

**TRICHOMALOPSIS SISYRAE ASKEW, SP. NOV. (HYMENOPTERA:  
PTEROMALIDAE), A PARASITOID OF SISYRA (NEUROPTERA: SISYRIDAE)  
IN TASMANIA, AUSTRALIA**

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(with one text-figure and one plate)

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A new species of hymenopteran parasitoid, *Trichomalopsis sisyrae* Askew (Hymenoptera: Pteromalidae) is described from Tasmania, Australia. Adults emerge solitarily from pupal cocoons of the endemic neuropteran *Sisyra pedderensis* Smithers. The first record of a pteromalid from Tasmania, the species is compared with other pteromalid parasitoids of Sisyridae (Neuroptera) and Gyrinidae (Coleoptera) with similar life history strategies.

**Key Words:** *Trichomalopsis*, new species, *Sisyra*, *Gyrinophagus*, *Sisyridivora*, Chalcidoidea, Pteromalidae, Sisyridae, Gyrinidae, ectoparasitoid.

## INTRODUCTION

Species of Sisyridae (Neuroptera), the spongilla flies, have aquatic larvae that feed on freshwater sponges. *S. pedderensis* Smithers, 2008 larvae feed on the endemic freshwater sponge *Radiospongilla pedderensis* Osborn, Forteath & Stanisc, 2008 which abounds in Lake Pedder, Tasmania (Northings 5264680 and 5235000 and Eastings 416550 and 448280 (GDA94)) (Osborn *et al.* 2008).

When fully grown, sisyrid larvae leave the water and move, often a considerable distance, to a drier situation where they spin two-layered silken cocoons. Pupation sites often used by members of this genus include walls of bridges, crevices in tree trunks and spaces beneath loose bark. It is this cocooned terrestrial phase in the sisyrid life cycle that is vulnerable to attack from parasitic Chalcidoidea (Hymenoptera).

Previously reported chalcid parasitoids of Sisyridae are the pteromalids *Gyrinophagus aper* (Walker, 1839) and *Sisyridivora cavigena* Gahan, 1951. *G. aper* has been reared in Britain from cocoons of *Sisyra fuscata* (Fabricius, 1793) at Oxford in 1932 (Killington 1933 as *Eupteromalus* sp., Graham 1969) and at Speybank, Inverness, in 1997 from a cocoon found under loose alder bark (Hancock 1999). Other European records from the same host are from Austria (Weissmair 1994) and former Czechoslovakia (Peck *et al.* 1964). *G. aper* has been found in Canada (Bouček 1993) where it was reared from cocoons of Gyrinidae (Coleoptera) (Bouček & Heydon 1997).

A second species of *Gyrinophagus*, *G. luteipes* Ruschka, 1914, is considered by Graham (1969) and Bouček (1990) probably to be a small variant of *G. aper*. However, neither author proposed formal synonymy, chiefly because of the difference in hosts of the two species, Gyrinidae and Sisyridae respectively. Polyphagy, however, is very common in Pteromalidae which are sometimes known to utilise a range of unrelated hosts sharing particular ecological features (e.g., Askew 1962), and the small, terrestrial or semi-terrestrial cocooned stages of two unrelated, aquatic

hosts may be physically sufficiently alike to be located and accepted as hosts by *G. aper*.

*Sisyridivora cavigena* was described by Gahan (1951) from specimens obtained from “nymphs” of the sisyrid *Climacia areolaris* (Hagen, 1861) in Ohio, USA, and probably the same parasitoid species was found in 1952 in Michigan by Spangler attacking cocooned prepupae or pupae of *Sisyra vicaria* (Walker, 1853) at the tops of sedge stems, sometimes adjacent to gyrenid cocoons (Parfin & Gurney 1956).

Brown (1951) gave a detailed account of the biology of *S. cavigena* as a parasitoid of *C. areolaris*. Only cocooned stages of *C. areolaris* are attacked, exposed pupae and prepupae being ignored by host-searching females. *S. cavigena* is a solitary ectoparasitoid, ovipositing on the surface of host prepupae after these have been paralysed by an injection of venom. Brown observed a female *S. cavigena* applying its mouthparts to the puncture made by the ovipositor; this was probably an instance of host-feeding. In order to reach the host surface, the ovipositor of *S. cavigena* must penetrate the two-layered host cocoon, and sometimes its abdomen becomes entangled in the meshes of the outer net-like covering so that it may die before laying an egg. The total duration from egg to adult in this pteromalid is 9–15 days while adult *S. cavigena* are thought to be active from spring to autumn.

