöffen 1902

57 mm wide; the dome-like apex with 6–8 large and about 30 small, round protuberances, surrounded by a wide annular furrow; no marginal lappets; mouth-arms dichotomous, each with four long filaments; numerous very small filaments among the mouths; seven inter-rhopalar canals in each octant.

VANHÖFFEN 1902, p. 45, Pl. 4, figs. 13, 14: *Cephea coerulea* n.sp.; east coast of Africa. MAYER 1910, p. 657, text-fig. 408: as *C. cephea* var. *coerulea*. STIASNY 1921b, p. 75: *C. coerulea*. STIASNY 1938, p. 23: *C. coerulea* a valid species. KRAMP 1955a, p. 302: off Sierra Leone and Nigeria, W. Africa.

#### *Cephea conifera* Haeckel 1880

100–120 mm wide, 30–40 mm high; a thick-walled, flatly rounded, central dome bears 20–30 large and numerous small protuberances, surrounded by deep annular furrow; eight rhopalia in deep niches; 80 indistinct lappets; mouth-arms bifurcated near outer end, with numerous short branches; only one long, stout filament from each of the four perradial corners of the ventral side of the arm-disk; also more than 100 long, slender filaments between the mouths; numerous inter-rhopalar canals in each octant.

HAECKEL 1880, p. 576, Pl. 36, figs. 3–6: *Cephea conifera* n.sp.; Caroline and Samoa Islands, tropical Pacific. MAYER 1910, p. 655, text-fig. 407: as *C. cephea* var. *conifera*. STIASNY 1921b, p. 75: *C. conifera*. STIASNY 1922c, p. 63, fig. 1. STIASNY 1938, p. 23: *C. conifera* = *cephea*.

#### *Cephea octostyla* (Forskål 1775)

90 mm wide, 20 mm high, exumbrella flat, rim vertical; exumbrella with a zone of numerous low warts leaving central portion free; about 72 marginal lappets, seven velar and two ocular in each octant, rectangular, separated by

very slight indentations which are spanned by a web; eight bifurcated mouth-arms with numerous short filaments, and in middle region 4–12 long, tapering, wart-covered filaments.

FORSKÅL 1775, p. 106, Pl. 29: as *Medusa octostyla* n.sp.; Red Sea. L. AGASSIZ 1862, p. 156: *Cephea octostyla*. HAECKEL 1880, p. 613: as *Stylorhiza octostyla* n.g.; Singapore. MAYER 1910, p. 652, text-fig. 405: *C. octostyla*; Philippines. MAYER 1915a, p. 184: Philippines. MAYER 1917a, p. 209, fig. 13: Philippines. STIASNY 1921b, p. 73: Forskål's *Medusa octostyla* is doubtful, and not = *C. octostyla* L. Agassiz. STIASNY 1926b, p. 251, fig. 2: as *C. octostyla* juv.? Australia.

*Cephea* sp. Mayer 1915

MAYER 1915a, p. 185: *Cephea* sp.; Philippines. MAYER 1917a, p. 210: *Cephea* sp.; Philippines.

*Cephea* sp. Stiasny 1937

STIASNY 1937a, p. 229, text-fig. 11: *Cephea* sp.; Arabian Sea.

*Cephea* sp. Kramp 1958

KRAMP 1958b, p. 372: *Cephea* juv.; the Nicobars, Indian Ocean.

Genus *Cotylorhiza* L. Agassiz 1862

Cepheidae with numerous (up to 13) short radial canals in each octant; ex-umbrella with a smooth central dome without warts; mouth-arms with stalked suckers.

Type-species: *C. tuberculata* (Macri).

L. AGASSIZ 1862, p. 158: *Cotylorhiza* n.g. MAYER 1910, p. 658. THIEL 1958b, p. 48: discussion on alternation of generations.

*Cotylorhiza ambulacrata* Haeckel 1880

90 mm wide; with 11–13 radial canals in each octant; ? = *C. tuberculata*.

HAECKEL 1880, p. 611: *Cotylorhiza ambulacrata* n.sp.; Canary Islands. MAYER 1910, p. 659: probably synonym of *C. tuberculata*. STIASNY 1921b, p. 82: the species is retained. STIASNY 1922c, p. 65: by a mistake *Stomaster palmatus* Haeckel from the Atlantic has been the type specimen of *C. ambulacrata*.

*Cotylorhiza erythraea* Stiasny 1920

Up to 90 mm wide; 4–6 radial canals in each octant.

STIASNY 1920, p. 223: *Cotylorhiza erythraea* n.sp.; Suez Canal. STIASNY 1921b, p. 84, Pl. 1, fig. 3, Pl. 3, fig. 23, Pl. 5, fig. 38: Suez Canal.

'*Cotylorhiza*' *pacifica* Mayer 1915

Probably about 200 mm in diameter; about eight irregularly spaced, bluntly

pointed velar lappets in each octant, with deep furrows between them; the eight mouth-arms with window-like openings in the lateral membranes; proximal portion of arms  $1/4$  of the length of distal portion; centre of arm-disk with numerous slender filaments; appendages on outer parts of arms not very numerous; the eight rhopalar canals twice as wide as the inter-rhopalar canals, of which there are 16-17 in each octant. Doubtful species.

MAYER 1915a, p. 185, fig. 4: *Cotylorhiza pacifica* n.sp.; Philippines. MAYER 1917a, p. 211, fig. 14: Philippines. LIGHT 1921, p. 37: as *Cotylorhizoides pacifica* n.g.; examination of type-specimen. STIASNY 1921b, p. 81: discussion; the species cannot be retained. STIASNY 1924b, p. 50: *Cotylorhizoides pacificus* Light 1921, p. 39 non = *C. pacifica* Mayer. STIASNY 1924c, p. 65: possibly to *Phyllorhiza*.

### *Cotylorhiza tuberculata* (Macri 1778)

Usually less than 170 mm wide; with smooth, elevated dome surrounded by a gutter-like ring; marginal lappets elongated, subrectangular; each mouth-arm bifurcates near its base, branching several times; numerous short, club-shaped appendages with expanded, disk-like ends, and some less numerous somewhat larger ones; in addition numerous longer filaments with expanded ends; 7-9 radial canals in each octant.

MACRI 1778a, p. 20: as *Medusa tuberculata* n.sp. DELLE CHIAJE 1822, p. 75, Pls. 3, 4, figs. 1-6, Pls. 140, 141: as *Cassiopea borbonica* n.sp. ESCHSCHOLTZ 1829, p. 56: as *Cephea tuberculata*. L. AGASSIZ 1862, p. 158: *Cotylorhiza tuberculata* n.g. MAYER 1910, p. 659, Pl. 73, fig. 2, text-fig. 410: synonyms; (Mediterranean) Naples, Italy (new record); (Red Sea; ? Canary Islands). STIASNY 1920, p. 223: Mediterranean. STIASNY 1921b, p. 82: *Cassiopea borbonica* = *C. tuberculata*; Trieste. STIASNY 1922c, p. 66: Mediterranean. ANSELMI 1923, p. 73: as *Cothyloriza microtuberculata*; Mediterranean. FREINKEL 1925, pp. 658-90: experiments on orientation. KRAMP 1925, p. 53, fig. 39: Mediterranean. STIASNY 1930a, p. 23: Naples. STIASNY 1931a, p. 143: Naples. BENAZZI 1933, pp. 212, 216. BOONE 1933, p. 47, Pl. 9: Monaco. WEILL 1934b, p. 547, figs.: nematocysts. BRUNELLI 1941, p. 55: Venice, Italy. FOX & PANTIN 1944, p. 121: as *Cassiopeia borbonica*; pigmentation. RANSON 1945b, p. 318: Mediterranean. RANSON 1945c, p. 67, Pl. 1, figs. 5, 6: S.W. of Balearics, Mediterranean. SKRAMLIK 1945, pp. 296-336: experiments; Naples. BERRILL 1949b, pp. 399-407: development. ROSSI 1950, p. 29: Golfo di Rapallo, Italy. KRAMP 1955b, p. 166. CARTHY 1958, p. 197: responses to stimuli. HOENIGMAN 1958, pp. 261-2: Adriatic Sea.

### Genus *Netrostoma* L. S. Schultze 1898

Cepheidae with three inter-rhopalar canals in each octant; exumbrella with large warts on central dome; stiff appendages on mouth-arms and arm-disk.

Type-species: *N. typhlodendrium* Schultze.

L. S. SCHULTZE 1898, p. 457: *Netrostoma* n.g. MAYER 1910, p. 651: synonym of *Cephea*.

*Netrostoma coerulescens* Maas 1903

200 mm wide or more; with a central dome with about 10 wart-like projections; 6–8 round-edged lappets in each octant; the eight mouth-arms short, massive, laterally compressed, curved outwards, bifurcated at outer ends and with numerous short lateral branches, with two kinds of appendages between the mouths: the one small, thin, tubular with prominent nematocyst warts, and the other somewhat larger, spindle-shaped.

MAAS 1903, p. 35, Pl. 5, figs. 37, 46, Pl. 11, figs. 97, 103, Pl. 12, fig. 109: *Netrostoma coerulescens* n.sp.; Malay Archipelago. MAYER 1910, p. 653: as *Cephea octostyla* var. *coerulescens*; (Maldiv Islands). STIASNY 1920, p. 223: *N. coerulescens*; Panaroeakan, Malayan Archipelago. STIASNY 1921b, p. 77, Pl. 1, fig. 2, Pl. 3, figs. 19, 20, text-figs. 3, 4. STIASNY 1922e, p. 526: Jolo, Philippines; p. 527: '*Polyrhiza vesiculosa*' from Suez probably = *N. coerulescens*. STIASNY 1926a, p. 246: Philippines. STIASNY 1926b, p. 251: Australia. STIASNY 1929c, p. 199: Malay Archipelago. STIASNY 1931a, p. 142: Maldiv Islands, Indian Ocean. STIASNY 1931b, p. 36: Australia. MENON 1936, p. 4: Krusadai Islands, India. STIASNY 1937a, p. 229: Arabian Sea. RANSON 1945b, p. 318: Indochina; coast of Malabar. NAIR 1951, p. 74: Trivandrum coast, India. ?GEORGE 1953, p. 82: *Netrostoma* sp.; Calicut, southern India. UCHIDA 1954, pp. 209–19: Japan. KRAMP 1955b, p. 165: by Haeckel 1880 determined as *Polyrhiza vesiculosa*.

*Netrostoma dumokuroa* (Agassiz & Mayer 1899)

300 mm wide, flat, disk-shaped, with vertical sides near margin; with a large, prominent dome, smooth, surrounded by two verticils of solid projections and a wide, shallow furrow; marginal lappets scarcely perceptible; eight short bifurcated mouth-arms; no filaments and no club-shaped appendages; colour blue.

AGASSIZ & MAYER 1899, p. 172, Pls. 11, 12, figs. 36–9: as *Cephea dumokuroa* n.sp.; Fiji Islands, Pacific. MAAS 1903, p. 38: *Netrostoma dumokuroa*. MAYER 1910, p. 656: as *C. cephea* var. *dumokuroa*. STIASNY 1921b, p. 75.

*Netrostoma setouchianum* (Kishinouye 1902)

100–200 mm wide, with a prominent central dome covered completely by 50 or more solid, pointed projections, and surrounded by a wide annular furrow; 6–8 flatly rounded velar lappets in each octant; mouth-arms with numerous small, short appendages among the frilled mouths.

KISHINOUE 1902, p. 11, Pls. 1, 2, figs. 8–10: as *Microstylus setouchianus* n.g., n.sp.; Japan. BROWNE 1905a, p. 967: *Netrostoma setouchianus*. MAYER 1910, p. 657, text-fig. 409: as *Cephea cephea* var. *setouchiana*. BIGELOW 1913, p. 101: as *C. cephea* var. *setouchiana*; Japan. STIASNY 1937d, pp. 110–15, figs. 1, 2: *N. setouchianum*; Fiji Islands, Pacific. UCHIDA 1938a, p. 149: *N. setouchiana*; Japan. UCHIDA 1954, pp. 209–19: *N. setouchiana*. YAMAZI 1958, p. 139: Tanabe Bay, Japan.

