

# Iulomorphid millipedes (Diplopoda, Spirostreptida, Iulomorphidae) of Tasmania, Australia

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## Abstract

Tasmanian Iulomorphidae are here assigned to the genera *Amastigogonus* Brölemann, 1913, *Atelomastix* Attems, 1911 and *Equestrigonus* gen. n. Descriptions or redescriptions are given for *Amastigogonus danpicola* sp. n., *A. elephas* sp. n., *A. fossuliger* Verhoeff, 1944, *A. hardyi* (Chamberlin, 1920), *A. bellyeri* sp. n., *A. michaelsae* sp. n., *A. orientalis* sp. n., *A. peninsulensis* sp. n., *A. tasmanianus* Brölemann, 1913 (type species of *Amastigogonus*), *A. verreauxii* (Gervais, 1847), *Atelomastix bonhami* sp. n., *A. smithi* sp. n. and *Equestrigonus tasmaniensis* gen. n., sp. n. The synonymy of *Amastigogonus nichollsii* Verhoeff, 1944 with *A. hardyi* is accepted, and lectotypes are designated for *A. nichollsii* and *A. tasmanianus*.

## Keywords

Diplopoda, Spirostreptida, Iulomorphidae, Tasmania, Australia

## Introduction

In Tasmania, Australia, native species of Spirostreptida are found at all elevations and in most natural habitats, although they are rarely seen in coastal dune scrubs or in grasslands and moorlands. Spirostreptidans can be abundant in native forest and in *Eucalyptus* and *Pinus radiata* plantations. For example, spirostreptidans made up 65% (Mesibov 1993) and 48% (Mesibov 1998) of all millipedes collected in two of the author's hand-sampling studies in wet eucalypt forest and cool temperate rainforest. Spirostreptida include Tasmania's longest millipedes (Fig. 1A) and are well-known to many Tasmanian naturalists for the strong smell of their benzoquinone defensive secretions.

Although the spirostreptidan family Cambalidae Bollman, 1893 occurs in Tasmania (Mesibov, in preparation), the most frequently collected spirostreptidans are in Iulomorphidae Verhoeff, 1924 as circumscribed by Korsós and Read (2012). The dominant iulomorphid genus is *Amastigogonus* Brölemann, 1913, which is endemic to Tasmania and has five named species:

- (1) *Amastigogonus fossuliger* Verhoeff, 1944.
- (2) *A. hardyi* (Chamberlin, 1920). Described as *Euethogonus hardyi*, assigned to *Amastigogonus* by Hoffman (1972).
- (3) *A. nichollsii* Verhoeff, 1944. Synonymised with *A. hardyi* by Hoffman (1972).
- (4) *A. tasmanianus* Brölemann, 1913, type species.
- (5) *A. verreauxii* (Gervais, 1847). Described as *Iulus Verreauxii*, assigned to *Amastigogonus* by Mauriès, Golovatch and Hoffman (2001).

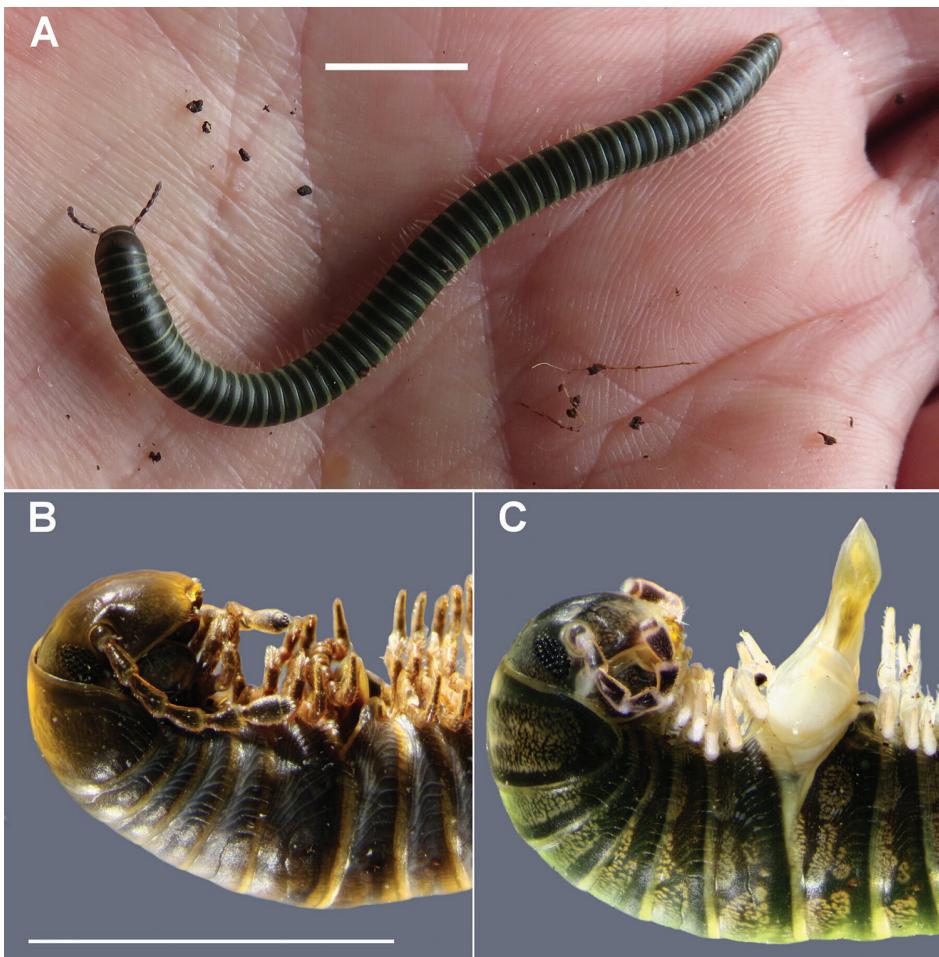
In the present study *A. fossuliger*, *A. hardyi*, *A. tasmanianus* and *A. verreauxii* are redescribed, lectotypes are designated for *A. nichollsii* and *A. tasmanianus*, and six new Tasmanian species are added to *Amastigogonus*. I also describe two new Tasmanian species of *Atelomastix* Attems, 1911, a genus previously known only from mainland Australia, and I propose a new genus for a distinctive iulomorphid species which is widespread and locally abundant in the north of Tasmania's main island.

