

## A new species of the genus *Ethon* Laporte & Gory, with observations on its biology and host plants (Coleoptera: Buprestidae)

by

T. J. HAWKESWOOD (1) & J. R. TURNER (2)

*Abstract* - *Ethon jessicae* sp. nov. (Coleoptera: Buprestidae: Coraebini) is described from specimens collected from several localities in central eastern New South Wales, Australia during 1993 and 1994. Observations on its habitat, biology and host plants are provided. Its larval and adult food plants are listed and compared with those of other *Ethon* species. A key to the species of *Ethon* presently known from New South Wales is also provided.

*Riassunto* - È descritta la nuova specie *Ethon jessicae* sp. nov. (Col., Buprestidae: Coraebini) su esemplari provenienti da diverse località del New South Wales centro-orientale, Australia. Ne vengono considerati habitat, biologia e piante ospiti di larva ed adulto, queste ultime confrontate con quelle di altre specie del genere. È presente una chiave dicotomica per le specie di *Ethon* note del New South Wales.

### INTRODUCTION

The genus *Ethon* Laporte & Gory (Coleoptera: Buprestidae: Coraebini) contains about 6-8 species restricted to eastern and southern Australia (CARTER, 1923, 1929). They are somewhat small, dull-coloured, thick-set beetles which have the characteristic habit of breeding in the stems and probably the roots of certain native *Fabaceae* (*Leguminosae*) (SAUNDERS, 1847; FROGGATT, 1892, 1907; HAWKESWOOD & PETERSON, 1982; HAWKESWOOD, 1987, 1988; VOLKOVITSH & HAWKESWOOD, 1990; HAWKESWOOD & TURNER, 1992; WEBB, 1993). During 1993, field observations by one of us (JRT) resulted in the discovery of an apparently undescribed species of *Ethon*, widely distributed in the Sydney Basin of New South Wales. Further research has shown the species is indeed undescribed. The results of Turner's observations and collections are presented below for the first time.

### MATERIALS AND METHODS

#### a) Collection sites (fig. 1)

1) McPherson State Forest, near Kulnura [100 km north of Sydney, New South Wales (33°12'S, 151°08'E)].

On 3 March 1993, JRT, while accompanying Mr R. W. Wells who was undertaking a vertebrate survey in this State Forest for the New South Wales Forestry Commission, observed a number of galls on stems of several *Dillwynia glaberrima* Sm. (*Fabaceae*) shrubs growing to about 2 metres in height on the western side of a mostly cleared hilltop. Stem billets containing the galls were collected for further examination. A check along the road leading to the site resulted in the collection of more galls from *D. glaberrima* as well as from the western side of the ridge where this plant also occurred. Opening the galls disclosed both larvae and adults of a buprestid.

On 27 August 1993, JRT again visited the Kulnura site where a search was conducted along a cliffline near the top of sandstone ridges in the areas which had not been searched for galls previous-

(1) c/o North Star Caravan Resort, Coast Road, Hastings Point, New South Wales 2489, AUSTRALIA.

(2) 117 Derby Street, Penrith, New South Wales 2750, AUSTRALIA.

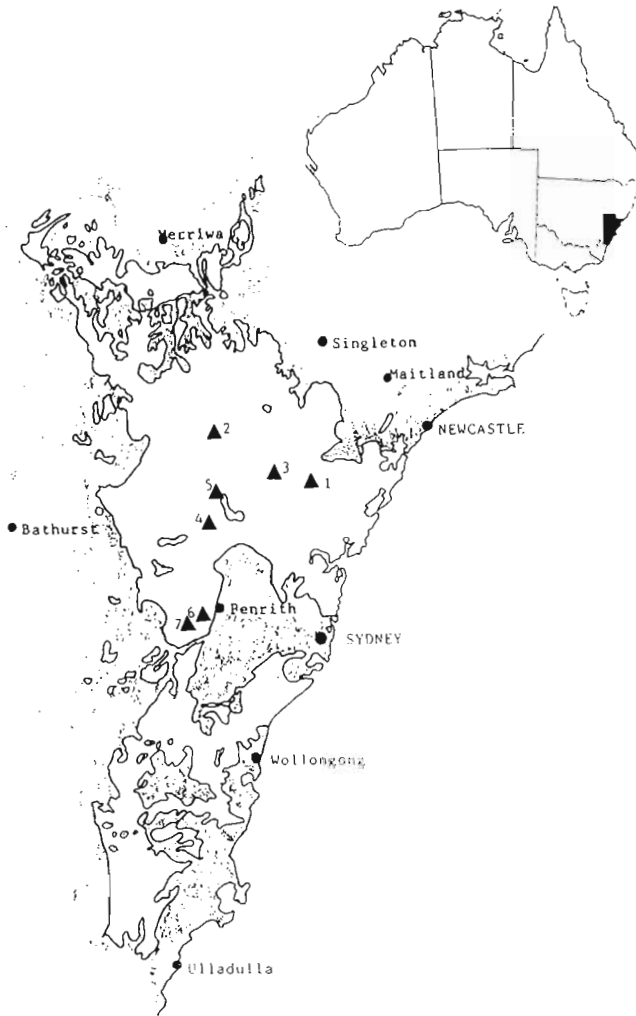


Fig. 1. Map showing the locations of the seven sites in New South Wales where *Ethon jessicae* sp. nov. is presently known to occur (Map: J. R. Turner).

afternoon, a search was undertaken along the western side of a sandstone ridge. Near the top of the ridge along a cliffline which ranged from 1 to 5 metres in height, a number of *Pultenaea flexilis* Sm. (*Fabaceae*) shrubs, 2-4 metres in height, were located, many having galls on their stems and branches. A number of billets were collected and upon opening the galls, it was found they contained the same species of *Ethon* recorded earlier from Kulnura (McPherson State Forest). The Wollemi site was revisited on 28 August 1993 when a more thorough search was instigated along the ridge top visited nine days earlier. On this visit, *P. flexilis* was in flower and a search along the ridge top

ly. The sandstone cliffs ranged in height from 1 to 3 metres. Within a short period of time, numerous *D. glaberrima* shrubs were located in a sheltered gully on the western side of the ridge and many of these shrubs possessed numerous galls, many with new emergence holes. On the earlier visit, no galls were observed with emergence holes. Data on galls obtained from this site are shown in table 1.