*Netrostoma typhlodendrium* Schultzze 1898

110 mm wide, flatly rounded; with low central dome completely covered

by about 80 rounded warts; about eight rounded or cleft velar lappets in each octant; ocular lappets sharp-pointed; small, spindle-shaped, sharp-pointed filaments only on the arm-disk.

SCHULTZE 1898, p. 457, Pl. 34, figs. 10-12a: *Netrostoma typhlodendrium* n.g., n.sp.; Amboina, Malayan Archipelago. MAYER 1910, p. 658: as *Cephea typhlodendrium*. STIASNY 1922c, p. 66, fig. 2. STIASNY 1929c, p. 199: Malayan Archipelago. RAO 1931a, p. 41: Indian Ocean. STIASNY 1937d, p. 114: *N. typhlodendrium* is considered identical with *N. coeruleus*.

### Genus *Polyrhiza* L. Agassiz 1862

Doubtful genus.

L. AGASSIZ 1862, p. 156: *Polyrhiza* n.g. for *Cephea vesiculosa* Ehrenberg. MAYER 1910, p. 663. STIASNY 1921b, p. 73: discussion.

#### *Polyrhiza vesiculosa* (Ehrenberg 1835)

Doubtful species, insufficiently described by Ehrenberg.

EHRENBERG 1835, p. 260: as *Cephea vesiculosa* n.sp.; Red Sea. L. AGASSIZ 1862, p. 156: *Polyrhiza vesiculosa* n.g. MAYER 1910, p. 663: description from Haeckel. STIASNY 1921b, p. 73: doubtful species. STIASNY 1922e, p. 527: a specimen from Suez, determined by Haeckel, probably = *Netrostoma coeruleus*.

### *Krikomyariae*

Kolpophorae with annular subumbrellar muscles. With eight rhopalar radial canals. With ring canal. With a continuous genital porticus. Subgenital ostia very broad. Arm-disk quadratic, with four primary canals.

### Family MASTIGIIDAE

Krikomyariae with short, pyramidal, three-winged mouth-arms; with filaments on the arm-disk.

### Genus *Mastigias* L. Agassiz 1862

Mouth-arms terminating in a naked, club-shaped extremity; mouths not only along the three edges of the mouth-arms, but also on their flat, expanded sides; numerous small clubs and filaments between the frilled mouths; intra-circular mesh-work of canals with 6-20 canal-roots in each octant, usually communicating with the rhopalar canals.

Type-species: *M. papua* (Lesson).

L. AGASSIZ 1862, p. 152: *Mastigias* n.g. HAECKEL 1880, pp. 622, 624: as *Mastigias* and *Eucrambessa* n.g. VANHÖFFEN 1888, pp. 33, 35, 44, 45: as *Mastigias* and *Desmostoma*. MAYER 1910, p. 677.

*Mastigias albipunctatus* Stiasny 1920

Up to 145 mm wide, usually faintly vaulted, exumbrella with a network of nematocyst warts, with a whitish accumulation of nematocysts at apex; number of velar lappets variable, 6–14 in each octant; arm-disk with one very long central filament surrounded by several shorter; mouth-arms about as long as disk-radius, their terminal appendages variable in length and shape; 12–14 canal-roots in each octant; perradial rhopalar canals shorter and broader than the interradian, with few or no anastomoses.

STIASNY 1920, p. 224: *Mastigias albipunctata* n.sp.; Malayan Archipelago. STIASNY 1921b, p. 93, Pl. 1, fig. 5, Pl. 3, figs. 24–6, Pl. 5, fig. 46: Malayan Archipelago. STIASNY 1929c, p. 202: Malayan Archipelago. RAO 1931a, p. 44: Mergui Archipelago, Indian Ocean. STIASNY 1931a, p. 144: Malayan Archipelago; Australia. STIASNY 1935, p. 35: Malayan Archipelago. STIASNY 1937b, p. 207: Malayan Archipelago.

*Mastigias andersoni* Stiasny 1926

Up to 90 mm wide, vaulted, exumbrella with polygonal network of nematocyst warts; six broad velar lappets in each octant, the two median lappets usually split; arm-disk quadratic, with one central and four peripheral filaments; mouth-arms about as long as disk radius, without filaments, terminal appendages long, with a club-shaped swelling at the end of the long, thin pedicel; 12–15 (or 18) canal-roots in each octant; perradial rhopalar canals bottle-shaped, without anastomoses.

STIASNY 1926b, p. 252, fig. 3: *Mastigias andersoni* n.sp.; Australia.

*Mastigias gracilis* (Vanhöffen 1888)

35 mm wide, thin at margin but very thick at apex, exumbrella with irregularly placed clusters of small warts; margin irregularly lobed, with 5–10 lappets in each octant; arm-disk with particularly long filaments; mouth-arms hardly as long as disk radius, lower three-winged portion 3–4 times as long as upper portion; each arm with a short, rounded terminal knob, and with short, gelatinous knobs between the frilled mouths; 6–7 canal-roots in each octant.

VANHÖFFEN 1888, pp. 35, 45, Pl. 4, figs. 5–7: as *Desmostoma gracile* n.g., n.sp.; Assab, Red Sea. MAYER 1910, p. 681: *Mastigias gracile*. STIASNY 1921b, p. 89: a valid species. STIASNY 1923b, p. 227: examination of the original specimens.

*Mastigias ocellatus* (Modeer 1791)

About 100 (up to 190) mm wide, exumbrella with nematocyst warts in polygonal pattern, and with 'eye-spots', consisting of white circles with brown centre and brown rim; gelatinous substance firm; about 12 rounded velar lappets in each octant; arm-disk with few filaments; mouth-arms

shorter than disk radius, broad, with large and firm lateral branches and with clubs and filaments, terminal appendage triangular in cross-section; 15-20 canal-roots in each octant; perradial rhopalar canals bottle-shaped, without anastomoses.

MODEER 1791, p. 27: as *Medusa ocellata* n.sp. HAECKEL 1880, p. 606, Pl. 40, figs. 9-12: as *Versura palmata* n.g., n.sp.; Malayan Archipelago p. 623: *Mastigias ocellata*; near Cocos Islands, Indian Ocean; Straits of Sunda. MAYER 1910, p. 680: (China Sea; Hong Kong); Philippines; (eastern part of Indian Ocean); p. 685: as *Versura palmata* (Japan). MAYER 1915a, p. 194: Philippines. MAYER 1917a, p. 220: Philippines. STIASNY 1921b, p. 89: *M. ocellata*; p. 104: as *V. palmata*; imperfectly described; *V. palmata* Goette 1886 from Zanzibar and Japan to *Mastigias*. STIASNY 1922e, p. 530, figs. 4-6: Malayan Archipelago; p. 538: the type-specimen of '*V. palmata*' Haeckel = *M. ocellata*. STIASNY 1924a, p. 490, figs. 2, 3: Malayan Archipelago. RAO 1931a, p. 43: Indian Ocean. RANSON 1945b, p. 319: Straits of Sunda. KRAMP 1955b, p. 166: by Haeckel 1880 determined as *Versura palmata* and *Cotylorhiza*?

### *Mastigias pantherinus* Haeckel 1880

Size? exumbrella with 'eye spots' like *M. ocellatus*; 16 velar lappets in each octant; mouth-arms nearly as long as bell diameter, upper portion hardly half as long as the three-winged lower portion; terminal club very long, 2-3 times as long as bell diameter; more than 10 canal-roots in each octant.

HAECKEL 1880, p. 624: *Mastigias pantherina* n.sp.; Samoa Islands, Pacific. MAYER 1910, p. 681. STIASNY 1921b, p. 89: the species only seen by Haeckel, but it seems well characterized.

### *Mastigias papua* (Lesson 1830)

Up to 80 mm wide, usually hemispherical, exumbrella with very fine granulations; gelatinous substance firm; deep furrows between the eight velar lappets (in each octant); mouth-arms about half as long as bell diameter, the simple upper portion  $1\frac{1}{2}$  times as long as the three-winged lower portion; each arm usually, but not always, terminates in a club-like filament, triangular in cross-section; numerous small, club-shaped vesicles between mouths; less than 10 canal-roots in each octant; rhopalar canals slender, usually with anastomoses.

LESSON 1830, p. 122, Pl. 11, figs. 2, 3: as *Cephea papua* n.sp. L. AGASSIZ 1862, p. 152: *Mastigias papua* n.g. KISHINOUE 1895, pp. 86-8, Pl. 13, figs. 1-13: as *M. physophora* n.sp.; Shima and Sagami, Japan. MAAS 1903, p. 66, Pl. 6, figs. 54-7, Pl. 7, figs. 58, 59, 61, 64, Pl. 8, figs. 75-7, Pl. 9, figs. 84, 85, Pl. 12, fig. 110: as *M. papua* var. *sibogae* nov. var.; Malayan Archipelago. MAYER 1910, p. 678, text-fig. 415: = *M. physophora* Kishinouye; (Indian and Pacific oceans to Japan and Fiji Islands); p. 680: as *M. papua* var. *sibogae* Maas. BIGELOW 1913, p. 100: Japan. LIGHT 1914b, p. 209: Philippines. MAYER 1915a, pp. 160, 193: Torres Straits; Philippines. MAYER 1917a, p. 220: Philippines. OKADA 1917, pp. 389-400: as *M. physophora*. STIASNY 1920, p. 223: Japan. LIGHT 1921, p. 42: Philippines.

STIASNY 1921*b*, p. 92: Japan. STIASNY 1922*c*, p. 67: *M. physophora* = *papua*. STIASNY 1922*e*, p. 529, fig. 3: Siam; Philippines; East Asia; Sumatra. STIASNY 1924*a*, p. 489: Malayan Archipelago. STIASNY 1926*a*, p. 247: as *M. papua* var. *sibogae*; Philippines. UCHIDA 1926*a*, pp. 119-25. UCHIDA 1926*b*, pp. 45-95, Pl. 6, text-figs. 1-49: Japan. OKADA 1927*b*, p. 252, fig. 1. OKADA 1927*c*, p. 539, figs. 24-7. UCHIDA 1928*a*, p. 376: on the size. RAO 1931*a*, p. 45: as *M. papua* var. *sibogae*; Indian Ocean. STIASNY 1931*a*, p. 144: northern Australia. STIASNY 1935, p. 35: Malayan Archipelago. STIASNY 1937*b*, p. 207. BOONE 1938, p. 49, Pl. 7: Malayan Archipelago. UCHIDA 1938*a*, p. 149: Japan. STIASNY 1940*a*, p. 23, fig. C: New Caledonia; Gulf of Siam. KINOSHITA 1941, pp. 209-20: experiments; Japan. RANSON 1945*b*, p. 318: Indochina. UCHIDA 1947*a*, p. 318: Palao Islands and Saipan Islands, central Pacific. UCHIDA 1947*b*, p. 343: Japan. BERRILL 1949*b*, pp. 393-409, figs.: development. CHIU 1954*b*, p. 56. UCHIDA 1954, pp. 209-19: Japan. KRAMP 1955*b*, p. 167. UCHIDA 1955*a*, p. 15: Loochoo Islands, S. of Japan. SEARLE 1957, p. 76, fig. 4*b*: Singapore. YAMAZI 1958, p. 139: Tanabe Bay, Japan.

### *Mastigias roseus* (Reynaud 1830)

Size? Disk flat and hat-shaped; deep radial furrows between the 7-8 velar lappets (in each octant); eight separate (!) mouth-arms, short, with numerous appendages, terminal appendage club-shaped. Doubtful species.