## Materials and methods

While preparing this paper I supplemented material in the collections of the Queen Victoria Museum and Art Gallery and the Tasmanian Museum and Art Gallery with fresh specimens from selected localities. Iulomorphid millipedes were hand collected in or under woody litter during the day, as well as on tree trunks at night.

In descriptions of individual spirostreptidans I follow Enghoff et al. (1993) in counting trunk rings by excluding the telson and giving podous + apodous ring counts, e.g. “(55+1) rings”, and I give the count ranges I observed rather than count frequencies. In *Atelomastix* species, the three branches of the anterior gonopod are here called sclerites “a”, “b” and “c”, following Attems (1911) and Edward and Harvey (2010). *Amastigogonus* species descriptions only include diagnostically relevant features and the genus description for *Amastigogonus* should be consulted for other details.

Long-preserved Spirostreptida are often deeply stained and made brittle by defensive secretion, and it is difficult to dissect such specimens to examine gonopods without breaking the rings adjoining the gonopod aperture. However, *Amastigogonus* males usually have everted gonopods when first killed by freezing, then submerged in tap water for several hours at room temperature (Fig. 1B, C). I used this procedure to prepare some fresh *Amastigogonus* specimens for examination and description.



**Figure 1.** *Amastigogonus fossiliger* Verhoeff, 1944. **A** Living male on author's palm, later preserved in QVM 23:54468 **B** Long-preserved male with retracted gonopods, ex QVM 23:54290 **C** Male with gonopods everted after freeze-killing and soaking in water, ex QVM 23:54468. Scale bars: **A** = 10 mm, **B, C** = 5 mm.

Another methodological problem is that the pseudoflagellum on the anterior gonopod of several *Amastigogonus* species is remarkably thin and fragile. In this paper I provide gonopod drawings rather than scanning electron micrographs, as the SEM facility to which I have access does not have a critical-point dryer, and even brief drying can damage or distort an *Amastigogonus* pseudoflagellum.

Dissected gonopods and other body parts were first cleared in 80% lactic acid, then temporarily mounted in 1:1 glycerine:water and imaged using an eyepiece video camera mounted on an Amscope binocular microscope. Preliminary drawings of cleared parts were traced from printed copies of images. Drawings were then edited by reference to the actual part.

Photomicrographs were taken with a Canon EOS 1000D digital SLR camera mounted on a Nikon SMZ800 binocular dissecting microscope equipped with a beam splitter. Measurements were made to the nearest 0.1 mm with the same microscope using an eyepiece grid and a reference scale. Photomicrographs used in the figures are focus-stacked composites prepared with Zerene Stacker 1.04.

Plates were composed using GIMP 2.8. Backgrounds in some photomicrographs have been edited to remove distracting highlights and artifacts. Maps were drawn with QGIS 2.4.

Latitude/longitude figures are given in decimal degrees to four decimal places, both in the text and in Suppl. material 1, together with an estimate of spatial uncertainty. In cases where label locality data are in the UTM system, both the two-letter, six-digit grid reference on the label (as formerly used in Tasmania) and its unambiguous, global UTM equivalent are provided in the text and in Suppl. material 1, together with the datum used.