2) Wollemi National Park, near Putty, New South Wales (33°02'S, 150°36'E).

On 19 August 1993, JRT was assisting rangers from the New South Wales National Parks and Wildlife Service in a biodiversity study in this National Park, at Kings Waterhole, located about 120 km north-west of Sydney. During the morning, a number of *Dillwynia retorta* (Wendl.) Druce (*Fabaceae*) plants with galls were collected and a later examination revealed one specimen of an *Ethon* species (the same from site 1). During the

above and below the cliff revealed many more shrubs than were located on the previous visit. Most of them possessed one or more galls on the stem and/or branches. Some galls displayed emergence holes from previous seasons. The data on galls from this site are outlined in table 2.

3) Yengo National Park, near Bucketty, New South Wales (c. 33°10'S, 150°57'E).

During the afternoon of 27 August 1993, JRT drove north from Kulnura to Bucketty and then headed south to St. Albans. After checking a number of areas, a search was undertaken in a steep, sheltered sandstone gully having a westerly aspect and located part the way down Mogo Hill. A group of *Pultenaea blakelyi* J. Thompson (*Fabaceae*) shrubs growing up to 6 metres high were found to have numerous galls. The condition of galls on the stem and branches at this site indicated that the plants had been used as larval hosts for a number of years, since emergence holes in many galls had been completely overgrown by new bark, each becoming a depression where the exit hole had previously been. Billets were taken from one shrub and upon opening some of the galls, it was found that the dark metallic green *Ethon* species recorded from the other two sites had again been discovered. Several galls were observed to be chewed and exposed by feeding by birds, most likely parrots. It was noted that only at this site the emergence holes were situated at the bottom of the gall (i.e. that part of the end of the gall closest to the ground). A second clump of *P. blakelyi* was observed further down the hill but a recent fire appeared to have killed the shrubs. Data on galls from this site are provided in tables 3 and 4.

4) Mountain Lagoon, Wollemi National Park, New South Wales (c. 33°24'S, 150°36'E).

On the afternoon of 6 January 1994, JRT and TJH conducted a field trip to the south-eastern corner of Wollemi National Park in search of cycads involved in other research work, after following Mountain Lagoon Road, north-east from Bilpin, for about 15 km to reach the park. Upon entering Wollemi National Park, JRT observed that the area resembled the area in the Yengo National Park where *Ethon* galls on *Pultenaea blakelyi* J. Thompson had been discovered during a field trip in August 1993 (see site 1 above). After having driven approximately 1.5 km in the park, JRT noted galls whilst driving. An examination of the area revealed a large number of galls on *Pultenaeaflexilis* Sm. (*Fabaceae*) growing in thick stands alongside the road. The altitude of the area is 600 m. The vegetation is tall closed forest extending from the base of the valley to the northern side of the road, and on the southern side, the vegetation is open forest covering the highest points of the area. Tree species include species of *Eucalyptus*, *Angophora* and *Syncarpia* (all *Myrtaceae*), with thick stands of *Leptospermum* spp. (*Myrtaceae*) mixed with the stands of *P. flexilis*. On the afternoon of 14 January 1994, JRT conducted a second trip to the site. A thorough search of the area was instigated and it was found that galls were present on host plants from the Sams Way turnoff at Mountain Lagoon for a distance of 3.5 km into the park. At this distance, the road began to descend steeply to Upper Colo and thick stands of *P. flexilis* had given way to scattered stands on the ridge tops, while further down, *P. flexilis* was absent.

5) 15 km north of Colo Heights on the western side of Putty Road, New South Wales (c. 33°10'S, 150°37'E).

On 17 July 1994, JRT observed many galls on a few *Pultenaeaflexilis* Sm. (*Fabaceae*) on the north-western side of a hilltop.

6) Camp Fire Creek, 2 km SW of Glenbrook, Blue Mountains National Park, New South Wales (c. 33°38'S, 150°34'E).

On 24 July 1994, JRT observed many thousands of galls on *P. flexilis* Sm. growing on the southern side of the creek which runs in an east-west direction.

7) 6 km S of Glenbrook, New South Wales (c. 33°40'S, 150°33'E).

On 24 September 1994, JRT and TJH collected a few adults of *E. jessicae* sp. nov. from the flowers of *Dillwynia retorta* (Wendl.) Willd.<sup>1</sup> and *Daviesia corymbosa* Sm. (both *Fabaceae*) at this site, which is about 2-3 km from site 6 noted above. The food plants were exposed and growing along

the edge of a fire trail in the Blue Mountains National Park. The fire trail was surveyed for about 4 km during the morning and a return journey was undertaken during the afternoon. The vegetation of the area is dry sclerophyll forest and woodland, dominated by various species of *Eucalyptus* (*Myrtaceae*), with a relatively thick understorey of species of *Hakea*, *Persoonia*, *Lambertia* and *Lomatia* (*Proteaceae*), *Acacia* (*Mimosaceae*), *Daviesia*, *Pultenaea*, *Dillwynia* and *Phyllota* (*Fabaceae*) and with many other small shrubs, sedges and grasses. The soil is mostly skeletal over parent material of quartz sandstone. The elevation along the fire trail changes from approx. 250 to 500 m above sea level.