REYNAUD 1830, p. 97, Pl. 34: as *Rhizostoma rosea* n.sp.; tropical Atlantic. HAECKEL 1880, p. 586: as *Toxoclytus roseus* L. Agassiz. VANHÖFFEN 1888, p. 45: *Mastigias roseus*. MAYER 1910, p. 681: *M. (?) rosea*. STIASNY 1921*b*, pp. 89, 143: doubtful species, probably to *Mastigias*.

### *Mastigias sidereus* Chun 1896

70 mm wide, flatly rounded; velar lappets semicircular, six in each octant, the two median lappets split; subumbrella and mouth-arms with white spots; mouth-arms twice as long as disk radius, the simple upper part somewhat longer than the lower three-winged part; terminal appendage long and club-shaped; intracircular mesh-work of canals with large, open meshes; about seven canal-roots in each octant, all rhopalar canals with anastomoses.

CHUN 1896, p. 13, Pl. 1, fig. 3: *Mastigias siderea* n.sp. MAYER 1910, p. 679: as *M. papua* var. *siderea*; synonym: ?*Eucrambessa mülleri* Haeckel from Madagascar; (Zanzibar, East Africa; western part of the Indian Ocean). STIASNY 1920, p. 224: Singapore; Sumatra. STIASNY 1921*b*, p. 92, Pl. 1, fig. 4: Singapore; Sumatra. STIASNY 1922*b*, p. 44: Zanzibar. RANSON 1945*b*, p. 319: Sunda Straits.

### *Mastigias* sp. Rao 1931

RAO 1931*a*, p. 45: *Mastigias* sp.; Mergui Archipelago, Indian Ocean.

### Genus *Mastigietta* Stiasny 1921

Mouth-arms without appendages, their upper, undivided portion much reduced, almost rudimentary, and only partly united by eight membranes.

Type-species: *M. palmipes* (Haeckel).

STIASNY 1921*b*, p. 100: *Mastigietta* n.g.

*Mastigietta palmipes* (Haeckel 1880)

Up to 70 mm wide; exumbrella with numerous warts of nematocysts, but lappet region smooth; 5-8 velar lappets in each octant; mouth-arms thick, shorter than disk radius, without appendages; arm-disk with filaments; 12-14 canal-roots in each octant; rhopalar canals with anastomoses throughout their length.

HAECKEL 1880, p. 620: as *Crambessa palmipes* n.sp.; northern Australia. SCHULTZE 1898, p. 453, Pl. 33, fig. 1, Pl. 34, fig. 11: as *Crambessa palmipes*. MAYER 1910, p. 667: as *Catostylus palmipes*; (from Malayan Archipelago to northern Australia). STIASNY 1921b, p. 100: *Mastigietta palmipes* n.g. STIASNY 1922c, p. 68: examination of Haeckel's original specimen, a young Leptobranchid; Schultze's specimen an abnormal *Thysanostoma* or *Himantostoma*. ?STIASNY 1931a, p. 147: as '?*Mastigietta palmipes*'; Mauritius; Indian Ocean. MENON 1936, p. 6, Pl. 1, fig. 2: Krusadai Islands, Indian Ocean.

Genus *Phyllorhiza* L. Agassiz 1862

Mouth-arms broad, leaf-shaped, with large window-like openings in the lateral membranes, lower parts of the mouth-arms with numerous filaments; intracircular mesh-work of canals never communicating with the perradial rhopalar canals.

Type-species: *P. punctata* von Lendenfeld.

L. AGASSIZ 1862, p. 158: *Phyllorhiza* n.g. HAECKEL 1880, p. 588. MAYER 1910, p. 684: *P. chinensis* L. Agassiz and *P. trifolium* Haeckel imperfectly described; *P. punctata* Lendenfeld is the type-species. STIASNY 1924c, p. 56: new diagnosis of the genus.

*Phyllorhiza luzoni* Mayer 1915

60 mm wide, flat, exumbrella finely granular; nine rounded velar lappets in each octant; mouth-arms slender, strongly compressed, naked upper part 13 mm, three-winged lower part 11 mm; appendages lost; in each octant 6-9 inter-rhopalar canals anastomosing with the eight rhopalar canals (!). Systematic position uncertain.

MAYER 1915a, p. 194, fig. 7: *Phyllorhiza luzoni* n.sp.; Philippines. MAYER 1917a, p. 221, fig. 20; Philippines. STIASNY 1921b, p. 101: doubtful species, ? = *Mastigias papua*. STIASNY 1924c, p. 65: possibly to *Phyllorhiza*.

*Phyllorhiza pacifica* (Light 1921)

20-30 mm wide; in each octant eight velar lappets, in the middle two double lappets, at each side of these two single lappets and one ocular pointed lappet; terminal appendages nearly as long as the mouth-arms, predominantly purple in colour.

LIGHT 1921, p. 37, fig. 4: as *Cotylorhizoides pacificus* (Mayer 1915) juv.; Manila Bay, Philippines. STIASNY 1924b, p. 50: *Phyllorhiza pacifica* (Light, non Mayer).

*Phyllorhiza punctata* von Lendenfeld 1884

Up to 500 mm wide, jelly very thick, exumbrella finely granular; velar lappets some broad and double, others simple, altogether up to 14 in each octant; arm-disk with numerous filaments; arms three-winged, with numerous tapering, bluntly ending filaments, up to  $2/3$  of the length of the arms; terminal appendages sometimes very long, with distal expansion; 10-12 canal-roots in each octant.

VON LENDENFELD 1884c, pp. 296, 307, Pl. 4, fig. 1, Pl. 5, figs. 1-4: *Phyllorhiza punctata* n.sp.; Port Jackson, Australia. MAYER 1910, p. 684. STIASNY 1921b, pp. 101, 102: both genus and species are doubtful. STIASNY 1924c, p. 56, figs. 1-4: new diagnosis of the genus; Sydney, Australia. STIASNY 1926b, p. 255: Philippines. STIASNY 1931a, p. 144: Australia. UCHIDA 1954, pp. 209-19: as *P. trifolium* Haeckel; Japan.

Family *VERSURIGIDAE* nov. fam.

Krikomyariae with broad, leaf-shaped mouth-arms.

Genus *Versuriga* n.g.

Mouth-arms three-winged, broad, with secondary lappets and with clubs and filaments; without a terminal appendage; arm-disk with filaments.

Type-species: *V. anadyomene* (Maas).

Haeckel (1880) proposed the generic name *Versura* n.g., (p. 606) for three new species of Rhizostomae, *palmata* (p. 606), *pinnata* (p. 607) and *vesicata* (p. 645).

The genus was adopted by Mayer (1910 p. 685) with *V. palmata* as the type-species; he also described a new species, *V. maasi* (p. 687), and to the same genus he referred *Crossostoma anadyomene* Maas 1903. Haeckel's *V. pinnata* and *vesicata* were regarded as doubtful species. Mayer also stated that the generic name *Crossostoma* L. Agassiz 1862 p. 155 was preoccupied for a Mollusc.

Stiasny (1922e p. 538) examined Haeckel's type-specimen of *V. palmata* in the Zoological Museum of Copenhagen and found that it is a *Mastigias papua* (Lesson 1830). He, too, was of the opinion that *V. pinnata* and *vesicata* Haeckel are unidentifiable, and he stated that *V. maasi* Mayer 1910 is identical with *V. anadyomene* (Maas 1903) which accordingly is the only valid species of the genus.

Since the type has been identified with a species in another genus and since Haeckel's two other species are invalid, the generic name *Versura* must be rejected. It cannot be used for *Crossostoma anadyomene* Maas. Stiasny, however, retained the name *Versura* in a new sense with himself as author, which is not permissible. It is necessary to assign another generic name to *Crossostoma anadyomene*.

Since the older names *Stomaster* L. Agassiz 1862 (for *Cassiopea canariensis* and *C. frondosa* Tilesius 1829) and *Toxoclytus* L. Agassiz 1862 (for *Rhizostoma rosea* and *Cephea dubreuilii* Renaud 1830) cannot be used, it seems impossible to find an earlier generic name for *Crossostoma anadyomene* Maas. Hence a new generic name is necessary, and I propose

*Versuriga* n.g.

with *V. anadyomene* (Maas 1903) as the type-species by monotypy.

MAAS 1903, p. 56: as *Crossostoma*. MAYER 1910, p. 686: as *Versura*.

*Versuriga anadyomene* (Maas 1903)

Up to 600 mm wide, quite flat, exumbrella with network of anastomosing furrows; in each octant about eight large semicircular velar lappets alternating with small, narrow lappets; arm-disk with filaments; mouth-arms about as long as disk radius, strongly laterally compressed, with numerous flat, membranous branches, with small club-shaped vesicles and on ventral side tapering filaments; perradial rhopalar canals broad, without anastomoses, the interradial narrow, with numerous anastomoses.

MAAS 1903, p. 56, Pl. 7, figs. 65-8: as *Crossostoma anadyomene* n.sp.; Malayan Archipelago. MAYER 1910, p. 686: as *Versura anadyomene*, *Crossostoma* being preoccupied; p. 687, text-fig. 416: as *Versura maasi* n.sp.; Philippines. MAYER 1915a, p. 195: as *Versura maasi*; Philippines. MAYER 1917a, p. 222, fig. 21: as *Versura maasi*; Philippines. STIASNY 1921b, p. 105: *V. maasi* probably identical with *V. anadyomene*; p. 106, Pl. 1, fig. 7, Pl. 3, figs. 27, 28: as *V. anadyomene*; Malayan Archipelago. STIASNY 1922e, p. 534, fig. 7: criticism of genus *Versura*; Siam. STIASNY 1926b, p. 256: as *Versura anadyomene* juv.? Australia. RAO 1931a, p. 46: as *Versura anadyomene*; Bay of Bengal. STIASNY 1931b, p. 36: as *Versura anadyomene*; Australia. BOONE 1938, p. 52, Pls. 8, 9: as *Versura palmata*; Malayan Archipelago.

'*Versura pinnata*' Haeckel 1880

Doubtful species.

HAECKEL 1880, p. 607: *Versura pinnata* n.sp.; Cocos Islands. MAYER 1910, p. 686: may be identical with *V. palmata*. STIASNY 1922e, p. 539: doubtful species.

'*Versura vesicata*' Haeckel 1880

Doubtful species.

HAECKEL 1880, p. 645: *Versura vesicata* n.sp.; N.W. coast of Australia. MAYER 1910, p. 686: ? identical with *V. palmata*. STIASNY 1922e, p. 539: doubtful species.

Family *THYSANOSTOMATIDAE*

Krikomyariae with very elongate, narrow, lash-like mouth-arms, triangular or three-winged in cross-section, without clubs or filaments.

Genus *Thysanostoma* L. Agassiz 1862

With the characters of the family; mouth-arms with or without naked, club-shaped extremities; eight rhopalar canals all with anastomoses; ring canal distinct.

Type-species: *T. thysanura* Haeckel.

L. AGASSIZ 1862, p. 153: *Thysanostoma* n.g. HAECKEL 1880, pp. 625, 627: as *Thysanostoma* and *Lorifera* n.g. MAYER 1910, pp. 691, 693: *Thysanostoma* and *Lorifera*. STIASNY 1940a, p. 24: *Lorifera* = *Thysanostoma*.

*Thysanostoma flagellatum* (Haeckel 1880)

55–200 mm wide, exumbrella finely granulated; 6–8 broadly rounded, well separated velar lappets without connecting membrane; mouth-arms terminate in a long, tapering, naked filament, about  $2/3$  as long as the lower arm itself; intracircular canal system fine-meshed with about 20 canal-roots in each octant.