## Abbreviations

<b>AM</b>	Australian Museum, Sydney, Australia;
<b>MCZ</b>	Museum of Comparative Zoology, Cambridge, USA;
<b>MNHN</b>	Muséum national d'Histoire naturelle, Paris, France;
<b>QVM</b>	Queen Victoria Museum and Art Gallery, Launceston, Australia;
<b>Tas</b>	Tasmania;
<b>TMAG</b>	Tasmanian Museum and Art Gallery, Hobart, Australia;
<b>ZMB</b>	Museum für Naturkunde, Berlin, Germany;
<b>ZMUC</b>	Zoological collections of the Natural History Museum, Copenhagen, Denmark.

## Results

### Order Spirostreptida Brandt, 1833

#### Suborder Epinannolenidea Chamberlin, 1922

#### Family Iulomorphidae Verhoeff, 1924

#### *Amastigogonus* Brölemann, 1913

*Amastigogonus* Brölemann 1913: 152. Verhoeff 1924: 75, 84; 1932: 1732, 1737; 1944: 36, 41. Jeekel 1971: 107; 1981: 39; 2009: 35. Hoffman 1972: 204; 1980: 91. Mauriès 1987: 198. Mauriès et al. 2001: 585. Korsós and Johns 2009: 3. Edward and Harvey 2010: 5. Korsós and Read 2012: 44.

*Euethogonus* Chamberlin 1920: 166. Hoffman 1972: 204 (synonymised with *Amastigogonus*); 1980: 91.

**Type species.** *Amastigogonus tasmanianus* Brölemann, 1913, by original designation.

**Other assigned species.** *Amastigogonus danpicola* sp. n., *A. elephas* sp. n., *A. fossuliger* Verhoeff, 1944, *A. hardyi* (Chamberlin, 1920), *A. hellyeri* sp. n., *A. michaelsae* sp. n., *A. orientalis* sp. n., *A. peninsulensis* sp. n., *A. verreauxii* (Gervais, 1847).

**Diagnosis.** Like *Victoriocambala* Verhoeff, 1944 in having the coxite process on the anterior gonopod close to the telopodite and nearly as long, forming a chamber resembling a bird's beak in which the pseudoflagellum is protected. Differences between *Amastigogonus*/*Victoriocambala*, as noted by Jeekel (2009: 35), are leg 1 with free/fused tibia and tarsus, posterior gonopod without/with reduced telopodite.

**Description.** Living animals usually with black or dark grey rings with annular pale band at rear of each metazonite, often with a greenish tinge (live *A. fossuliger* more consistently green, see species description); head, collum and telson often faintly reddish brown; legs pale. With long storage in alcohol and staining by defensive secretion, animals dull grey with faintly reddish legs.

Observed midbody diameter of larger males 2.5-4.2 mm, 55-71 podous rings. Head smooth, slightly convex, vertigial sulcus reaching to level of dorsalmost ocellar row. Ocellar area of larger males lenticular with ca 25-50 ocelli in 4-6 somewhat irregular horizontal rows. Antennae short, barely reaching past posterior edge of collum when manipulated dorsally; relative antennomere lengths (2=3)>6>(4=5); antennomere 6 widest; 4 apical cones; socket ca 1 socket diameter from lateral margin of head capsule. Gnathochilarium with lateral edges of mentum slightly convex, mentum about as wide as combined lingual plates; mentum-promentum junction slightly concave anteriorly; a prominent pit with small seta anteriorly on each gnathochilarial stipes. Collum convex, laterally narrowing with rounded corner, margins straight. Prozonites only slightly narrower than metazonites; suture weakly defined; fine longitudinal striae on lower portion of metazonite, anterior end of each stria (Fig. 3C; s) bent obliquely upwards towards suture (see Remarks, below); prozonites and metazonites with surface otherwise smooth, free of setae. Ozopores (Fig. 3C; o) small, round, beginning ring 6 at a little over 1/2 ring height, ring 6 ozopore distinctly lower than ring 7 ozopore; each ozopore at ca 1/3 the distance from suture to posterior metazonite margin, and usually absent from apodous rings. Limbus lamellar, undivided. Preanal ring smooth, epiproct broadly rounded, extending slightly over anal valves; hypoproct with slightly convex margin.

Legpair 1 separate on coxosternite, each leg 1 with 5 podomeres without setae, anteroposteriorly somewhat flattened; relative podomere lengths typically femur>tibia>(prefemur=postfemur)>tarsus, relative widths typically prefemur>femur>tibia>postfemur>tarsus (see Remarks, below); no claw. Small brushes of setae on legpair 1 coxosternite anterior to and between legs, and laterally on coxosternite corners. Leg 2 leg-like with large claw and reduced prefemur; penis arising basally on posterior coxal surface, barrel-shaped with a few long setae in apical crown. Leg 7 (and sometimes other legs near gonopod aperture; see Remarks, below) with elongated coxa (Fig. 2). Midbody legs short, ca 2/3 ring diameter when extended; relative podomere lengths prefemur>(femur=tarsus)>(postfemur=tibia). Most prefemora distally with conical prefemoral pad (Fig. 5A, B; pa); pads first appear on ring 8 legs and diminish in size posteriorly; pads small or absent on last 2-4 legpairs (see Remarks, below).