#### b) Collection of beetles and observations in captivity

Whole plants or billets of the host plants were collected from the field by JRT. Some of this material, both plants and beetles, were sent to TJH for dissection and further analyses. Adults were collected as they emerged from their galls during the warmer conditions at the end of spring and early summer 1993. Individuals of newly emerged adults from all three collection sites were initially kept in separate containers. However, in order to encourage mating, they were all eventually placed into a single container and within a day, two mating pairs were observed. Each mating pair was then transferred to a separate container. The males were easily distinguishable from females in having dark metallic green elytra; the females usually have bronze red elytra (although in each sex, some variations may occur; see also description below of the species).

The 1.8 metre billet from the Mogo Hill site had 38 galls visible when collected; between 10 and 29 September 1993, a total of 16 adults emerged and another two adults had died in their galls after having partially completed their exit holes. Thus a total of 18 adults emerged, 14 males and 4 females (table 4). Several emergence holes appeared where galls were not present.

#### c) Key to the *Ethon* species from New South Wales

- 1 Elytra with well-defined pubescent fasciae in pre-apical and post-median regions. 2
- Elytra without well-defined pubescent fasciae in pre-apical and post median regions. 4
- 2 Elytra prominently but irregularly pubescent, the two pre-apical fasciae confluent with the two post-median ones (see fig. 2b); form broadly-elongate, very robust. 3  
*E. corpulentum* Boheman
- Elytra with less but more regular pubescence, the two pre-apical and two pre-median fasciae not usually confluent; form more narrowly elongate and less robust. 3
- 3 Form moderately robust; elytral pubescence distinct, with many prominent patches of setae in the median region and with two, large pre-median patches (see fig. 2a); parameres of aedeagus narrow, broadly arcuate (fig. 2m). 4  
*E. affine* Laporte & Gory
- Form less robust; elytral pubescence less distinct with smaller median patches and with small, somewhat indistinct (or absent) pre-median patches (see fig. 2d). 4  
*E. jessicae* sp. nov.
- 4 Body prominently greenish (especially the head and pronotum) and copper with greenish and coppery reflections; elytral pubescence very indistinct, not forming any definite pattern or spots (fig. 2c). 5  
*E. fissiceps* (Kirby)
- Body dark copper to brassy-copper or coppery-black. 5
- 5 Elytral pubescence mostly arranged in distinctive spots (fig. 2f). 6  
*E. maculatum* Blackburn
- Elytral pubescence poorly defined, but short setae mainly in the median region of the elytra from apex to base, often interrupted in several places by more or less glabrous areas (fig. 2e). 6  
*E. lei* Carter

#### d) Description

*Ethon jessicae* Hawkeswood & Turner, sp. nov. Figs. 2d, j, p, 3f

Male. Moderately elongate, subcylindrical, robust, small-sized, 10-11 (12) mm long, 3.5-4.0 mm wide.

slightly convex; head, antennae, pronotum, scutellum and elytra brassy-black with greenish and coppery reflections. Undersurface of body bluish-black with bluish and greenish reflections; tergites deep metallic sky blue; eyes dark brown.

Head evenly punctate with moderately long, anteriorly directed coppery hairs; deep median sulcus dividing the frons; vertex between the eyes wide, about 2.5 times the diameter of the eye as viewed dorsally. Antennae: Segment 1 about 3.0 times longer than wide, cylindrical; segment 2 about 1.5 times longer than wide; segments 3-11 about as long as wide, moderately serrate, each segment with a few, short, silvery-coppery hairs.

Pronotum about 2.0 times wider at base than long in the middle; slightly narrower than the elytra; anterior margin weakly bisinuate; lateral margins slightly arcuately rounded in front towards anterior margin; posterior (basal) margin strongly bisinuate; sub-lateral carina well developed, extending from posterior margin and almost reaching the anterior margin; lateral carina well developed; disc evenly and moderately punctate and striate-punctate near the base in the middle, with concentrations of coppery hairs medially, on the lateral margins and towards the anterior margin.

Scutellum large, triangular, glabrous, very minutely punctate.

Elytra slightly convex, slightly wider than width of pronotum, ratio of width of each elytron at base to length in the midline 1:4.4 - 1:4.8; striate-punctate; sutural costa well developed; base of each elytron square; sides feebly arcuate behind humerus to behind middle and then broadly rounded to apex; each elytron with a moderately deep humeral depression and with the following concentrations of coppery hairs: a pre-apical lunate patch, a larger post-median arcuate fascia (sometimes broken), 8-10 smaller, irregular post-median and median patches and at least two small pre-median spots.

Undersurface densely and more or less evenly punctate; tergites densely punctate, less so on the posterior and lateral margins; hairs coppery.

Genitalia as in figs. 2j, p.

Female. Differs from the male mostly in dorsal coloration, which is usually more reddish-coppery on the pronotum and elytra; the male is generally more dark metallic, with greenish-coppery reflections. The tergites of the female abdomen are light metallic yellow-green, which are in contrast with the metallic blue colour of the male tergites.

Material examined - Holotype: Male, McPherson State Forest, New South Wales, 3 March 1993, J. R. Turner (ANIC 00401). Paratypes: 15 males and 1 female, McPherson State Forest, New South Wales, 3 March and 27 August 1993, J. R. Turner (JRT); 4 males and 4 females, Kings Waterhole, Wollemi National Park, 19 and 28 August 1993, J. R. Turner (JRT); 7 males and 2 females, Mountain Lagoon, New South Wales, 6 January 1994, J. R. Turner (JRT); 17 males and 4 females, Mogo Hill, Yengo National Park, New South Wales, 27 August 1993, J. R. Turner (JRT); 1 male, Wollemi National Park, New South Wales, 19 August 1993, J. R. Turner (ANIC 00408); 1 female, Mountain Lagoon, New South Wales, 6 January 1994, J. R. Turner (ANIC 00411); 1 male, Mogo Hill, Yengo National Park, New South Wales, 27 August 1993, J. R. Turner (ANIC 00416).