HAECKEL 1880, p. 629: as *Himantostoma flagellata* n.sp.; Hawaiian Islands. MAYER 1910, p. 695: as *Lorifera flagellata*; Philippines. STIASNY 1929c, p. 204, fig. 4: as *L. flagellata*; Malayan Archipelago. STIASNY 1938, p. 27: comparison with *T. thysanura* and *lorifera*. STIASNY 1940a, p. 25: *Thysanostoma flagellata*; N. of Borneo. RANSON 1945b, p. 319: Hawaiian Islands.

*Thysanostoma loriferum* (Ehrenberg 1835)

Up to 200 mm wide, exumbrella smooth or finely granulated; 6–8 velar lappets in each octant, united by a membrane; mouth-arms terminate in a short, oval, naked knob; perradial rhopalar canals; intracircular canal system fine-meshed, with up to 30 canal-roots in each octant.

EHRENBERG 1835, p. 260: as *Rhizostoma lorifera* n.sp.; Red Sea. HAECKEL 1880, p. 628, Pl. 38, figs. 1–6: as *Himantostoma lorifera*; p. 628: as *Lorifera arabica* n.sp.; Red Sea. SCHULTZE 1897, p. 153, Pl. 15, figs. 1, 1a, 6: as *H. loriferum* var. *pacifica*; Malayan Archipelago. MAYER 1910, p. 694: as *L. lorifera*; p. 695: as *L. lorifera* 'var.' *pacifica*. MAYER 1915a, p. 197: as *L. lorifera* var. *pacifica*; Philippines. MAYER 1917a, p. 229: as *L. lorifera* var. *pacifica*; Philippines. STIASNY 1922c, p. 72: examination of the original specimen; as *H. lorifera* var. *pacifica*. STIASNY 1923b, p. 238, figs. 4, 5: examination of Ehrenberg's original specimen; as *H. lorifera*; p. 241: *H. lorifera* var. *pacifica* a local variety of *H. lorifera*. STIASNY 1924a, p. 493: as *L. lorifera*; Malayan Archipelago. STIASNY 1935, p. 35, Pl. 1, figs. 1, 2: as *L. lorifera*; Malayan Archipelago. STIASNY 1937b, p. 207: as *L. lorifera*. STIASNY 1938, p. 23, Pl. 2, figs. 7, 8, text-fig. D: as *L. lorifera*; p. 28, Pl. 2, fig. 9, text-fig. F: juv. of *L. lorifera*; Red Sea. STIASNY 1940a, p. 24, Pl. 2, figs. 4, 5: *Thysanostoma lorifera*; Philippines. RANSON 1945b, p. 319: Amboina, Malayan Archipelago.

*Thysanostoma thysanura* Haeckel 1880

100–120 mm wide, exumbrella with polygonal network of nematocysts; velar lappets well separated, without a connecting membrane, shape, size and number variable; arm-disk with numerous short, slender filaments; mouth-arms without a naked terminal portion; intracircular canal system with comparatively large, open meshes.

HAECKEL 1880, p. 625, Pl. 39, figs. 1–9: *Thysanostoma thysanura* n.sp.; Australia. KISHINOUE 1910, p. 23: *T. thysanura*, different from *T. denscriptum* Kishinouye 1895; Japan. MAYER 1910, p. 692, text-fig. 420; = *T. denscriptum* Kishinouye; (Malay Archipelago; Amboina); Philippines; (from Moluccas to Japan). MAYER 1915a, p. 197: Philippines. MAYER 1917a, p. 227, fig. 24: Philippines. STIASNY 1920, p. 224: Malayan Archipelago. LIGHT 1921, p. 45: Philippines. STIASNY 1921b, p. III, Pl. I, fig. 6, Pl. 3, figs. 22, 23, text-figs. 5, 6: Malayan Archipelago. STIASNY 1922c, p. 71: Australia. STIASNY 1924a, p. 493: Malayan Archipelago. STIASNY 1929c, p. 202, figs. 2, 3: Malayan Archipelago. RAO 1931a, p. 47: Indian Ocean. STIASNY 1935, p. 35: Malayan Archipelago. STIASNY 1937b, p. 207. STIASNY 1938, p. 27: diagnosis. STIASNY 1940a, p. 25, Pl. 2, figs. 6, 7: north of Borneo. RANSON 1945b, p. 319: Amboina, Malayan Archipelago. UCHIDA 1947b, p. 343: Japan. UCHIDA 1954, pp. 209–19: Japan.

Suborder **DAKTYLIOPHORAE**

Mouth-arms three-winged. A network of anastomosing canals, issuing from the primary ring canal, does not communicate with the gastral cavity except through the radial canals. Subumbrellar muscles annular. Rhopalar pits with radial folds. Subgenital ostia narrowed by papillae.

*Inscapulatae*

Dactyliophorae without scapulets; with permanent ring canal; with 16 or 32 radial canals not all extending to umbrella margin; with a continuous genital porticus.

Family **LYCHNORHIZIDAE**

Inscapulatae with centripetal, usually blindly ending and not anastomosing canals between the 16 radial canals; with broad, much folded mouth-arms.

Genus *Anomalorhiza* Light 1921

Lychnorhizidae with mouth-arms each with an axial terminal club.

Type-species: *A. shawi* Light.

LIGHT 1921, p. 33: *Anomalorhiza* n.g. STIASNY 1924b, p. 47: *Anomalorhiza* is referred to *Lychnorhiza*.

*Anomalorhiza shawi* Light 1921

600 mm wide, flat, exumbrella with low, wart-like projections in central part; in each octant six velar lappets, slightly convex, the two lateral smaller; mouth-arms branched only near the tip, the entire outer surface quite bare; mouths surrounded by tiny filaments; near centre of disk very small, slender filaments; each arm terminates in a long, slender club; inter-rhopalar canals end at ring canal; between the 16 radial canals only one intracircular canal.

LIGHT 1921, p. 33, figs. 1-3: *Anomalorhiza shawi* n.g., n.sp.; Philippines. STIASNY 1924b, p. 47: *A. shawi* is referred to *Lychnorhiza*.

Genus *Lychnorhiza* Haeckel 1880

Mouth-arms three-winged, without axial terminal clubs, with or without filaments; eight radial canals reaching bell margin, eight only reaching ring canal; in each of the 16 spaces 2-4 centripetal vessels.

Type-species: *L. lucerna* Haeckel.

HAECKEL 1880, pp. 587, 633: as *Lychnorhiza* n.g. and *Cramborhiza* n.g. MAYER 1910, p. 672: *Lychnorhiza*.

*Lychnorhiza arubae* Stiasny 1920

230 mm wide, exumbrella with numerous ribs radiating from apex towards margin; eight (2×4) pointed velar lappets in each octant; arm-disk with short filaments; mouth-arms as long as disk radius, widely separated from each other, with few short filaments; rhopalar radial canals broad, inter-rhopalar narrower, two centripetal canals between adjacent radial canals.

STIASNY 1920, p. 225: *Lychnorhiza arubae* n.sp.; Malayan Archipelago. STIASNY 1921b, p. 120, Pl. 2, fig. 8: Malayan Archipelago.

*Lychnorhiza lucerna* Haeckel 1880

120-150 mm wide, flatter than a hemisphere, exumbrella with fine granules and minute, sharp-pointed projections; four large velar lappets in each octant; mouth-arms as long as diameter of bell, much folded, the numerous mouths surrounded by minute clubs and numerous long filaments; two centripetal vessels between adjacent radial canals.

HAECKEL 1880, p. 587, Pl. 34, eight figs.: *Lychnorhiza lucerna* n.g., n.sp.; Brazil; p. 646: as *Cramborhiza flagellata*; Brazil. MAYER 1910, p. 673: synonyms: *C. flagellata* (young specimen) and *L. flagellata* Vanhöffen 1888. STIASNY 1921b, p. 119: = *C. flagellata* and *L. flagellata*. STIASNY 1923b, pp. 235, 237: Rio de Janeiro, Brazil (a specimen, determined by Haeckel *Cephea polynema* n.sp.). RANSON 1945b, p. 319: French Guiana, South America. VANNUCCI 1951a, p. 94, Pl. 4, figs. 25-7: Brazil. VANNUCCI 1954, p. 128: Brazil. KRAMP 1955b, p. 167: by Haeckel 1880 determined as *Cramborhiza flagellata*. VANNUCCI 1957a, pp. 594-6: Brazil.

*Lychnorhiza malayensis* Stiasny 1920

100 mm wide, exumbrella partly smooth, partly with irregular network of nematocysts; eight ( $2 \times 4$ ) pointed velar lappets in each octant; mouth-arms about as long as diameter of disk, without any appendages; four blind centripetal canals between adjacent radial canals.

STIASNY 1920, p. 226: *Lychnorhiza malayensis* n.sp.; Malayan Archipelago. STIASNY 1921b, p. 122, Pl. 2, fig. 9: Malayan Archipelago. MENON 1930, p. 17, Pl. 2, figs. 8a-c: Madras, India. STIASNY 1932, pp. 89-95, figs. 1-4: Batavia, Java. NAIR 1951, p. 74: Trivandrum coast, India.

Genus *Pseudorhiza* von Lendenfeld 1882

Mouth-arms with very long terminal clubs, with or without filaments between the mouths; eight radial canals reaching bell margin, eight only reaching ring canal; in each of the 16 spaces 10 centripetal unbranched, blind vessels.

Type-species: *P. aurosa* von Lendenfeld.

VON LENDENFELD 1882b, p. 380: *Pseudorhiza* n.g. MAYER 1910, p. 682.

*Pseudorhiza aurosa* von Lendenfeld 1882

400 mm wide, about 130 mm high, flatly rounded, exumbrella rough; in each octant six velar lappets, each consisting of three secondary lappets; mouth-arms without filaments.

VON LENDENFELD 1882b, p. 380: *Pseudorhiza aurosa* n.g., n.sp.; South Australia. MAYER 1910, p. 682. STIASNY 1921b, p. 123: discussion. STIASNY 1931a, p. 148, fig. 1: examination of original specimens; discussion. SOUTHCOTT 1958, fig. 2B.

*Pseudorhiza haeckeli* Haacke 1884

200-250 mm wide, 50-100 mm high; exumbrella rough; in each octant six wide, short, rounded velar lappets; each leaf of the three-winged mouth-arms with many flat, fern-like expansions; a single very long filament arises from the distal end of one of the mouth-arms.

HAACKE 1884, p. 291: *Pseudorhiza haeckelii* n.sp.; South Australia. MAYER 1910, p. 683. STIASNY 1921b, p. 123: discussion. THIEL 1926, pp. 223-47, Pl. 3: S.W. Australia. SOUTHCOTT 1958, p. 58, fig. 2C: ? = *P. amaskala* von Lendenfeld.

## Family CATOSTYLIDAE

Inscapulateae with intracircular network of anastomosing canals communicating with the ring canal, but not always with the 16 radial canals; the eight rhopalar canals extending to the umbrella margin, the eight inter-rhopalar only to the ring canal; mouth-arms pyramidal.

Genus *Acromitoides* Stiasny 1921

With a broad intracircular anastomosing network in direct communication with the ring canal and the inter-rhopalar canals only; mouth-arms without appendages.

Type-species: *A. stiphropterus* (Schultze).

SCHULTZE 1897, p. 159: as *Crambessa* in part. MAYER 1910, pp. 670, 671: as *Catostylus* in part. STIASNY 1921b, p. 136: *Acromitoides* n.g.

*Acromitoides purpurus* (Mayer 1910)

115 mm wide, 35 mm high, exumbrella smooth; in each octant four cleft and two simple velar lappets (two median and two lateral lappets are cleft); mouth-arms shorter than radius of bell, lower three-winged portion 5-7 times as long as upper cylindrical portion; uniform dark brownish-purple.