Posterior margin of gonopod aperture raised and thickened on either side, adjoining tips of retracted anterior gonopods. Anterior gonopods (Figs 3A, 3B, 3D, 3E, 6, 8) parallel, closely appressed. Anterior gonopod coxite (Figs 3A, B, D, E; cx) massive, rounded laterally, extending thin, finger-shaped process (Figs 3A, 3B, 3D, 3E, 6, 8; cxp) from anteromedial surface, process slightly concave laterally, thickened medially to ca 2/3 process height (coxite process more complex in *A. danpicola* sp. n., see species description). Telopodite (Figs 3A, 3B, 3D, 3E, 6, 8; te) arising from wide, shallow recess on coxite, paralleling coxite process and slightly longer; thin and slightly concave medially; somewhat thickened distally from near posterior margin to midline near apex, the thickening usually with row of more or less evenly spaced, prominent setae on posterior side and sometimes a separate row or group of setae on anterior side. Posterior surface of telopodite produced basally as rounded flange. Pseudoflagellum (Figs 3C, 6, 8; ps) thinly lamellar, usually arising at ca 1/2 telopodite height, usually supported by setae on distomedial surface of telopodite. Prostatic groove (Figs 3C, 6, 8; pg) running anterodistally from posterobasal corner of telopodite under rounded flange to pseudoflagellum, following anterior side of pseudoflagellum and terminating at pseudoflagellum tip. Posterior gonopod (Fig. 3F) ca 1/3 height of anterior gonopod, subcylindrical with apical recess posterolaterally, a crown of short setae around recess and an arm-like cylindrical process with rounded apex arising at ca 1/2 gonopod height on posterolateral surface and directed distally. In situ, posterior gonopod grips base of anterior gonopod telopodite between arm-like process and body of posterior gonopod, the posterior gonopod apex pressed against prostatic groove: “The rudimentary posterior gonopods (Fig. 3H) appear to be attached like forceps to the wall at the very base of the caudomedian ridges of the anterior gonopods (Fig. 3E)” (Mauriès, Golovatch and Hoffman 2001: 585).

Female slightly larger in diameter than male with same ring count; leg 1 normally leg-like, claw-bearing; no prefemoral pads on any legs.

**Remarks.** *Amastigogonus* species are closely similar in size, general appearance and habits, and males can only be positively identified by close inspection, and usually dissection, of the anterior gonopods. There is also some variation in non-gonopodal male structures, as noted here and in the species descriptions. The most reliable of these differences are in cardo shape and modifications of near-aperture legs:

**Cardo.** In *A. danpicola* sp. n. the cardo extends further ventrally in its posterior half than in its anterior half, i.e. the cardo is deeper posteriorly (Fig. 4A). In other *Amastigogonus* species the ventral edge of the cardo is either evenly convex or is deeper anteriorly (Fig. 4B).

**Near-aperture legs.** In all *Amastigogonus* species, leg 7 has an elongated coxa (Fig. 2A, B; arrow). Less elongated coxae are also found on legs 10 and 11 in *A. hellyeri* sp. n. and on legs 6, 10 and 11 in *A. danpicola* sp. n. (Fig. 2C).

Other differences between species do not seem to be large enough or consistent enough to be useful for taxonomic purposes:

**Legpair 1.** The relative lengths and widths of the leg 1 podomeres vary a little between species (Fig. 4C–G), between individuals, and sometimes between right and left legs.

*Prefemoral pads.* There are differences between species in pad length, as shown in Fig. 5A and 5B (pa), but these differences are masked by the anteroposterior size gradient on single individuals as well as by variability from individual to individual.

*Metazonal striae.* The height reached by the horizontal striae on the metazonites diminishes slightly from anterior to posterior. At ca 2/3 body length, the topmost horizontal stria lies at ca 1/2 or ca 3/4 of the height to the ozopore (Fig. 5C; st), depending on species, but with considerable variation between rings and between individuals.

### *Amastigogonus danpicola* sp. n.

<http://zoobank.org/A2FB1293-9FCD-4F34-B8E3-DA5F9160C4EF>

Figs 2C, 4A, 4C, 6A

**Holotype.** Male, Apsley River, Tas, -41.7992 148.1508 ±250 m [label "EP 955 717" (= 55G 595500 5371700, AGD66)], 300 m a.s.l., 5 July 1988, R. Mesibov, QVM 23:54377 (specimen in 3 pieces).