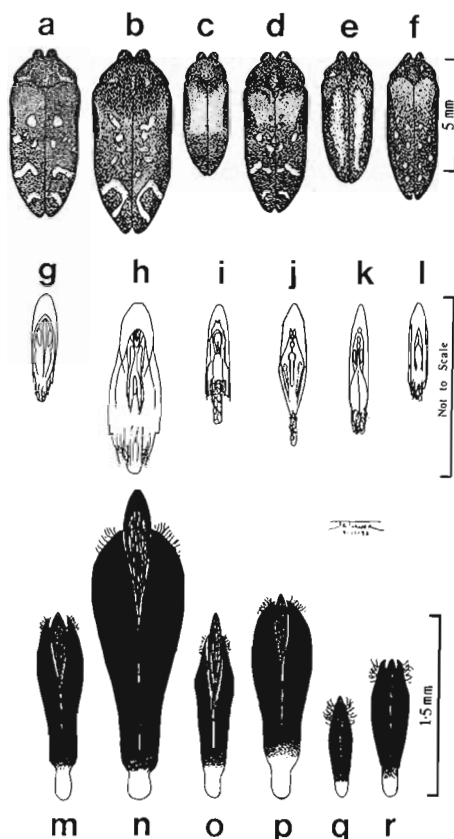


Fig. 2. a-f: Dorsal habitus of *Ethon* species showing patterning on the elytra. a: *E. affine* Laporte & Gory; b: *E. corpulentum* (Boheman); c: *E. fissiceps* (Kirby); d: *E. jessicae* sp. nov.; e: *E. leai* Carter; f: *E. maculatum* Blackburn. g-l: Penis of males of *Ethon* species. g: *E. affine*; h: *E. corpulentum*; i: *E. fissiceps*; j: *E. jessicae*; k: *E. leai*; l: *E. maculatum*. m-r: Aedeagus of males of *Ethon* species. m: *E. affine*; n: *E. corpulentum*; o: *E. fissiceps*; p: *E. jessicae*; q: *E. leai*; r: *E. maculatum* (Illustrations: J. R. Turner).

Table 1. Summary of the data obtained from an examination of galls from plants of *Dillwynia glaberrima* Sm. (*Fabaceae*) collected on 3 and 4 March 1993 (plant nos. 1-9) and 27 August 1993 (plant nos. 10-11) from the McPherson State Forest near Kulnura, New South Wales.

Plant no.	Plant height (cm)	No. of galls	Stem diameter at gall (mm)	Length (mm)	Gall Width (mm)	Height (mm)	Height of gall on plant (cm)	Content
1	150	1	16-18	30	16	8	20	Pupa
2	130	4	10	25	12	9	40	Adult
			9	21	12	9	50	-
			9	13	11	7	58	-
			6	15	12	8	75	-
3	220	1	10	25	13	10	38	Pupa
4	150	3	10-11	27	16	11	45	-
			10-11	24	15	10	55	-
			10-11	20	11	8	80	-
5	190	1	8-9	22	13	8	35	-
6	195	1	7	22	13	11	85	Pupa
7	320	5	15	23	18	11	55	Parasite
			12-13	26	13	7	110	-
			10	28	13	8	150	-
			7-8	23	18	11	210	Pupa
8	175	7	7	20	9	6	230	-
			25-35	20	12	5	8	Adult
			28	25	13	6	15	Adult
			25	30	16	8	22	Adult
			25	20	15	6	26	-
			25	20	13	6	40	Dead 1st instar larva
			25	23	15	4	46	Adult
25	22	17	8	52	Adult			
9	150	1	24	22	13	6	80	Adult
10	-	2	10	23	9	4	-	Parasite
			6	22	17	8	-	Parasite
11	-	3	10	16	14	7	-	-
			10	20	14	7	-	Adult
			5	21	14	10	-	-
Range	130-320	1-7	5-35	13-30	9-18	4-11	8-230	
Mean ( $\bar{x}$ )	186.7	2.6	14.0	22.3	13.9	7.9	67.7	
S.D.	54.1	1.9	7.7	3.8	2.2	2.0	55.4	

Depositories. ANIC = Australian National Insect Collection, CSIRO Division of Entomology, Canberra, Australian Capital Territory; JRT = Private collection of Mr. James R. Turner, Penrith, New South Wales.

Etyymology - The specific epithet honours the daughter of the second author, Jessica M. Turner.

## DISCUSSION

### a) Relationships of *Ethon jessicae* sp. nov. with other species

As indicated in the key to species of *Ethon* from New South Wales, *E. jessicae* sp. nov. is most closely related to the well-known *E. affine* Laporte & Gory, but differs from this species in elytral pubescence and degree of robustness. In addition, the parameres of the aedeagus of *E. jessicae* are slightly longer and broader and more strongly rounded (fig. 2p) than those of *E. affine* (fig. 2m). *E. jessicae* is clearly distinguished from the other species of *Ethon* by the shape and size of the genitalia (figs. 2g-r).

The sexually dimorphic colour and variation observed in *E. jessicae* is identical to that ob-

Table 2. Summary of the data obtained from an examination of galls from plants of *Pultenaea flexilis* Sm. (*Fabaceae*) collected on 19 August 1993 (gall nos. 1-8) and 28 August 1993 (gall nos. 9-16) from Howes Waterhole, Wollemi National Park, New South Wales. \* immature gall.