MAYER 1910, p. 671, text-fig. 412: as *Catostylus purpurus* n.sp.; Philippines. LIGHT 1914b, p. 207: as *C. purpurus*; Philippines. MAYER 1915a, p. 187: as *C. purpurus*; Philippines. MAYER 1917a, p. 213, fig. 15: as *C. purpurus*. LIGHT 1921, p. 41: as *C. purpurus*; Philippines. STIASNY 1921b, p. 136: *Acromitoides purpurus* n.g. STIASNY 1924b, p. 39, fig. 1: Philippines. CHIU 1954b, p. 56: as *Catostylus purpurus*.

*Acromitoides stiphropterus* (Schultze 1897)

100 mm wide, smooth; in each octant at least five large, cleft velar lappets, 10 mm long; mouth-arms shorter than radius of bell, distal three-winged portion five times as long as proximal cylindrical portion; exumbrella with four perradial areas of brown spots.

SCHULTZE 1897, p. 159, Pl. 15, figs. 4, 5, 5a: as *Crambessa stiphropterus* n.sp.; Ternate, Malayan Archipelago. MAYER 1910, p. 670: as *Catostylus stiphropterus*. STIASNY 1921b, p. 136: *Acromitoides stiphropterus* n.g.

Genus *Acromitus* Light 1914

With a broad intracircular anastomosing network in direct communication with the ring canal and the rhopalar canals only (not with the inter-rhopalar canals); mouth-arms each with a terminal whip-like appendage, usually with whip-like filaments (except in *A. hardenbergi*).

Type-species: *A. maculosus* Light.

LIGHT 1914b, p. 212: *Acromitus* n.g.

*Acromitus flagellatus* (Maas 1903)

120 mm in diameter; exumbrella smooth or finely granulated; the sub-genital papillae hammer- or heart-shaped; mouth-arms about as long as diameter of bell, narrow, with long, thread-like endings with short filaments; intracircular anastomosing network richly branched.

MAAS 1903, p. 77, Pl. 10, figs. 87-92, Pl. 11, fig. 101: as *Himantostoma flagellata*; Malayan Archipelago. MAYER 1910, p. 695: as *Lorifera flagellata*, including *H. flagellata* Haeckel 1880 and Maas 1903. MAYER 1915a, p. 191, fig. 6: as *Lychnorhiza bornensis* n.sp.; Borneo. MAYER 1917a, p. 218, fig. 19: as *L. bornensis*; Borneo. STIASNY 1920, p. 226: *Acromitus flagellatus* = *H. flagellata* Maas 1903, non Haeckel 1880. STIASNY 1921b, p. 131, Pl. 2, fig. 10, Pl. 4, fig. 30, Pl. 5, fig. 40, text-figs. 7-9: Malayan Archipelago; pp. 120, 135: = *L. bornensis* Mayer 1915. STIASNY 1922e, p. 546, figs. 10-12: Siam; Java. STIASNY 1929c, p. 210, figs. 11-15: Malayan Archipelago. RAO 1931a, p. 48: Indian Ocean. STIASNY 1931a, p. 161: Malayan Archipelago. STIASNY 1934b, p. 5. STIASNY 1934c, pp. 8-10, figs.: anomalies; Batavia, Java. MAADEN 1935, pp. 228-36: = a variety of *A. maculosus*; Amoy, China. MENON 1936, p. 8: Krusadai Islands, Indian Ocean. GRAVELY 1941, p. 12, fig. 6: Madras, India. PATIL 1951, p. 132: as *Acromitus*; Karwar coast, India. UCHIDA 1954, pp. 209-19: Japan. UCHIDA 1955a, p. 16, figs. 1, 2: Formosa (Tai-wan).

#### *Acromitus hardenbergi* Stiasny 1934

About 90 mm wide; exumbrella almost smooth or finely granulated; subgenital papillae pear- or egg-shaped; mouth-arms a little longer than bell radius, with short whip-like filaments, but without thread-like endings; anastomosing network richly branched; with forked extracircular canals.

STIASNY 1934b, pp. 1-7, figs. 1-5: *Acromitus hardenbergi* n.sp.; Borneo. MAADEN 1935, p. 234: *A. hardenbergi* a variety of *A. maculosus*.

#### *Acromitus maculosus* Light 1914

90 mm wide; exumbrella with blunt, conical protuberances; subgenital papillae flap-like; mouth-arms 1.3 to two times the length of radius of bell, thick and broad, with long whip-like filaments and long thread-like endings; a few (no more than three) anastomoses inside the ring canal.

LIGHT 1914b, p. 212, figs. 4-6: *Acromitus maculosus* n.g., n.sp.; Philippines. STIASNY 1934b, p. 5. MAADEN 1935, p. 233: only species of *Acromitus*.

#### *Acromitus rabanchatu* Annandale 1915

200 mm wide, exumbrella finely granulated; subgenital papillae broad, triangular cones with blunt tips; mouth-arms up to twice the length of radius of bell, with short whip-like filaments and long thread-like endings; a few (no more than three) faintly branched anastomoses inside the ring canal.

ANNANDALE 1915, p. 96: *Acromitus rabanchatu* n.sp.; Chilka Lake, east coast of India. STIASNY 1925, p. 11, figs. 6-10. RAO 1931a, p. 49: Chilka Lake, India. STIASNY 1934b, p. 5. MAADEN 1935, p. 234: a variety of *A. maculosus*.

#### *Acromitus tankahkeei* Light 1924

44 mm wide; in the centre of the upper lip of each subgenital ostium is a granulate, pear-shaped protuberance with its swollen base towards the ex-

terior; this character and the colour separates the species from *A. maculosus*; mouth-arms nearly as long as bell diameter, slender, with short whip-like filaments and with long thread-like endings; anastomosing network inside the ring canal richly branched.

LIGHT 1924, pp. 449-51, figs.: *Acromitus tankahkeei* n.sp.; China. STIASNY 1934b, p. 5. MAADEN 1935, p. 234: a variety of *A. maculosus*. CHIU 1954b, pp. 50, 51: China.

### Genus *Catostylus* L. Agassiz 1862

With a broad, intracircular anastomosing network in direct communication with both rhopalar and inter-rhopalar canals and with the ring canal; mouth-arms without special appendages.

Type-species: *C. mosaicus* (Quoy & Gaimard).

L. AGASSIZ 1862, pp. 152, 153: as *Catostylus* n.g. and *Rhacophilus* n.g. HAECKEL 1869, p. 509: as *Crambessa* n.g. in part. MAYER 1910, p. 664: *Catostylus*.

#### *Catostylus cruciatus* (Lesson 1830)

120-150 mm wide; hemispherical with deep radiating furrows; in each octant four large triangular velar and two very small ocular lappets; mouth-arms one to 1.5 times the length of bell radius, distal three-winged portion four times as long as the proximal, simple portion.

LESSON 1830, p. 121, Pl. 11, fig. 1: as *Rhizostoma cruciata* n.sp.; Santa Catharina Island, coast of Brazil. L. AGASSIZ 1862, p. 153: as *Rhacophilus cruciatus* n.g. HAECKEL 1880, p. 620: as *Crambessa cruciata*. MAYER 1910, p. 667: *Catostylus cruciatus*. STIASNY 1921b, p. 141: critical remarks. VANNUCCI 1957a, pp. 594-6: Brazil.

#### *Catostylus mosaicus* (Quoy & Gaimard 1824)

250-350 mm wide; exumbrella with coarse granulations; about 16 lappets in each octant, all alike; arm-disk somewhat wider than bell radius; mouth-arms about 1.5 times as long as bell radius, proximal portion 1/6 as long as the distal, tapering, three-winged portion; outer edges branch profusely and taper to a pointed end below; no appendages; intracircular network rather narrow, with nearly radial meshes, extracircular network very wide and fine-meshed, extending into the lappets.

QUOY & GAIMARD 1824, p. 569, Pl. 85, fig. 3: as *Cephea mosaica* n.sp.; Australia. L. AGASSIZ 1862, p. 152: *Catostylus mosaicus* n.g. and as *C. wilkesii* n.sp. HAECKEL 1880, p. 622: as *Crambessa mosaica*. MAYER 1910, p. 666: *Catostylus mosaicus*; (Australian coast from Brisbane to Melbourne). MAYER 1915a, pp. 160, 190: Queensland, Australia. MAYER 1917a, p. 215: Philippines. STIASNY 1921b, p. 139. STIASNY 1922b, p. 45, figs. 1, 2: a specimen from Australia, determined *Versura palmata* by Haeckel. STIASNY 1922e, p. 554: N.S.Wales, Australia. STIASNY 1924c, p. 66, fig. 5: Australia. STIASNY 1929c, p. 214: New Guinea. STIASNY 1931a, p. 154: Australia. STIASNY 1931b, p. 38: Australia. POPE 1953b, pp. 16-21: Australia.

*Catostylus ornatellus* (Vanhöffen 1888)

About 55 mm wide; flatly rounded, granular surface with lines over lappets; in each octant eight large, bluntly pointed velar and two small, sharp-pointed ocular lappets; mouth-arms  $1/2$  to  $2/3$  the length of bell radius, distal three-winged portion as long as proximal simple portion, without appendages; intracircular mesh-work of canals very broad, reaching inwards almost to the arm-disk, with very broad anastomoses.

VANHÖFFEN 1888, pp. 28, 41, Pl. 2, figs. 3-6: as *Loborhiza ornatella* n.g., n.sp.; coast of Ecuador. MAYER 1910, p. 670: *Catostylus ornatellus*. STIASNY 1921b, p. 142. STIASNY 1923b, p. 229, fig. 1: examination of the original specimen.

*Catostylus perezi* Ranson 1945

Up to 230 mm wide, central part of exumbrella smooth, with rows of prominent rugged papillae radiating towards the margin; in each octant 12-16 pointed velar lappets; mouth-arms about 1.5 times the length of bell radius, sub-cylindrical, distal three-winged portion about six times as long as the proximal simple portion; intracircular canal system with fairly open irregular meshes.

RANSON 1945a, pp. 236-42, figs. 1-5: *Catostylus perezi* n.sp.; Arabia. RANSON 1945b, p. 319. KRAMP 1956b, p. 241: Iranian Gulf.

*Catostylus tagi* (Haeckel 1869)

Up to 650 mm wide, with dendritically branching furrows; in each octant eight large, triangular velar and two small, pointed ocular lappets; mouth-arms as long as bell diameter, distal three-winged portion 3-4 times as long as proximal, simple portion, terminal end of mouth-arms pointed, naked; intracircular mesh-work of canals extraordinarily wide, with broad anastomoses; extracircular mesh-work very fine-meshed, extending into the lappets.

HAECKEL 1869, p. 509, Pls. 38, 39: as *Crambessa tagi* n.g., n.sp.; Portugal. HAECKEL 1880, p. 621: as *Crambessa tagi* and *pictonum* n.sp.; Atlantic coast of France. MAYER 1910, p. 668: *Catostylus tagi*, synonym *Crambessa pictonum* Haeckel? (from Senegambia, Africa, to France). VANHÖFFEN 1920, pp. 16, 17: as *Catostylus* sp.; West Africa. STIASNY 1921b, p. 142: *C. pictonum* doubtful species; remarks on *C. tagi*. STIASNY 1922c, p. 74, figs. 4, 5: *C. pictonum*. STIASNY 1922e, p. 541, fig. 8: *C. tagi*; Panama. STIASNY 1929c, p. 214: St Louis, north of Cape Verde. STIASNY 1930d, pp. 20-31, figs. 1, 7: mouth of Congo. STIASNY 1931a, p. 155: Spain; Portugal. STIASNY 1939c, p. 43: mouth of Congo. RANSON 1945b, p. 319: Bay of Biscay. RANSON 1945c, p. 71: *C. pictonum* = *C. tagi*; p. 72, Pl. 1, figs. 1-4: mouth of Loire, France. RANSON 1949, p. 144: discussion; Angola; Rio Ora, N.W. Africa. KRAMP 1955a, p. 303: Gulf of Guinea, W. Africa. KRAMP 1959b, p. 25: West Africa.