Parasitoids of Sisyridae have previously not been recorded from Australia. Adults of a parasitoid emerged solitarily from pupal cocoons of *Sisyra pedderensis* (Smithers *et al.* 2008), an endemic sisyrid found at Lake Pedder in southwestern Tasmania. The undescribed parasitoid exhibited similar biology to *G. aper* and *S. cavigena* and is placed in the genus *Trichomalopsis* Crawford, all three genera placed in Pteromalidae: Pteromalinae. Other pteromalids apparently related to these three sisyrid parasitoids, or which share with them certain morphological features, have been reared from cocoons of Gyrinidae (Coleoptera); *G. aper* is possibly a parasitoid of both Sisyridae and Gyrinidae.

Here we describe the newly discovered species of *Trichomalopsis*.

## SYSTEMATICS

Pteromalidae Dalman, 1820  
*Trichomalopsis* Crawford, 1913  
*Trichomalopsis sisyræ* Askeu sp. n.

## Description

*Female*: Head and mesosoma dark green with extensive coppery tints, especially dorsally; metasoma black with coppery reflections. Antenna with scape testaceous, darkened at very apex; pedicel brown, paler ventrally; flagellum dark brown. Legs with coxae and thorax concolorous, metallic, legs below coxae reddish testaceous, only protarsus, mesotarsus distally and fifth segment of metatarsus pale brown and pretarsi dark brown. Tegulae testaceous; wings almost clear to faintly infumate, venation brown. Length 2.2–3.0 mm.

Head in dorsal view (fig. 1A) slightly more than twice as broad as long; temple 0.4x as long as eye, weakly curved; POL only slightly greater than OOL, OOL about 4.5x ocellar diameter; occiput (fig. 1B) moderately emarginate with strong, highly arched occipital carina. Head in front view (fig. 1C) 1.4x as broad as high, vertex elevated; eye height 1.6–1.7x malar space, gena moderately buccate; lower margin of torulus above ocular line but nearer to anterior margin of clypeus than to lower edge of median ocellus (13:16); clypeus with radiating striae which extend only a short distance onto lower face, its anterior margin weakly emarginate. Mouth opening 1.8x malar space; both mandibles with four teeth, the left with inner tooth poorly

developed. Head in profile about 1.5x as high as long with lower face rather protuberant below level of eyes; eye length about 1.5x malar space. Antenna (fig. 1D) with scape (fig. 1C) 7x as long (excluding radícula) as broad, reaching distinctly above level of vertex; combined length of pedicel and flagellum 0.84x breadth of head; pedicel in dorsal view about 2.25x as long as broad, scarcely longer than anelli plus first funicle segment (F1); both anelli transverse; flagellum weakly clavate, funicle proximally slightly broader than pedicel, F1 subquadrate to slightly transverse, somewhat shorter than F2, F2–F5 subquadrate, F6 slightly broader than long, clava hardly longer than combined lengths of F5 and F6 (18:17), about 1.8x as long as broad collapsing in air-dried specimens; sensilla in a single transverse row on funicle and claval segments.

Mesosoma 1.4x as long as broad. Pronotal collar with anterior margin raised but without a distinct carina. Mesoscutum 2.1x as broad as long, only 0.87x as broad as head; notauli extending over anterior two-thirds. Scutellum slightly longer than mesoscutum, frenum demarcated by finer reticulate sculpture than elsewhere on scutellar dorsum but frenal groove absent. Dorsellum very short, smooth. Propodeum medially about 0.7x as long as scutellum; median area about 1.4x as broad as long, margined by strong, sinuate lateral plicae which extend down sides of nucha, median carina well-raised, straight and extending over transverse groove in front of nucha, sculpture of median area strong and quite evenly reticulate but finer and weaker in shallow antero-lateral foveae; nucha occupying almost