Gall no.	Stem diameter at gall (mm)	Length (mm)	Gall Width (mm)	Height (mm)	Gall texture/colour	Content
1	-	20	16	8	Red ochre	Mould
2	-	20	12	7	Red ochre	Larva
3	7	18	14	10	Red ochre / grey stripes	Larva
4	5	22	10	7	Red ochre / grey stripes	Larva
5	5	25	18	10	Red ochre	Adult
6	4	18	10	6	Red ochre	Adult
7	14	22	10	5	Red ochre	Larva
8*	9	14	4	2	Red ochre	Larva
9	7	23	17	8	Light orange	Adult
10	4	22	16	10	Light orange	Adult
11	5	22	16	9	Light orange	Larva
12	7	21	16	8	Light grey	Dead adult
13	6	25	20	10	Orange / dark grey stripes	-
14	10	24	19	8	Orange / dark grey stripes	Larva
15	5	23	17	10	Grey	Adult
16	5	24	18	10	Grey	Adult
Range	4-14	14-25	4-20	2-10	-	-
Mean ( $\bar{x}$ )	6.6	21.4	14.6	7.9	-	-
S.D.	2.7	2.8	4.1	2.2		

served in *E. fissiceps* (Kirby). Pantone Colour Chart value for *E. affine* dorsal metallic sheen is close to 490, while for *E. fissiceps* and *E. jessicae*, the value is 456.

[The identity of specimens of *E. affine* Laporte & Gory, *E. fissiceps* (Kirby), *E. corpulentum* Boheman and *E. leai* Carter in the collection of JRT was determined/confirmed during 1984 by Dr. B. Levey of the British Museum (Natural History)].

b) Museum material

Of the three museum collections examined by JRT, i.e. Macleay Museum (University of Sydney), Australian Museum (Sydney) and the Australian National Insect Collection, ANIC (Canberra), only the latter held specimens of *E. jessicae*. There were two specimens of *E. jessicae*, one male and one female, which were mounted on a single card, without any locality or collection data and included amongst material of *E. affine*.

Collectors tend to collect mostly in the Sydney area during September/October as plant species begin to flower and usually visit places like Kings Waterhole during November/December when *Leptospermum* species are in flower. As *E. jessicae* appears to emerge during late September to early October, this may partially explain why this species has been overlooked by early and contemporary collectors and why it is absent from the collections in the three main museums in New South Wales and the ACT viewed by JRT.

c) Habitat

There are some similarities among the seven sites from where *E. jessicae* has been collected (fig. 1). The habitats are dry sclerophyll forests / closed forests and woodlands at (600-) 750-1200 metres of altitude, and the galls are almost invariably located on plants growing on the western sides of ridges. All sites are rugged and also somewhat isolated, although sites 3, 4, 5 and 7 have a road traversing the stands of host plants. At least two sites (sites 1 and 2) are situated several kilometres from the nearest road and are accessible only by walking.

Table 3. Summary of the data obtained from an examination of galls from plants of *Pultenaea blakelyi* J. Thompson (*Fabaceae*) collected on 27 August 1993 from Mogo Hill, Yengo National Park, New South Wales.

Gall no.	Stem diameter		Gall		Content
	at gall (mm)	Length (mm)	Width (mm)	Height (mm)	
1	10	24	18	8	Dead adult
2	10	22	18	8	Adult
3	9	22	14	8	-
4	8	24	17	8	Adult
5	10	20	15	8	Dead adult
6	9	22	17	7	- (Parrot attack)
7	8	20	17	7	- (Parrot attack)
8	5	25	20	12	Adult
9	5	22	18	10	Adult
10	5	23	17	8	Adult
11	5	19	15	9	-
12	6	25	20	13	Larva
13	-	25	13	12	Adult
14	9	22	17	6	Adult
15	-	20	21	8	-
16	14	20	17	8	Adult
17	14	24	18	10	-
18	6	24	18	12	-
19	4	20	14	7	Adult
20	-	20	20	12	Adult
21	30	24	17	9	Adult
22	-	27	20	10	Adult
23	13	25	20	8	Adult
24	15	24	20	9	Larva
25	4	25	18	10	Larva
26	4	23	17	10	Adult
27	7	25	15	10	Larva
28	4	20	18	10	-
29	11	27	18	12	-
30	4	20	13	8	-
31	30	30	20	10	-
Range	4-30	19-30	13-21	6-13	
Mean ( $\bar{x}$ )	9.6	23.0	17.4	9.3	
S.D.	6.8	2.6	2.2	1.8	

The present known distribution of *E. jessicae* is outlined in the map for fig. 1. The pale areas on the map indicate vegetation composed of mixed *Eucalyptus* communities, predominantly sclerophyll forests, sometimes with rainforest gully floras, tree-heaths, mallees, heaths and swamps; this flora is also known as a sandstone flora or sandstone complexes (Natural Vegetation of New South Wales Map, *Department of Lands*, New South Wales, Bathurst, *Australian National University*, 1971). As indicated in fig. 1, *E. jessicae* is restricted to this habitat. Based on this known distribution, we predict that the buprestid could also be found in a similar habitat between Ulladulla and Wollongong in the south and in the northern area south of Merriwa.

#### d) Galls and larval host plants

HAWKESWOOD & TURNER (1992) reviewed the biology and host plants of *Ethon*. Since that paper was written and published, we have discovered another paper, i.e. SAUNDERS (1847), which has been overlooked by all other buprestid authorities and which records the gall-forming habit in *Ethon* affine Laporte & Gory. Thus it is apparent that SAUNDERS (1847) was the first author to describe gall-



formation by *Ethon* on *Pultenaea stipularis* Sm. (*Fabaceae*) and not FROGGATT (1892, 1907) (see also table 8, this paper). The important points mentioned by SAUNDERS (1847) in this brief but significant paper are as follows: a) galls of *Ethon affine* (cited as *Diphucrania auriflua* Hope) recorded on *Pultenaea stipularis* Sm. in the Sydney area; b) galls oval-shaped, 2/3-1 inch (16-25 mm) in length; c) galls usually occur singly or occasionally two together, reddish-brown in colour and often warty in appearance; d) anterior part of gall apparently composed of a spongy mass of woody fibres with an external covering of wood; e) adult emergence occurs through a rounded exit hole; f) brief description of the larva; g) larvae present in galls during June, adults postulated to emerge during spring or in the early summer. These observations were basically the same as noted by FROGGATT (1892, 1907) and later authors, but without reference to the SAUNDERS (1847) paper, which also illustrates the adult, mature larva and galls.