*Catostylus townsendi* Mayer 1915

100 mm wide, flatter than a hemisphere, finely granular, jelly of horny rigidity; number of lappets variable, velar lappets about twice as wide as

long, rhopalar lappets small and oval; deep clefts between lappets extend upwards; mouth-arms  $2/3$  of the length of diameter, distal three-winged portion 2-4 (up to seven) times as long as proximal simple portion, tapering to pointed distal ends; intracircular mesh-work with rather wide meshes, extracircular mesh-work fine-meshed, extending into the lappets.

MAYER 1915a, p. 188, fig. 5: *Catostylus townsendi* n.sp.; Borneo. MAYER 1917a, p. 214, fig. 16: Borneo. STIASNY 1920, p. 227: Malayan Archipelago. STIASNY 1921b, p. 144, Pl. 2, fig. 12, Pl. 4, fig. 31, Pl. 5, figs. 39, 47, text-fig. 10: Malayan Archipelago. STIASNY 1921d, p. 109, fig. 1: juvenile specimen; Malayan Archipelago. STIASNY 1922e, p. 545, fig. 9. STIASNY 1925, p. 5, figs. 1-5: Batavia, Java. STIASNY 1931a, p. 156: Batavia, Java. RANSON 1945b, p. 319: Indochina; Gulf of Siam. ?SEARLE 1957, p. 75, fig. 4a: as *C.* sp.

#### *Catostylus tripterus* (Haeckel 1880)

50 mm wide, hemispherical; in each octant four wide, quadratic velar and two narrow, long, projecting ocular lappets; mouth-arms as long as bell radius, distal three-winged portion half as long as proximal, simple portion.

HAECKEL 1880, p. 586: as *Toxoclytus tripterus* n.sp.; Fernando Po, W. Africa. MAYER 1910, p. 671: *Catostylus tripterus*. STIASNY 1921b, p. 143: probably to *Catostylus*, but doubtful species.

#### *Catostylus viridescens* (Chun 1896)

80 mm wide, hemispherical, smooth; lappets?; mouth-arms as long as bell radius, distal three-winged portion five times as long as proximal simple portion; terminal ends bluntly rounded.

CHUN 1896, p. 12, Pl. 1, fig. 2: as *Crambessa viridescens* n.sp.; mouth of Pangani River, E. Africa. MAYER 1910, p. 670: *Catostylus viridescens*. STIASNY 1921b, p. 142: doubtful species. STIASNY 1922b, p. 49: Zanzibar.

### Genus *Crambione* Maas 1903

With a narrow, wide-meshed, intracircular anastomosing mesh-work, not stretching far towards the centre and communicating only with the ring canal; mouth-arms with clubs and whip-shaped filaments; without terminal clubs.

Type-species: *C. mastigophora* Maas.

MAAS 1903, pp. 48, 81: *Crambione* n.g. MAYER 1910, pp. 674, 676: as *Lychnorhiza* in part, and *Crambione*.

#### *Crambione bartschi* (Mayer 1910)

74 mm wide, smooth, thick but not very rigid; 10 bluntly pointed velar lappets in each octant; mouth-arms with numerous simple, flattened, tapering filaments between the mouths; mouth-arms about as long as bell radius,

distal three-winged portion about twice as long as proximal simple portion; extracircular network of canals not extending into the velar lappets, intracircular system with almost quadratic meshes.

MAYER 1910, p. 674, text-figs. 413, 414: as *Lychnorhiza bartschi* n.sp.; Philippines. MAYER 1915a, p. 191: as *L. bartschi*; Philippines; Celebes. MAYER 1917a, p. 217, figs. 17, 18: as *L. bartschi*. STIASNY 1921b, pp. 120, 126: belongs to *Crambione*, possibly = *C. mastigophora*.

*Crambione cooki* Mayer 1910

110 mm, hemispherical, tough; smooth in flexible zone above margin, central inflexible part reticulated by deep, more or less radial furrows; in each octant 11 (9+2) large, pointed lappets, all alike; mouth-arms about  $\frac{3}{4}$  the length of diameter, lower  $\frac{2}{3}$  three-winged, complexly folded; four slender filaments (as long as bell radius) from arm-disk; 2-6 globular appendages on outer side of each mouth-arm; canal system?

MAYER 1910, p. 677, Pl. 74, fig. 2: *Crambione cooki* n.sp.; Great Barrier Reef, E. Australia. STIASNY 1921b, p. 125: systematic position uncertain.

*Crambione mastigophora* Maas 1903

400 mm wide, highly arched, exumbrella smooth; in each octant 8-10 velar lappets, elongate, with rounded outer edges and deep clefts; arm-disk very wide; mouth-arms about as long as bell radius, distal three-winged portion as long as proximal simple portion; distal portion pyramidal, with many small club-shaped and some long filamentous appendages; extracircular canal system fine-meshed, not extending into the velar lappets; intracircular system with comparatively few meshes, partly elongated, radiating.

MAAS, 1903, p. 49, Pl. 6, figs. 47-53, Pl. 8, figs. 71-4, Pl. 11, figs. 100, 104, Pl. 12, fig. 113: *Crambione mastigophora* n.g., n.sp.; Malayan Archipelago. MAYER 1910, p. 676. STIASNY 1920, p. 226: Malayan Archipelago. STIASNY 1921b, p. 127, Pl. 2, fig. 11, Pl. 4, fig. 29, Pl. 5, fig. 45: Malayan Archipelago. STIASNY 1924a, p. 495, figs. 4-7: Malayan Archipelago. STIASNY 1929c, p. 207, figs. 5-10: Malayan Archipelago. STIASNY 1931a, p. 154: Ceylon. STIASNY 1935, p. 37, fig. 9: Malayan Archipelago. STIASNY 1937b, p. 207. UCHIDA 1947a, p. 318: Truk Islands, central Pacific.

Genus *Crambionella* Stiasny 1921

With a narrow, wide-meshed, intracircular anastomosing network, not stretching far towards the centre, and communicating only with the ring canal; mouth-arms with short terminal clubs, but without whip-like filaments.

Type-species: *C. orsini* (Vanhöffen).

VANHÖFFEN 1888, p. 34: as *Mastigias* in part. MAYER 1910, p. 669: as *Catostylus* in part. STIASNY 1921b, p. 129: *Crambionella* n.g.

*Crambionella annandalei* Rao 1931

Differs from *C. stuhlmanni* 'only in the great length of the terminal club and its tapering form and in having small foliaceous appendages among the mouth-frills'.

MENON 1930, p. 18, Pl. 3, figs. 14a, c, e: as *C. stuhlmanni*?; Madras, India. RAO 1931a, p. 50, Pl. 3, Pl. 4, fig. 1, text-figs. 4-8: *Crambionella annandalei* n.sp.; India; Burma. STIASNY 1937a, p. 236: doubtful species.

*Crambionella orsini* (Vanhöffen 1888)

100-200 mm wide, plump, massive, hard and cartilaginous, smooth; in each octant 16 small, sharp-pointed, smooth velar lappets, separated by furrows extending upwards on exumbrella, furrows without pigment; mouth-arms about as long as bell radius, proximal portion short, 1/3 as long as distal three-winged portion, which is large, prismatic, with a short gelatinous, pyramidal, bluntly pointed, three-cornered terminal knob; extra-circular canal system with several radial vessels.

VANHÖFFEN 1888, pp. 34, 44, Pl. 4, figs. 2-4: as *Mastigias orsini* n.sp.; Red Sea. MAYER 1910, p. 669: as *Catostylus orsini*. STIASNY 1921b, p. 129: *Crambionella* n.g. *orsini*. STIASNY 1923b, p. 232, figs. 2, 3: examination of type-specimen. MENON 1930, p. 18, Pl. 3, figs. 14b, d: Madras, India. MENON 1936, p. 7, Pl. 1, figs. 1, 3: Krusadai Islands, Indian Ocean. STIASNY 1937a, p. 231, Pl. 1, figs. 4, 5, text-figs. 12-14: Arabian Sea. STIASNY 1938, p. 31: Red Sea. RANSON 1945b, p. 319: Pondichery, east coast of India. NAIR 1946, p. 97: Travancore, India. NAIR 1951, p. 75: Travancore, India. KRAMP 1956b, p. 241: Iranian Gulf.

*Crambionella stuhlmanni* (Chun 1896)

80-200 mm wide; in each octant 12 velar lappets, each provided with a median row of sharp-pointed projections; mouth-arms shorter than bell diameter, with a short, pyramidal, bluntly pointed, three-cornered terminal knob.

CHUN 1896, p. 10, Pl. 1, two figs.: as *Crambessa stuhlmanni* n.sp.; East Africa. MAYER 1910, p. 669: *Catostylus stuhlmanni*. STIASNY 1921b, p. 129: *Crambionella stuhlmanni*. STIASNY 1922b, p. 50, fig. 3: as '*Crambessa*' *stuhlmanni*; Mozambique, S.E. Africa. STIASNY 1937a, p. 237: a valid species. RANSON 1945b, p. 319: Madagascar.

Genus *Leptobrachia* Brandt 1838

The long, linear mouth-arms bear no frilled mouths near the middle of their length; but near their points of origin from the arm-disk there is a ventral row of mouths, and beyond the naked mid-region there are three lines of

mouths, one ventral and two dorsal; mouth-arms terminate in a naked, pointed end. Doubtful genus.

Type-species: *L. leptopus* (Chamisso & Eysenhardt).

BRANDT 1838b, p. 191: *Leptobrachia* n.g. HAECKEL 1880, pp. 630, 631: *Leptobrachia* and as *Leonura* n.g. MAYER 1910, p. 696: *Leptobrachia*.

*Leptobrachia leptopus* (Chamisso & Eysenhardt 1821)

80 mm wide, flatter than a hemisphere, exumbrella with regularly arranged polygonal elevations (caused during collecting by pressure of the net?); in each octant 8 + 2 sharply pointed lappets, the largest in the middle, converging furrows from the clefts upwards; mouth-arms about as long as bell diameter, slender, terminating in a triangular, pointed, naked extremity, 1/4 as long as entire mouth-arm. Doubtful species.

CHAMISSO & EYSENHARDT 1821, p. 356, Pl. 27, figs. 1A, D: as *Rhizostoma leptopus* n.sp.; Radack Islands, tropical Pacific. BRANDT 1838b, p. 191: *Leptobrachia leptopus* n.g. HAECKEL 1880, pp. 631, 646: as *Leonura leptura* n.g., n.sp. and *Leonura terminalis*; near New Zealand. MAYER 1910, p. 696: *Leptobrachia leptopus*, = *Leonura leptura* and *terminalis* Haeckel. STIASNY 1921b, pp. 117, 118: both genus and species doubtful; p. 147: *Leonura terminalis* doubtful species, nearest related to *Catostylus*. STIASNY 1931a, p. 156, fig. 2: *L. terminalis* = *Leptobrachia leptopus*; belongs to *Catostylidae*.

Family *LOBONEMATIDAE*

Inscapulatae with intracircular network of anastomosing canals communicating with the ring canal and with some or all of the 16-32 radial canals, but not with the stomach; with window-like openings in the membranes of the mouth-arms; marginal lappets elongated, tentacle-like.

Genus *Lobonema* Mayer 1910

With a large-meshed, intracircular anastomosing network, which communicates with both rhopalar and inter-rhopalar canals and with the ring canal.

Type-species: *L. smithi* Mayer.

MAYER 1910, p. 688: *Lobonema* n.g.

*Lobonema mayeri* Light 1914

500 mm wide; differs from *L. smithi* in that it has 12-16 rhopalia instead of eight, in that the circular muscle is completely interrupted in the ocular radii, in that it has a false ostium in each interostial pillar, and in that the inter-rhopalar canals do not reach the bell margin; probably = *L. smithi*.