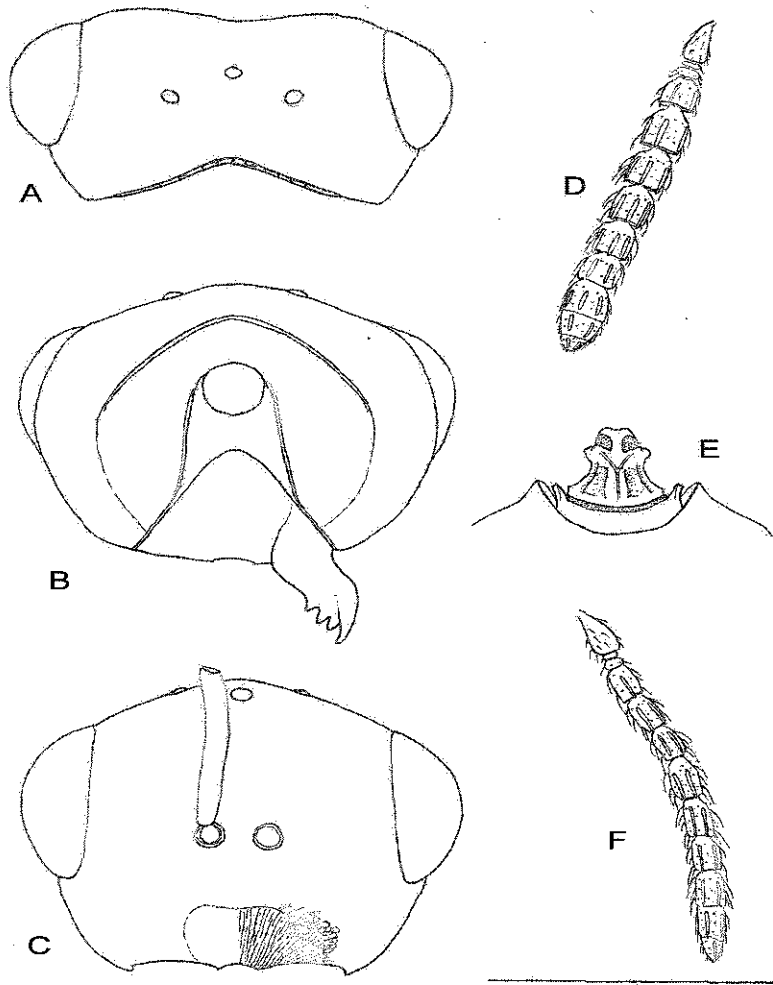


FIG. 1—(A) Head of female *Trichomalopsis sisyræ* sp. n. in dorsal view. (B) Posterior view of head of female *T. sisyræ* sp. n. with right mandible. (C) Front view of head of female *T. sisyræ* sp. n. with scape of right antenna. (D) Antennal pedicel and flagellum of female *T. sisyræ* sp. n.. (E) *T. sisyræ* sp. n. petiole in dorsal view and anterior part of basal segment of metasoma of female *T. sisyræ* sp. n. (F) Antennal pedicel and flagellum of male *T. sisyræ* sp. n. Scale bar = 0.5 mm.



## PLATE 1

Dorsal view of an adult male jewel wasp,  
*Trichomalopsis sisyrae* sp. n. Actual size:  
2.4 mm.

half of propodeal length, with strong, reticulate sculpture; spiracles small, separated from metanotum by less than a major diameter; callus rather densely pilose.

Forewing 2.4x as long as broad, reaching just beyond apex of gaster in fluid preserved specimens but well beyond in air-dried material, bare proximally to level of base of marginal vein except for setae on submarginal vein and costal cell pilosity; costal cell undersurface with a complete hair row and additional hairs on apical quarter; speculum open below, moderately large; wing membrane distal to speculum densely pilose; lengths costal cell: marginal vein: stigmal vein: postmarginal vein as 30:13:8:11; venation slender, especially stigmal vein which is slightly curved with stigma occupying only about one-third of its length.