**Paratypes.** 1 male, locality and collector as for holotype but -41.7972 148.1544 ±250 m [label "EP 958 719" (= 55G 595800 5371900, AGD66)], 320 m a.s.l., 6 July 1988, R. Mesibov, QVM 23:54371; 1 male, same locality and collector but -41.7964 48.1592 ±250 m [label "EP 962 720" (= 55G 596200 5372000, AGD66)], 350 m a.s.l., 18 July 1988, R. Mesibov, QVM 23:54373.

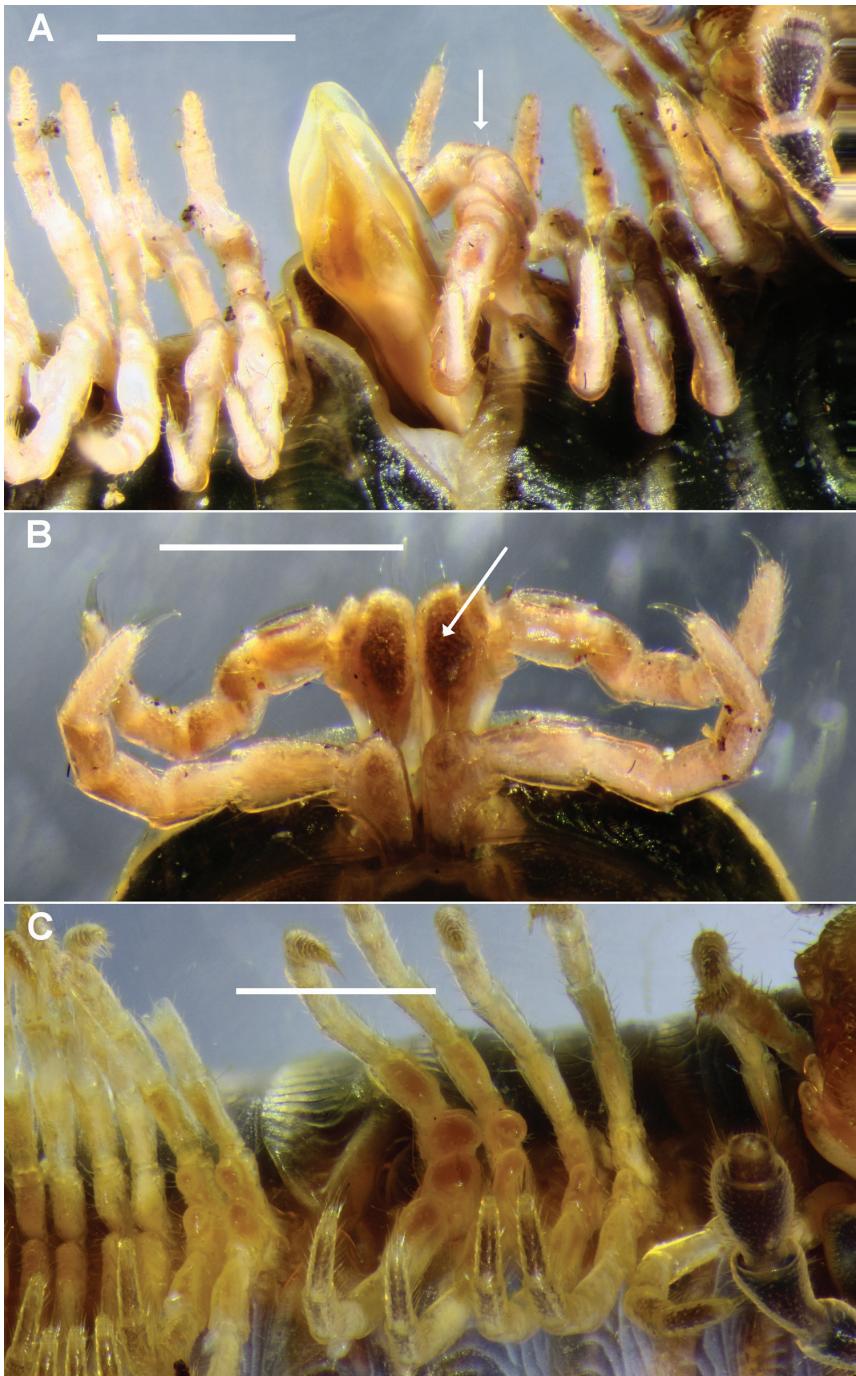
**Other material.** 22 males, 4 probable females from 16 unique localities; details in Suppl. material 1.

**Diagnosis.** Coxite process of the anterior gonopod divided by narrow fossae apically and anterobasally; legs 6, 7, 10 and 11 with elongated coxae.