LIGHT 1914b, p. 217, figs. 7, 8, 9: *Lobonema mayeri* n.sp.; Philippines. LIGHT 1921, p. 43: uncertain that *L. mayeri* differs from *smithi*. STIASNY 1921b, p. 150: two species of *Lobonema*: *smithi* and *mayeri*. RAO 1931, p. 56: *L. mayeri* probably = *smithi*. THIEL 1935a, p. 6: *L. mayeri* = *smithi*; poisonous effect. RANSON 1945b, p. 320: Indochina.

*Lobonema smithi* Mayer 1910

236 mm wide, thick, tough, and rigid; exumbrella with erect, gelatinous papillae, largest and most abundant at centre, about 35–40 mm long, pointed, with nematocysts; four velar lappets in each octant, 90–100 mm long, tapering, pointed; mouth-arms 150 mm long, distal three-winged portion  $1\frac{1}{2}$  times as long as proximal portion; numerous long spindle-shaped and thread-like appendages; 16 radial canals.

MAYER 1910, p. 689, text-figs. 417, 418: *Lobonema smithi* n.g., n.sp.: Philippines. LIGHT 1914b, p. 217, figs. 7–9: as *L. mayeri* n.sp. Philippines. MAYER 1915a, p. 196: *L. smithi*; Philippines. MAYER 1917a, p. 224, figs. 22, 23: Philippines. LIGHT 1921, p. 43: as *L. mayeri*; p. 44: *L. smithi*; Philippines. STIASNY 1921b, p. 150: two species of *Lobonema*: *smithi* and *mayeri*. RAO 1931a, p. 56: Indian Ocean. THIEL 1935a, p. 6: *L. mayeri* synonym of *smithi*. SOUTHCOTT 1959, p. 575.

Genus *Lobonemoides* Light 1914

With a large-meshed, intracircular anastomosing network, which communicates only with the rhopalar canals and the ring canal.

Type-species: *L. gracilis* Light.

LIGHT 1914b, p. 222: *Lobonemoides* n.g.

*Lobonemoides gracilis* Light 1914

50–85 mm wide, transparent; exumbrella with a few scattered, small, slender papillae, up to 2 mm long; 14 rhopalia, 28 radial canals, all reaching the margin; four large pointed triangular velar lappets between two small ocular.

(The short marginal lappets, the simple structure of the canal system, the lack of subgenital papillae and of windows in the mouth-arms suggests that *L. gracilis* is a younger stage of *L. robustus*.)

LIGHT 1914b, p. 222, figs. 10–13: *Lobonemoides gracilis* n.g., n.sp. Philippines. MAYER 1915a, p. 196: ? = *Lobonema mayeri* juv. MAYER 1917a, p. 224: ? = *L. mayeri* juv. STIASNY 1921b, p. 156: probably = *Lobonemoides robustus* juv. STIASNY 1924b, p. 45: may be = *L. robustus*; not to *Lobonema*.

*Lobonemoides robustus* Stiasny 1920

160–320 mm wide, faintly arched, central portion very thick, margin thin, exumbrella with pointed papillae, 15–30 mm long; 11–21 rhopalia; velar

lappets up to 95 mm long with slender, thread-like extremities, 1-6 between adjacent rhopalia; mouth-arms broad, three-winged, up to 145 mm long, each with 1-4 window-like openings and with filaments up to 130 mm long, and a long spindle-shaped terminal appendage; 20-34 radial canals, inter-rhopalar canals effaced beyond ring canal.

STIASNY 1920, p. 227: *Lobonemoides robustus* n.sp.; Malayan Archipelago. STIASNY 1921b, p. 151, Pl. 2, fig. 13, Pl. 4, fig. 32, Pl. 5, figs. 41-4, text-figs. 11-14: Java. STIASNY 1924b, p. 45: Manila, Philippines.

*Lobonemoides sewelli* Rao 1931

260 mm wide, central portion of exumbrella with some scattered papillae; tongue-shaped thickenings at base of velar lappets; 16 rhopalia; between adjacent rhopalia 2-6 velar lappets, elongately triangular, 10-15 mm long; mouth-arms 90-155 mm, with window-like openings, without filamentous appendages, but with short, stiff, rod-like appendages scattered amongst the mouths; 16 rhopalar canals reaching margin, 16 inter-rhopalar only to ring canal.

RAO 1931a, p. 57, figs. 9-13: *Lobonemoides sewelli* n.sp.; Mergui Archipelago, Indian Ocean.

### Scapulatae

Dactyliophorae with eight pairs of scapulets on upper arms; with or without ring canal; with 16 radial canals all extending to umbrella margin; with four separated subgenital cavities.

### Family RHIZOSTOMATIDAE

Scapulatae with mouth-arms coalesced in proximal portion only; without a primary mouth opening; manubrium with a complicated canal system; distal portion of arms three-winged, usually with a terminal club.

### Genus *Eupilema* Haeckel 1880

Without filaments, clubs or other appendages (torn off?), without a terminal club.

Type-species: *E. scapulare* Haeckel.

HAECKEL 1880, p. 590: *Eupilema* n.g. MAYER 1910, p. 709. STIASNY 1921b, p. 169: probably = *Rhopilema*.

*Eupilema scapulare* Haeckel 1880

Doubtful species; probably a damaged specimen of *Rhopilema*. 150 mm wide, 50 mm high.

HAECKEL 1880, pp. 582, 590: *Eupilema scapulare* n.g., n.sp.; Sunda Archipelago and Sumatra. MAYER 1910, p. 709. STIASNY 1920, p. 229: Japan. STIASNY 1921b, p. 169: probably a damaged specimen of *Rhopilema esculenta*.

### Genus *Rhizostoma* Cuvier 1800

Rhizostomatidae with small scapulets and short manubrium; mouth-arms without secondary clubs nor filaments, but each with a single, club-like terminal appendage; usually with a ring canal; intracircular network of canals with few and large meshes.

Type-species: *R. pulmo* (Macri).

CUVIER 1800, p. 69, Pl. 4: *Rhizostome* n.g. PÉRON & LESUEUR 1809, p. 362: *Rhizostoma*. HAECKEL 1880, p. 591: as *Pilema* n.g. MAYER 1910, p. 698.

#### *Rhizostoma luteum* (Quoy & Gaimard 1827)

Up to 300 mm wide; differs from *R. pulmo* in the proximal portion of the mouth-arms being considerably longer and stronger than the distal portion and throughout most of its length coalesced into a thick manubrium; the distal portion of the arms remarkably small, the terminal appendage with club-shaped extremity on a long, thin, prismatic pedicel. Subgenital papillae an isolated, egg-shaped or bean-shaped protuberance in the bottom of each subgenital pit.

QUOY & GAIMARD 1827, p. 175, Pl. 4B, fig. 1: as *Orithyia lutea* n.sp.; Straits of Gibraltar. ESCHSCHOLTZ 1829, p. 51: *Rhizostoma lutea*. MAYER 1910, p. 703: as *R. pulmo* var. *lutea*. STIASNY 1921b, p. 159: a valid species. STIASNY 1931a, p. 164, figs. 4-6: *R. luteum*; off coast of Portugal. STIASNY 1936, pp. 1-6, figs. 1, 2: Tejo, Lisbon. RANSON 1949, p. 147: discussion; Angola; Mauretania. KRAMP 1955a, p. 304: Gulf of Guinea, W. Africa. KRAMP 1959b, p. 26, fig. 5: West Africa.

#### *Rhizostoma pulmo* (Macri 1778)

Occasionally up to 600 mm wide, usually highly arched, thick and rigid, exumbrella finely granulated; 8-12 small velar lappets per octant; total length of mouth-arms about equal to disk diameter, proximal portion about as long as distal three-winged portion, terminal clubs about 1/3 of the total length of the arms, triangular in cross-section; subgenital papillae represented by a thickened valve on the outer edge of each subgenital pit.

*Rhizostoma pulmo* forma *typica*: 8-9 velar lappets in each octant; proximal portion of mouth-arms somewhat longer than distal three-winged portion; terminal clubs widest near their bases.

*Rhizostoma pulmo* var. *octopus*: 11-12 velar lappets in each octant, more pointed than in f. *typica*; proximal portion of mouth-arms somewhat shorter than distal three-winged portion; terminal clubs widest near their ends.

MACRI 1778b, p. 45, Pl. 1: as *Medusa pulmo* n.sp.; Mediterranean. L. AGASSIZ 1862, p. 150: *Rhizostoma pulmo*. HAECKEL 1880, p. 591: as *Pilema pulmo*. MAYER 1910,

p. 699, Pl. 73, text-fig. 422: synonyms; (Naples, Mediterranean): p. 703: as *R. pulmo* var. *octopus*; (France to Germany, Scotland); p. 703: as *R. pulmo* var. *corona*; (Red Sea); p. 703: as *R. pulmo* var. *capensis*; (South Africa). JORDAN 1912, p. 127: as *R. octopus*. HAUROWITZ 1920, pp. 28-37: as *R. cuvieri*; Trieste, Adriatic Sea. STIASNY 1920, p. 228: as *R. octopus*; Holland; p. 228: *R. pulmo*; St Nazaire, France. SCHAEFER 1921, pp. 49 ff.: as *Rhizostoma*; experiments. STIASNY 1921*b*, p. 160, Pl. 2, fig. 14, Pl. 4, fig. 33: as *R. octopus*; Holland; p. 161: *R. pulmo*; Bay of Biscay. ANSELMI 1923, p. 73: *Rizosthoma pulmo*; Mediterranean. ELMHIRST 1923, p. 22: Clyde Sea area, Scotland. FREINKEL 1925, pp. 658 ff.: experiments. SCHODDUYN 1926, p. 40: as *R. cuvieri*; Pas de Calais, English Channel. SLONIMSKI 1926, pp. 926, 927, one fig.: Villefranche-sur-Mer, France. SCHODDUYN 1927, p. 26: as *Rhizostoma*. STIASNY 1928*a*, pp. 177, 184, 189, figs. 1-5, 6-8, 1-10: as *R. octopus*; North Sea. STIASNY 1929*b*, pp. 4-15, Pls. 1-9: as *R. octopus*; anomalies in the gastrovascular system. STIASNY 1930*a*, p. 24, Pl. 2, figs. 10-12: as *R. octopus*; Belgium. MAR. BIOL. ASS. 1931, p. 86: as *R. octopus*; Plymouth. NOBRE 1931, p. 27: Portugal. STIASNY 1931*a*, p. 161, fig. 3: *R. pulmo*, comparison with *R. octopus*; Naples. BENAZZI 1933, pp. 212, 213: observations in aquaria. BERNTROP 1934, p. 2084: as *R. octopus*; coast of Holland. KRAMP 1934*a*, pp. 211-21: as *R. octopus*; Denmark. KRAMP 1934*b*, pp. 234-40, fig. 2: as *R. octopus*; Denmark. WEILL 1934*b*, p. 545, figs.: as *R. octopus*; nematocysts. THIEL 1935*a*, p. 4, fig. 3: poisonous effect. LAMBERT 1936, p. 71: Essex coast, England. KRAMP 1937*b*, p. 192, figs. 83-5: Denmark. KÜNNE 1937*b*, p. 5: as *R. octopus*; Western Baltic. PASPALLEFF 1938*a*, pp. 1-25, figs.: Black Sea. VERESS 1938, pp. 153-70: as *Rhizostoma*; movements. NETCHAEFF & NEU 1940, p. 63: as *Pilema pulmo*; Black Sea. TAMBS-LYCHE 1940, pp. 85-92: as *R. octopus*; west coast of Norway. BRUNELLI 1941, p. 55: Venice, Adriatic Sea. MAADEN 1942*a*, pp. 347 ff.: Holland. VERWEY 1942, p. 419: Holland. FOX & PANTIN 1944, p. 121: as *R. cuvieri*. KOLOSVARY 1945, p. 140: Adriatic Sea. SKRAMLIK 1945, pp. 296-336: experiments; Naples. RANSON 1945*b*, p. 320: *R. pulmo*; Mediterranean; as *R. octopus*; Atlantic coast of France. CUTCLIFF 1946, p. 171: as *R. octopus*; Exeter, England. LELOUP 1947, p. 42: as *R. octopus*; Belgium. JOHNSEN 1948, p. 221: Norway. ROSSI 1949, p. 28: Golfo di Rapallo, Italy. FRANC 1951, p. 28: as *R. octopus*; St Malo, English Channel. KÜNNE 1952, pp. 14, 32, 43: as *R. octopus*; S.E. North Sea. RUSTAD 1952, p. 5: as *R. octopus*; Bergen, Norway. CHRISTOMANOS 1954, pp. 875, 876, figs. 1, 2: chemical examination of pigment; Mediterranean. HUMMELINCK 1954, p. 166: as *R. octopus*; no longer occurs in the Zuider Zee, Holland. LUBET 1954, p. 214: Arcachon, Bay of Biscay. NEWELL 1954, p. 331: as *R. octopus*; Kent, England. SOUTHWARD 1954, p. 20: as *R. octopus*; Irish Sea. BOVET 1955, pp. 94-101, figs. 1, 2: Ortello, Thyrrenian Sea, Mediterranean; physiology. HORRIDGE 1955*a*, pp. 636-41: physiology. BASSINDALE & BARRET 1957, p. 248: Dale Fort, Wales. VALKANOV 1957, p. 17: Black Sea. CARTHY 1958, p. 197: responses to stimuli. HORRIDGE 1959, pp. 78, 81, 89.