Metasoma ovate, in air-dried specimens slightly longer than mesosoma, 1.5x as long as broad, 1.2x broader than thorax; basal tergite occupying almost one-third (one-fifth in alcohol-preserved specimens) of metasomal length with posterior margin almost straight and a forwardly-directed flange on each side of the petiole (fig. 1E), a few setae laterally in anterior half; basal sternite also with a flange which ventrally half surrounds the posterior expansion of the petiole, and a basal longitudinal carina flanked by two foveae; apex of hypopygium at about half gaster length. Petiole in dorsal view (fig. 1E) campaniform, broadest posteriorly, about as broad as long and slightly shorter than propodeal nucha which mostly conceals it, its surface with raised, irregular sculpture.

*Male*. Resembles female but differs as follows: head and mesosoma with coppery tints usually less extensive; forewing a little more strongly infumate. Length 1.9–2.6 mm. Eye somewhat larger, eye height in front view 1.8x malar space. Antenna longer, combined length of pedicel and flagellum almost as long as breadth of head (18:19); flagellum (fig. 1F) hardly expanded distally (pl. 1); all funicle segments longer than broad. Forewing slightly narrower, 2.5x as long as broad. Metasoma (air-dried) dorsoventrally flattened, 1.2x as long as broad, slightly shorter than mesosoma (43:46), basal tergite occupying two-fifths of metasomal length.

## Type Material

HOLOTYPE: ♀ QVM (Queen Victoria Museum & Art Gallery, Launceston): 12:53189, Tasmania: Lake Pedder, Starfish Inlet, ex pupal cocoon of *Sisyra pedderensis* Smithers, emerged 24.iii.2008 (G.N.R. Forteach & A. W. Osborn).

ALLOTYPE: ♂ QVM: 12:53190, same data as holotype except emerged 6.iii.2008.

PARATYPES: 9♀♀ 11♂♂. Same data as holotype except emergence dates 27.ii–23.xi.2008, although mostly in March 3♂♂ QVM: 12: 53191–53193; 2♀♀ QVM: 12: 53194–53195; 3♂♂ Australian National Insect Collection (ANIC) 32:057477–057479, 2♀♀ ANIC 32:057480–057481; 2♀♀, 2♂♂ collection of R.R. Askew.

Additional material: A further 46♀♀ and 26♂♂ were reared from *S. pedderensis* cocoons from the type locality in 2008 giving an overall ♀:♂ ratio of 3:2.

## Etymology

The only species of *Trichomalopsis* currently known to parasitise pupal cocoons of *Sisyra* (Neuroptera: Sisyridae).

## COMMENTS

*Trichomalopsis sisyrae* is referable to *Trichomalopsis* Crawford, 1913 (= *Eupteromalus* Kurdjumov, 1913) in Pteromalinae having an occipital carina, antennal clava that is only slightly broader than the funicle, a reticulate propodeum with a large subglobose nucha that forms a hood over the small, vertical metasomal petiole, and forewing with slender venation and bare basal cell, basal vein and speculum.

There are at least 35 species of *Trichomalopsis* in Europe (Bouček & Rasplus 1991), 15 in the Nearctic region (Gibson & Floate 2001), four species are found in rice paddy in Japan and elsewhere in southeast Asia and India (Kamijo & Grissell 1982). Bouček (1988) notes that at least 10 species are known from New Zealand and five are listed for Australasia.

*Trichomalopsis* species are often difficult to identify, good morphological distinguishing characters for many species being difficult to find, and the biologies of some species may be confusingly similar. For instance, four of the five species known to parasitise filth fly puparia in North America include *Musca domestica* L. in their host ranges (Gibson & Floate 2001) and the previously known Australian species have been reared only as secondary parasitoids of Lepidoptera attacking cocoons of microgastrine Braconidae (Bouček 1988).

Bouček (1988) lists four species of *Trichomalopsis* from Australia, but later in the same work one of these, *T. pulchra* (Girault & Dodd, 1915 in Girault 1915), is put in the genus *Oxyharma* Bouček characterised by an elongated metasomal petiole. The type material of *T. australiensis* (Girault, 1926) is lost but it is considered by Bouček probably to be a junior synonym of *T. braconophaga* (Cameron, 1912).

Therefore, with the description of *T. sisyræ*, only three species are known with certainty from Australia.