**Description.** Mature males observed with (48+4) rings, 2.6 mm midbody diameter to (71+1) rings, 3.2 mm. Cardo deeper posteriorly than anteriorly (Fig. 4A; ce). Legs 6, 7, 10 and 11 with elongated coxae, swollen distomedially (Fig. 2C); leg 7 coxa longest and most swollen. Prefemoral pad ca 3/4 femur length. Striae on posterior metazonites reaching ca 1/2 ozopore height.

Coxite process on anterior gonopod (Fig. 6A; cxp) with basal portion divided anteriorly by fossa (Fig. 6A; fo) into lateral and medial longitudinal flanges, the medial flange with deep, V-shaped notch at ca 1/2 coxite height on anterior margin; process divided apically by shallow fossa (Fig. 6A; fo) separating distolateral and distomedial margins; process not reaching level of telopodite apex. Telopodite (Fig. 6A; te) with row of minute setae on posterior side of medial thickening, behind pseudoflagellum (Fig. 6A; ps). Pseudoflagellum ca 1/2 telopodite width at base, truncate at ca 1/2 pseudoflagellum height, extending anterodistally from anterior corner of truncate basal portion as thin, flexible ribbon, the latter usually curving laterally over telopodite apex in preserved specimens.

**Distribution.** Eucalypt forest over ca 1000 km<sup>2</sup> on the East Coast of Tasmania, mainly in the Apsley, Douglas, St Pauls and Swan River catchments (Fig. 7C), from near sea level to at least 600 m. Possibly parapatric with *A. elephas* sp. n. in the upper



**Figure 2.** **A, B** *Amastigogonus fossiliger* Verhoeff, 1944 ex QVM 23:54468. **A** Left ventrolateral view of male with partly everted gonopods, showing legpair 7 (arrow) with elongated coxae **B** Anterior view of legpairs 6 and 7 on isolated ring 6 of same male, with leg 7 coxa marked with arrow **C** *A. danpicola* sp. n., QVM 23:54403, left ventrolateral view of male. Scale bars = 1 mm.

St Pauls River catchment and with *A. michaelsae* sp. n. near Swansea. Sympatric with *A. fossuliger* and with *A. orientalis* sp. n.

**Name.** Abbreviation in lower case “damp” for Douglas-Apsley National Park plus Latin *cola*, inhabitant; noun in apposition. This species is abundant in the Park, which also contains the type locality.

**Remarks.** *A. danpicola* sp. n. is the most apomorphic species within the group included here in *Amastigogonus*. I place it in this genus because the structure and position of the pseudoflagellum and its supporting setae conform to the general pattern seen in the other *Amastigogonus* species.

### *Amastigogonus elephas* sp. n.

<http://zoobank.org/0F43E23A-AA7E-4356-8AB7-891A95DC64FA>

Fig. 6B

**Holotype.** Male, Mt Elephant, Tas, -41.6338 148.2421 ±25 m, 420 m a.s.l., 13 May 2016, R. Mesibov, QVM 23:54519.

**Paratypes.** 3 males, 3 females, details as for holotype, QVM 23:54520; 1 male, same locality but -41.6244 148.2425 ±250 m [label “FP 034 910” (= 55G 603400 5391000, AGD66)], 19 January 2002, R. Mesibov and T. Moule, QVM 23:54369.

**Other material.** 6 males from 5 unique localities; details in Suppl. material 1.

**Diagnosis.** Like *A. verreauxii* in having a telopodite with a subquadrate extension of the posterobasal margin and a posteriorly curving pseudoflagellum; distinguished from *A. verreauxii* in the pseudoflagellum having a small, tooth-like, distally directed extension basal to the posterobasally directed tip.

**Description.** Mature males observed with (47+3) rings, 3.2 mm midbody diameter to (69+0) rings, 3.6 mm. Cardo not deeper posteriorly. Leg 7 (only) with elongated coxa. Prefemoral pad ca 1/2 femur length. Striae on posterior metazonites reaching ca 3/4 of ozopore height.

Coxite process on anterior gonopod (Fig. 6B) with small portion of posterodistal margin extended as rounded tab (Fig. 6B; t), sharply folded over laterally; process nearly reaching level of telopodite apex. Telopodite with posterobasal surface produced posteriorly as subquadrate flange (Fig. 6B; fl) and with single row of prominent setae on posterior side of medial thickening. Pseudoflagellum with small rounded swelling adjoining base posteromedially; arising at 1/3–1/2 telopodite height, ca 2/3 width of telopodite at base, slightly curving posteriorly, slightly expanded posteriorly at 1/3–1/2 pseudoflagellum height, apically with small, rounded, distally directed, tooth-like extension, the prostatic groove opening on posterobasally directed pseudoflagellum tip.