A summary of the size of *Ethon jessicae* galls on host plants at the four sites studied in this paper is presented in table 6. These data show that the mean values of these size parameters are similar at each site; some of the variation observed may be attributed to differing host plant branch/stem characters, age of gall when collected and whether the galls still contain active live larvae.

A comparison of various characters of stem galls of three species of *Ethon* are provided in table 7. This comparison shows that the galls of *E. jessicae* are more similar to those of *E. affine* Laporte & Gory than they are to those of *E. fissiceps* (Kirby). This similarity to the former species confirms the very close relationship between the two species as based on gross morphology and the structure of the genitalia. However, the galls of *E. jessicae* are often larger than those of *E. affine* and are more variable in colour. Also, *E. jessicae* galls are often situated on host plants that have thinner stems (probably younger plants?) than those of *E. affine*.

A sample of 29 galls from the MacPherson State Forest (table 1), indicated that galls were

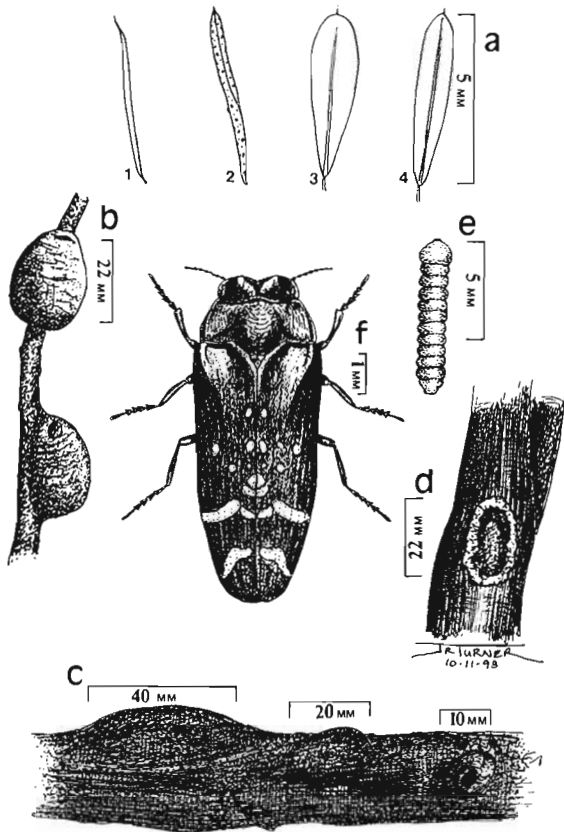


Fig. 3. *Ethon jessicae* sp. nov. and host plants. 3a: Leaves from larval hosts: 1: *D. glaberrima*; 2: *D. retorta*; 3: *P. flexilis*; 4: *P. blakelyi*. 3b: Typical gall from branch of *D. glaberrima*, *P. flexilis* and *P. blakelyi*. 3c: Three galls on a stem of *P. blakelyi*. 3d: Gall on a stem of *D. glaberrima* showing larval chamber. 3e: Larva. 3f: Adult (male) (Illustrations: J. R. Turner).

Table 4. Emergences of *Ethon jessicae* sp. nov. from stem billets of *Pultenaea blakelyi* J. Thompson (*Fabaceae*) from Mogo Hill, New South Wales.

Date (September 1993)	No. of beetles emerging	
	Males	Females
10	1	1
12	4	2
17	3	1
20	2	0
21	1	0
22	1	0
24	1	0
29	1	0
$\bar{x}$ (Mean)	1.8	0.5
S.D.	1.1	0.7

Table 5. Summary of the data obtained from an examination of galls from plants of *Pultenaea flexilis* Sm. (*Fabaceae*) collected on 6 and 14 January 1994 from Mountain Lagoon, Wollemi National Park, New South Wales.

Gall no.	Stem diameter at gall (mm)	Length (mm)	Gall		Content
			Width (mm)	Height (mm)	
1	24	30	20	10	Larva
2	24	31	14	8	Larva
3	27	33	18	9	Larva
4	29	25	10	4	Larva
5	29	25	11	4	-
6	25	30	12	6	Larva
7	19	25	14	8	Larva
8	20	24	17	8	-
9	17	23	12	3	Adult
10	20	27	15	8	Larva
11	22	30	17	12	Larva
12	28	27	12	8	Pupa
13	28	30	21	8	Pupa
14	17	27	16	8	Larva
15	20	26	16	9	Larva
16	22	30	19	9	-
17	22	27	23	8	-
18	16	27	20	8	-
19	16	25	18	9	Larva
20	20	30	15	10	Larva
21	22	30	25	14	Larva
22	9	24	15	8	-
23	13	26	20	13	Larva
24	17	17	12	3	-
25	15	20	10	5	-
Range	9-29	17-33	10-25	3-14	
Mean ( $\bar{x}$ )	20.8	26.8	16.1	8.0	
S.D.	5.1	3.5	4.0	2.7	

situated on the lower 10-70% of the host plant stems (*Dillwynia glaberrima*), but mostly between 30 and 50%. This indicates that the lower stems are more suitable for development of the larvae because the lower stems are thicker and thus provide more protection and nutrition.

#### e) Contents of galls

41.3% of the galls (n = 29) from the MacPherson State Forest (table 1), 81.3% of galls (n

Table 6. Statistics (Mean and Standard Deviation) on gall size for four sites (from tables 1-3, 5) (all measurements in mm).

Site no.	G a l l s i z e			N
	Length	Width	Height	
1	22.3 ± 3.8	13.9 ± 2.2	7.9 ± 2.0	29
2	21.4 ± 2.8	14.6 ± 4.1	7.9 ± 2.2	16
3	23.0 ± 2.6	17.4 ± 2.2	9.3 ± 1.8	31
4	26.8 ± 3.5	16.1 ± 4.0	8.0 ± 2.7	25

Table 7. Comparison of various characters of the stem galls of *Ethon affine* Laporte & Gory, *E. jessicae* sp. nov. and *E. fissiceps* (Kirby) (data for *E. affine* and *E. fissiceps* are derived from HAWKESWOOD, 1988 and HAWKESWOOD & TURNER, 1992).