### Genus *Rhopilema* Haeckel 1880

Rhizostomatidae with large scapulets and long manubrium; mouth-arms with numerous clubs or filaments and usually with a large terminal club; usually without a ring canal; canal network broad with numerous fine meshes; inter-rhopalar canals wide.

Type-species: *R. rhopalophorum* Haeckel.

HAECKEL 1880, p. 596: *Rhopilema* n.g. MAYER 1910, p. 704.

*Rhopilema esculentum* Kishinouye 1891

More than 450 mm wide and 330 mm high, when contracted; about 50 mm thick at centre, exumbrella smooth; in each octant 14–20 oval velar lappets with numerous radial grooves; the mouth-arms have no definite terminal clubs, but numerous filamentous and large fusiform appendages between the mouths.

KISHINOUE 1891, p. 53: *Rhopilema esculenta* n.sp.; Japan. MAYER 1910, p. 704, text-fig. 423: ? = *R. rhopalophora* Haeckel; (Japan; China). BIGELOW 1913, p. 101: Japan. STIASNY 1921b, p. 162: ? = *R. rhopalophora*. UCHIDA 1927b, p. 233, figs. 7–10: *R. esculenta* var. *asamushi* nov. var.; Japan. WU 1927, p. 1: China. TU 1931, p. 87: as *Rhopilema*; Bay of Korea. STIASNY 1933b, p. 154: comparison with *R. rhopalophora*. UCHIDA 1938a, p. 149: as *R. esculenta* and *R. asamushi* n.sp.; Japan. UCHIDA 1938b, p. 45: *R. asamushi* a valid species; Japan. CHIU 1954b, pp. 55, 56: China. UCHIDA 1954, pp. 209–19, fig. 2: as *R. esculenta* and *asamushi*; Japan. NAUMOV 1956b, p. 38. UCHIDA 1958, p. 165: as *R. asamushi*; Sado, Japan.

*Rhopilema hispidum* (Vanhöffen 1888)

250–340 mm wide, exumbrella with numerous small, sharp-pointed, conical projections; in each octant about eight velar lappets, oblong, rounded; mouth-arms terminate in a large club-shaped appendage with a faceted, swollen end, other club-shaped appendages between the mouths on the three wings.

VANHÖFFEN 1888, pp. 32, 43, Pl. 5, figs. 1, 2: as *Rhizostoma hispidum* n.sp.; Hong Kong, China. MAAS 1903, p. 73, Pl. 9, figs. 78–81: *Rhopilema hispidum*; Malay Archipelago. MAYER 1910, p. 706: synonym: *R. verrucosa* Kishinouye; (Japan). LIGHT 1914b, p. 227, figs. 14–16: as *R. visayana* n.sp.; Philippines. STIASNY 1920, p. 229: Malay Archipelago. STIASNY 1921b, p. 163, Pl. 2, fig. 15, Pl. 4, figs. 34–6, Pl. 5, fig. 48, text-fig. 15: Malay Archipelago; p. 167: *R. visayana* Light = *hispidum*. RAO 1931a, p. 62: Orissa coast, Bay of Bengal. STIASNY 1933b, p. 154: comparison with *R. rhopalophora*. STIASNY 1933c, pp. 162–74, figs. 1–8: Malay Archipelago. ?MENON 1936, p. 8: ?*R. hispidum* juv.; Krusadai Islands, Indian Ocean. STIASNY 1938, p. 31: Red Sea. STIASNY 1939b, p. 20, figs. 5–8: Red Sea. RANSON 1945b, p. 320: Suez Bay; Indochina. NAIR 1951, p. 75: Trivandrum coast, India. PANNIKAR & PRASAD 1952, pp. 295–296: association between ophiuroids, fish, crabs and *R. hispidum*. UCHIDA 1954, pp. 209–19, fig. 2, map: Japan.

*Rhopilema rhopalophorum* Haeckel 1880

42 mm wide (Haeckel: 100 mm wide, 50 mm high); exumbrella quite smooth, very thin; in each octant 14–16 (Haeckel: 18) roundish, flat velar lappets; without subgenital papillae; scapulets small; manubrium extraordinarily short, mouth-arms about 25 mm long, proximal portion 3 mm, distal portion 12 mm and terminal club 10–12 mm long; on mouth-arms a very few small clubs; filaments only on scapulets, faintly developed; ring canal poorly developed, intracircular canal system noticeably broad, its inner

margin parallel to the outline of the stomach, with many anastomoses with the rhopalar canals.

HAECKEL 1880, p. 596: *Rhopilema rhopalophora* n.sp.; east of Madagascar. MAYER 1910, p. 704: ? = *R. esculenta* Kishinouye. STIASNY 1933b, pp. 149-55, figs. 1-4: a valid species; Amoy, China.

*Rhopilema verrilli* (Fewkes 1887)

350 mm wide, thick and rigid; centre of exumbrella smooth, lappets with many shallow furrows, and near margin numerous minute elevations; in each octant six large oval velar lappets; mouth-arms with 26-60 blunt, spindle-shaped appendages besprinkled with nematocyst warts, each arm with a large, tapering terminal appendage.

FEWKES 1887, p. 119, Pl. 4: as *Nectopilema verrillii* n.g., n.sp.; New Haven, Connecticut, U.S.A. MAYER 1910, p. 707, Pl. 74, figs. 1, 1', text-fig. 424: *Rhopilema verrillii*; Atlantic coast of U.S.A. BIGELOW 1914b, p. 29: Atlantic coast of U.S.A. STIASNY 1921b, p. 163. STIASNY 1933b, p. 154: comparison with *R. rhopalophora*. HEDGPETH 1954, p. 278: Gulf of Mexico.

### Family STOMOLOPHIDAE

Scapulatae with mouth-arms coalesced throughout their entire length; with a permanent primary mouth opening; manubrium with reduced canal system; lower arms dichotomously or irregularly branched, without terminal clubs.

#### Genus *Stomolophus* L. Agassiz 1862

Usually without ring canal; rhopalar canals thickened; large scapulets; with a very wide, long and small-meshed canal system, lying very near to the radial canals.

Type-species: *S. meleagris* L. Agassiz.

L. AGASSIZ 1862, pp. 138, 151: *Stomolophus* n.g. HAECKEL 1880, pp. 597, 598: as *Brachiolophus* n.g. and *Stomolophus*. MAYER 1910, p. 709: *Stomolophus*.

*Stomolophus fritillarius* Haeckel 1880

Up to 90 mm wide, higher than a hemisphere, margin not constricted, usually incised in the middle of each octant; number of velar lappets variable, about 24 in each octant, grooves between them alternately long and short; scapulets short, hidden under the bell, their lower margin far removed from the bell margin; the lateral branches of the free ends of the mouth-arms short.

HAECKEL 1880, p. 598, Pl. 35, figs. 1-9: *Stomolophus fritillaria* n.sp.; Surinam, Atlantic coast of S. America. MAYER 1910, p. 711: as *S. meleagris* var. *fritillaria*.

BIGELOW 1914c, pp. 239-41: *S. fritillaria* = *meleagris*. STIASNY 1921b, p. 170: *S. fritillaria* a valid species. STIASNY 1922b, p. 55, fig. 4: non = *S. meleagris*. STIASNY 1931a, p. 169, figs. 7-9: British Guiana, S. America. RANSON 1945b, p. 320: French Guiana, S. America. RANSON 1949, pp. 150-4: discussion of species of *Stomolophus*; both *S. meleagris* and *fritillaria* are valid species; French Guiana. KRAMP 1955b, p. 165: *S. meleagris* var. *fritillaria*; discussion.

*Stomolophus meleagris* L. Agassiz 1862

Up to 180 mm wide, half-egg-shaped or almost globular; number of velar lappets variable, about 14 in each octant, grooves between them short, all alike; scapulets large, extending to or beyond level of bell margin; the free, bifurcate ends of the mouth-arms flare outwards, the lateral branches long.

L. AGASSIZ 1862, pp. 138, 151: *Stomolophus meleagris* n.g., n.sp.; east coast of U.S.A. HAECKEL 1880, p. 599: as *S. meleagris* and *agaricus* n.sp. VANHÖFFEN 1888, pp. 31, 42, Pl. 3, figs. 4, 5, Pl. 4, fig. 1: as *S. chunii* n.sp. MAYER 1910, p. 710, Pls. 75, 76: synonyms; southern part of the east coast of U.S.A.; (West Indies; northern part of S. America; Gulf of Mexico; off Pacific coast of Panama). VANHÖFFEN 1913a, p. 430: West Indies. BIGELOW 1914c, pp. 239-41: only species of *Stomolophus*; San Diego, California. STIASNY 1920, p. 229: Venezuela. STIASNY 1921b, p. 171, Pl. 2, fig. 16, Pl. 4, fig. 37, Pl. 5, figs. 49, 50: Venezuela. STIASNY 1922d, pp. 499-511, figs. 1-8: development. STIASNY 1922e, p. 550, figs. 13, 14: Panama; San Diego, California; p. 553: the type-specimen of *S. agaricus* Haeckel is a shrivelled *meleagris*. BIGELOW 1926, p. 365. GUTSELL 1928, pp. 358, 359: association between the spider crab *Libinia dubia* and *S. meleagris*; N. Carolina, U.S.A. STIASNY 1931a, pp. 170-5: comparison with *S. fritillaria*. BOONE 1933, p. 48, Pl. 10: Florida, U.S.A. BOONE 1938, p. 55: Galapagos Islands. BIGELOW 1940, p. 316: synonyms *S. fritillaria* and *chuni*; eastern tropical Pacific. COLBY 1943, p. 67: Gulf of Mexico. RANSON 1945b, p. 320: Gulf of California; off Ecuador. RANSON 1949, p. 150: comparison with *S. fritillaria*. CHIU 1954b, p. 56. HEDGPETH 1954, p. 278: Gulf of Mexico. UCHIDA 1954, pp. 209-19, fig. 2, map: as *S. nomurai* Kishinouye; Japan. VANNUCCI 1954, p. 126, Pl. 6, fig. 3: Brazil. KRAMP 1955b, p. 165: by Haeckel 1880 determined as *S. agaricus*. HARTMANN & EMERY 1956, p. 307: as *Stomopholis meleagris*; California. VANNUCCI 1957a, pp. 594-6: (Brazil).