**Distribution.** Eucalypt forest at the eastern end of the Fingal Valley on the Tasmanian East Coast (Fig. 7C), to at least 700 m elevation. The small range of this species is home to other locally endemic invertebrates, including the millipede *Tasmaniosoma nicolaus* Mesibov, 2015 and the onychophoran *Tasmanipatus anophthalmus* Ruhberg,

Mesibov, Briscoe & Tait, 1991. *A. elephas* sp. n. may be parapatric with *A. danpicola* sp. n. in the upper St Pauls River catchment.

**Name.** Latin *elephas*, elephant; noun in apposition. For the type locality, Mt Elephant.

**Remarks.** The anterior gonopod of *A. elephas* sp. n. (Fig. 6B) is similar to that of *A. verreauxii* (Fig. 8D). The wide disjunction in the species ranges (more than 100 km) and the remarkable consistency of form in the anterior gonopod of *A. verreauxii* (across a linear range extent of ca 400 km) suggests that the two lineages have long been separated.

### *Amastigogonus fossuliger* Verhoeff, 1944

Figs 1, 2A, B, 3C, 4B, 5B, 6C

*Amastigogonus fossuliger* Verhoeff 1944: 43, figs 6–8. Jeekel 1981: 43. Korsós and Read 2012: 45.

**Syntypes.** At least 1 male and 1 female, Lake Leake, Tasmania, date and collector unknown (see Remarks, below), specimens not located.

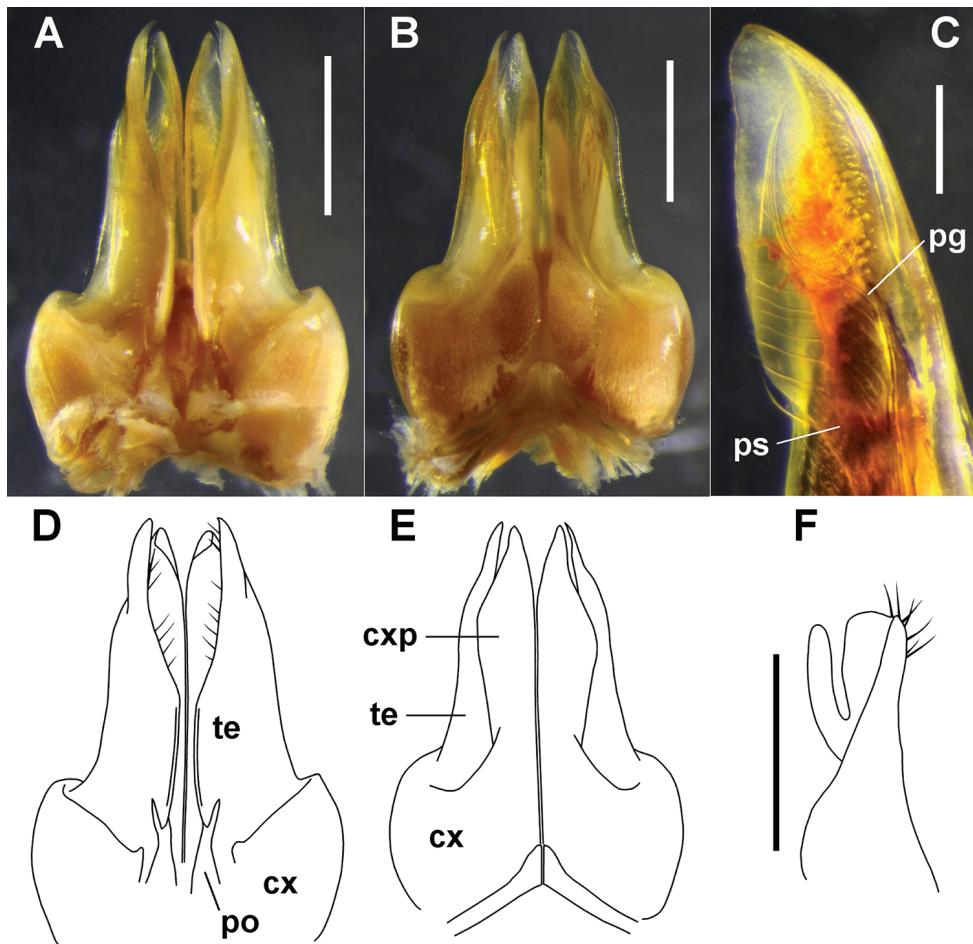
**Other material.** 130 males and 12 females from 66 unique localities; details in Suppl. material 1.

**Diagnosis.** Coxite process of anterior gonopod with posterodistal margin not extended; pseudoflagellum with dense field of short setae on telopodite behind pseudoflagellum tip; pseudoflagellum with distinct shoulder, the prostatic groove making an S-bend before entering the abruptly tapered tip of the pseudoflagellum.