We have examined the type of *T. braconis* (Dodd, 1917), but that of *T. braconophaga* was unavailable for study. However, from the original description of *Trichoglenes*(?) *braconophagus* Cameron, 1912, both it and *T. braconis* differ morphologically from *T. sisyræ* in having a female metasoma shorter than the mesosoma (1.25x as long in *T. sisyræ*) and at least the front coxae largely testaceous (all coxae darkened and metallic in *T. sisyræ*). Also the very different host association distinguishes *T. sisyræ* from the two secondary parasitoids of Lepidoptera.

In Graham's (1969) key to females of European and North American *Eupteromalus*, *T. sisyræ* approaches "sp. indet. A", but differs from it in its mainly copper colouration, in having a well-developed propodeal median carina and more transverse head in dorsal view. This species is now known as *T. arzoneae* (Bouček, 1970) which is biologically very different from *T. sisyræ*; *T. arzoneae* is gregarious and was described from 21♀♀ and 3♂♂ reared in Italy from a prepupa of the Ailanthus Silkmoth, *Philosamia cynthia* (Drury, 1773) (Saturniidae) parasitised by the tachinid *Pales pavidus* (Meigen, 1824) (Bouček 1970).

Although species of *Trichomalopsis* are often polyphagous, their host ranges are limited by ecological factors. The unusual host association of *T. sisyræ*, together with its combination of morphological characters, provide sufficient grounds for recognising it as a new species.

### KEY TO GENERA OF PTEROMALIDAE WHICH INCLUDE PARASITOIDS OF SISYRIDAE AND GYRINIDAE

In all genera the propodeal nucha is large, subglobose and has coarse, strongly-raised reticulate sculpture.

1. Metacoxa with dense pilosity on the length of its dorsal surface .....2  
Metacoxa with long hairs dorsally only towards its apex ..... 3
2. Occipital carina absent; basal cell of forewing bare; metasomal petiole distinctly longer than broad; both mandibles with 4 teeth ..... *Dineuticida* Bouček<sup>1</sup>  
Occipital carina present; basal cell of forewing with hairs on undersurface, but these thin and difficult to see; meta-

somal petiole inconspicuous under propodeal nucha, about as long as broad; left mandible with three teeth .....  
..... *Gyrinophagus* Ruschka<sup>2</sup>

3. Gena with a large hollow extending from base of mandible almost to eye; ♀ flagellum fusiform, broadest at apex of funicle; notauli indicated only near anterior margin of mesoscutum; scutellum with distinct frenal groove; forewing with basal cell bare but speculum absent; abdominal petiole twice as long as apical breadth ...  
..... *Sisyridivora* Gahan<sup>3</sup>

Gena with at most a small hollow at corner of mouth; ♀ flagellum subcylindrical to subclavate, funicle not broader than clava; notauli distinct over anterior two-thirds of mesoscutum; scutellum with frenum not separated by a frenal groove; forewing with basal cell bare in most species, speculum present; abdominal petiole very small, concealed beneath nucha ... *Trichomalopsis* Crawford<sup>4</sup>

<sup>1</sup> One species, *D. dineutis* (Ashmead), parasitoid in cocoons of *Dineutes* Gyrinidae), USA.

<sup>2</sup> *G. aper* (= *marginatus* Thomson), parasitoid in cocoons of Sisyridae, Holarctic; *G. luteipes*, parasitoid in cocoons of Gyrinidae, central Europe and *G. cycbreus* (Walker, 1850), host unknown but possibly Ephyridae (Diptera), Dublin, may be the same as *G. aper*, central Europe.

<sup>3</sup> One species, *S. cavigena*, parasitoid in cocoons of Sisyridae, USA.

<sup>4</sup> A large genus, formerly known as *Eupteromalus* Kurdjumov, which occurs in all major regions. Mostly solitary or gregarious, primary or secondary parasitoids of a range of hosts in cocoons or puparia, attacking particularly Lepidoptera or their braconid (Hymenoptera) or tachinid (Diptera) parasitoids, Diptera and Coleoptera, sometimes aculeate Hymenoptera and egg sacs of spiders. The species described above is a parasitoid of Sisyridae. Species range from being apparently more or less host-specific to very polyphagous.

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