Characteristic	<i>E. affine</i>	<i>E. jessicae</i>	<i>E. fissiceps</i>
Length of galls (mm)	15-27	13-33	12-13.5
Width of galls (mm)	9-17	12-25	4-8
Height of galls (mm)	5-16	5-14	3.5-5
Thickness of galls (mm)	2-3.5	2-4	0.5-1.5
Stem diameter (mm)	7-14	4-35	3-7
Pupal chamber length (mm)	7-8	8-12	7-8
Pupal chamber width (mm)	3-4	3-5	2-2.5
Gall texture/colour	Rough, dark reddish-brown (normal stem colour dark grey)	Rough, mostly orange to red ochre	Rough, same colour as normal stems
Gall arrangement	Usually one on a stem, not aggregated	Usually one to several per stem, not aggregated	More than one per stem at base of plant, often aggregated

Table 8. Summary of larval host plants and references for four *Ethon* species (Note: All host plants are from the family Fabaceae) (Modified from HAWKESWOOD & TURNER, 1992).

Species	Host plant	References
<i>Ethon affine</i> Laporte & Gory	<i>Pultenaea stipularis</i> Sm.	SAUNDERS (1847), FROGGATT (1892, 1907)
	<i>Pultenaea flexilis</i> Sm.	HAWKESWOOD (1988), VOLKOVITSH & HAWKESWOOD (1990)
<i>Ethon corpulentum</i> Boheman	<i>Dillwynia retorta</i> (Wendl.) Druce	FROGGATT (1892)
<i>Ethon fissiceps</i> (Kirby)	<i>Dillwynia retorta</i> (Wendl.) Druce	HAWKESWOOD & TURNER (1992)
	<i>Dillwynia floribunda</i> Sm.	TURNER & HAWKESWOOD (in press)
<i>Ethon jessicae</i> sp. nov.	<i>Dillwynia glaberrima</i> Sm.	HAWKESWOOD & TURNER (this paper)
	<i>Dillwynia retorta</i> (Wendl.) Druce	HAWKESWOOD & TURNER (this paper)
	<i>Pultenaea blakelyi</i> Thompson	HAWKESWOOD & TURNER (this paper)
	<i>Pultenaea flexilis</i> Sm.	HAWKESWOOD & TURNER (this paper)

= 16) from Howes Waterhole (table 2), 58.1% (n = 31) from Mogo Hill (table 3) and 61% (n = 25) from Mountain Lagoon (table 5), contained either a single living larva, pupa or adult at the time of dissection, indicating that developmental success was variable between sites. Predators of larvae and other stages appear to be parrots (presently unidentified) which break open the mature galls with their beaks (table 3) as well as hymenopterous parasites (presently unidentified due to the lack of fresh, undamaged material) (table 1). Many galls, often underdeveloped, contained neither larvae, pupae or adults and this condition appeared to be due to either a) the young larvae failed to develop for some reason and had disintegrated, b) attack of developing larvae by fungi, c) attack by predators which had completely devoured the larval body, or d) the adults had already emerged (in only a few

Table 9. Summary of the adult food plants and references for the various *Ethon* species (Note: The adult beetles usually feed on the floral parts of the plants) (Modified from HAWKESWOOD & TURNER, 1992).

Species	Food plant	Family	References
<i>Ethon affine</i> Laporte & Gory	<i>Dillwynia floribunda</i> Sm.	Fabaceae	WILLIAMS & WILLIAMS (1983), HAWKESWOOD (1987), WEBB (1993)
	<i>Dillwynia retorta</i> (Wendl.) Druce	Fabaceae	WEBB (1993)
	<i>Dillwynia</i> sp.	Fabaceae	CARTER (1923), HAWKESWOOD (1987)
	<i>Jacksonia scoparia</i> R. Br.	Fabaceae	HAWKESWOOD & PETERSON (1982), WILLIAMS & WILLIAMS (1983)
	<i>Phyllota grandiflora</i> (Sieb. ex DC.) Benth.	Fabaceae	WILLIAMS & WILLIAMS (1983), WEBB (1993)
	<i>Pultenaea acerosa</i> R. Br. ex Benth.	Fabaceae	TEPPER (1887)
	<i>Pultenaea daphnoides</i> Benth.	Fabaceae	TEPPER (1887)
	<i>Pultenaea ferruginea</i> Rudge	Fabaceae	WILLIAMS & WILLIAMS (1983), WEBB (1993)
	<i>Pultenaea flexilis</i> Sm.	Fabaceae	WEBB (1993)
	<i>Pultenaea</i> sp.	Fabaceae	CARTER (1923), HAWKESWOOD & PETERSON (1982), HAWKESWOOD (1987)
	? <i>Leptospermum</i> sp.	Myrtaceae	CARTER (1923)
<i>Ethon breve</i> Carter	<i>Patersonia occidentalis</i> R. Br.	Iridaceae	HAWKESWOOD (1980)
<i>Ethon corpulentum</i> Boheman	<i>Daviesia latifolia</i> R. Br.	Fabaceae	WILLIAMS & WILLIAMS (1983)
	<i>Dillwynia</i> sp.	Fabaceae	CARTER (1923)
	<i>Pultenaea</i> sp.	Fabaceae	CARTER (1923)
	<i>Leptospermum</i> sp.	Myrtaceae	CARTER (1923)
<i>Ethon fissiceps</i> (Kirby)	<i>Dillwynia floribunda</i> Sm.	Fabaceae	HAWKESWOOD (1978), WILLIAMS & WILLIAMS (1983), WEBB (1993)
<i>Ethon jessicae</i> sp. nov.	<i>Daviesia corymbosa</i> Sm.	Fabaceae	HAWKESWOOD & TURNER (this paper)
	<i>Dillwynia retorta</i> (Wendl.) Willd.	Fabaceae	HAWKESWOOD & TURNER (this paper)
<i>Ethon leai</i> Carter	<i>Dillwynia retorta</i> (Wendl.) Willd.	Fabaceae	WILLIAMS & WILLIAMS (1983)
	<i>Dillwynia sericea</i> A. Cunn.	Fabaceae	WILLIAMS & WILLIAMS (1983)
<i>Ethon maculatum</i> Blackburn	<i>Jacksonia</i> sp.	Fabaceae	WEBB (1993)
<i>Ethon</i> sp. near <i>E. affine</i>	<i>Phyllota grandiflora</i> (Sieb. ex DC.) Benth.	Fabaceae	WILLIAMS & WILLIAMS (1983)

cases). Despite these population regulating factors, *E. jessicae* appears to be common throughout its known range and some sites appear to sustain large populations of the species.

#### f) Larval host plants

The known larval host plants and references for *Ethon* are outlined in table 8. *Ethon jessicae* larvae continue the trend, as observed in other species of the genus, of breeding in the wood of shrubby *Pultenaea* and *Dillwynia* species (Fabaceae). *Ethon* is therefore monophagous at the plant family level (on Fabaceae) and displays systematic oligophagy on *Pultenaea* and *Dillwynia*. The largest number of larval hosts for *Ethon* is four for *E. jessicae*, but with further research, the known hosts for the other species are likely to increase. The very close relationship of *Ethon* species with

Table 10. Data on sex and size of specimens of *Ethon jessicae* sp. nov. reported in this paper. \* Measured at base across both elytra.

Locality	Sex	Body length (mm)	Pronotum width (mm)	Elytral length (mm)	Elytral* width (mm)	Specimen number
McPherson State Forest	M	8	3	6.5	3.2	00401
	M	8.5	3.3	7	3.5	00402
	M	8.2	3	6.5	3.2	00403
	M	8	3	6.2	3.2	00404
	M	8.2	3	6.2	3.2	00405
	M	7.6	2.8	6	3	00427
	M	8	2.8	6	3	00428
	M	8	2.8	6.5	3	00429
	M	8	3	6.3	3.2	00430
	M	8	2.8	6.2	3	00431
	M	8	2.8	6.1	3	00433
	M	8.1	2.9	6.5	3.3	00434
	M	7.6	2.7	6	2.9	00435
	M	8	3	6.5	3.2	00436
	M	8.2	3	6.5	3.2	00437
	M	8	2.9	6	3.1	00439
	F	8.8	3.2	7	3.5	00438
	Kings Waterhole, Wollemi National Park	M	8	2.8	6.2	3
M		8.6	3	7	3.5	00407
M		8	2.8	6.5	3	00408
M		8.2	3	6.5	3.2	00440
F		8.6	3	7	3.5	00409
F		8.5	3	7	3.2	00410
F		8.6	3.5	7	3.8	00425
F		8	3	6.8	3.3	00441
Mogo Hill, Yengo National Park	M	8	3	6.5	3.2	00426
	M	8.5	3	6.6	3.2	00532
	M	7.5	2.7	6	3	00416
	M	8.2	3	7.5	3.4	00417
	M	8	3	6.2	3.2	00418
	M	8	3	6.2	3.2	00419
	M	8.5	3	6.5	3.2	00422
	M	8.5	3	6.5	3.2	00423
	M	8.2	2.8	6.2	3	00424
	M	8	2.8	6	3	00447
	M	8.5	2.9	6.5	3.2	00448
	M	7.8	2.9	6.1	3	00449
	M	7.8	2.8	6.1	3	00450
	M	8.1	2.9	6.2	3.1	00451
	M	8	2.8	6.2	3	00452
	M	8	3	6.5	3.2	00453
	M	7.8	2.9	6	3.1	00454
	M	8.8	3.2	7	3.6	00455
	F	9	3.2	7.5	3.5	00420
	F	8.5	3	6.5	3.5	00421
F	8.5	3.1	6.8	3.3	00456	
F	8.2	3	7	3.3	00457	
Mountain Lagoon	M	8.5	3	6.8	3.5	00412
	M	8.5	3	7	3.5	00413
	M	8	2.8	6.5	3.2	00414
	M	8.5	3	6.5	3.2	00415
	M	8	3	6.5	3.2	00442
	M	7.8	2.8	7	3.1	00443
	M	8.2	3	6.5	3.2	00444
	F	8.2	3	6.8	3.2	00411
	F	8	2.8	6.3	3.1	00445
	F	8.5	3	7.6	3.2	00446

the closely-related genera *Dillwynia* and *Pultenaea* indicates a co-evolutionary relationship as noted in other Australian buprestids (HAWKESWOOD & PETERSON, 1982). This relationship will be further discussed in our future works on the genus *Ethon*.

#### g) Adult host plants

A summary of the known adult food/host plants from the literature and the present paper is provided in table 9. The data clearly show that the adults, like the larvae, are very closely associated with *Fabaceae*, although there is the unusual feeding record of *E. breve* from Western Australia, on the iris, *Patersonia occidentalis* R. Br. (HAWKESWOOD, 1980). The record of CARTER (1923) of *Ethon* on *Leptospermum* has not been substantiated in modern times and it is most probable that the record refers to *Cisseis* species, rather than *Ethon*. The number of adult hosts for most species exceeds the known larval hosts, but whether all plant species are shared by both larvae and adults remains to be determined. However, it is possible that some species may display wider host preferences amongst the *Fabaceae* in the adult stage than in the larval.

WILLIAMS & WILLIAMS (1983) collected an unidentified *Ethon* species from the Sydney Basin allied to *E. affine*, which could be *E. jessicae*, but we have not located any voucher specimens in museums, so the identity of that material remains unknown.

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