**Description.** Live males and females with more or less greenish-grey rings (Fig. 1A, C). Mature males observed with (39+4) rings, 2.1 mm midbody diameter to (63+1) rings, 3.6 mm. Cardo not deeper posteriorly (Fig. 4B). Leg 7 (only) with elongated coxa (Fig. 2A, C). Prefemoral pad ca 3/4 or more femur length (Fig. 5B). Striae on posterior metazonites reaching ca 2/3-3/4 of ozopore height.

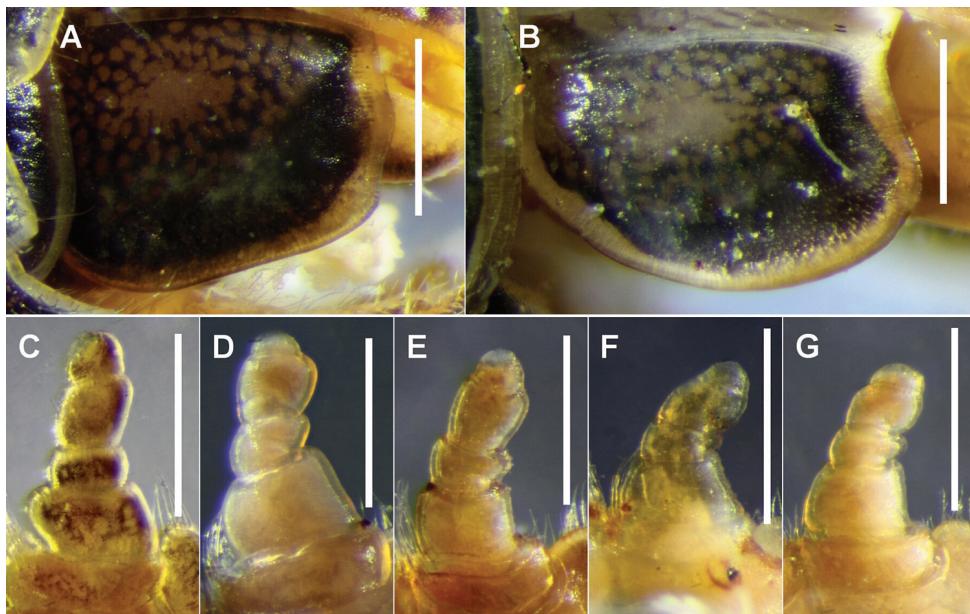
Coxite process on anterior gonopod (Fig. 6C) with posterodistal margin not extended and folded over laterally. Telopodite with single row of prominent setae on posterior side of medial thickening to near telopodite apex, the thickening then widening and bearing dense brush of numerous minute setae. Pseudoflagellum ca 1/2 width of telopodite at base, tapering abruptly at ca 1/2 pseudoflagellum height to narrow, sharply pointed tip with rounded shoulder on anterior side of tapered section (Fig. 3C; ps), sometimes with small, tooth-like, anterodistal extension on shoulder; prostatic groove (Fig. 3C; pg) making S-bend from anterior side of pseudoflagellum into tapered tip.

**Distribution.** Widespread in the eastern half of Tasmania (Fig. 7B) in dry and wet eucalypt forest from near sea level to at least 1050 m, extending across the Central Plateau to the Cradle Mountain area. Parapatric with *A. hellyeri* sp. n. along the Mersey Break, a well-documented faunal divide for millipedes in north central Tasmania



**Figure 3.** **A, B, D, E** *Amastigogonus hardyi* (Chamberlin, 1920) ex TMAG J5987. Posterior (**A, D**) and anterior (**B, E**) views of isolated gonopods, showing coxite (cx), coxite process (cxp) and telopodite (te) of anterior gonopod, and posterior gonopod (po) holding posteromedial flange of telopodite **C** *Amastigogonus fossuliger* Verhoeff, 1944, QVM 23:54356; anteromedial view of tip of anterior gonopod telopodite, showing transparent pseudoflagellum (ps) and prostatic groove (pg) **F** *Amastigogonus tasmaniensis* (Chamberlin, 1920) ex QVM 23:54344, isolated right posterior gonopod, medial view. Scale bars: **A, B** = 1.0 mm, **C** = 0.25 mm, **F** = 0.5 mm.

(Mesibov 1999). Co-occurs with *A. tasmaniensis* in northeast Tasmania. Overlaps with *A. verreauxii* on the Central Plateau and possibly in southern Tasmania, and to a small extent with *A. danpicola* sp. n. southeast of the Fingal Valley. The far southern record on the distribution map (Fig. 7B) is for two *A. fossuliger* males found on the verandah of a house at Francistown, and may represent an accidental translocation rather than a natural occurrence.

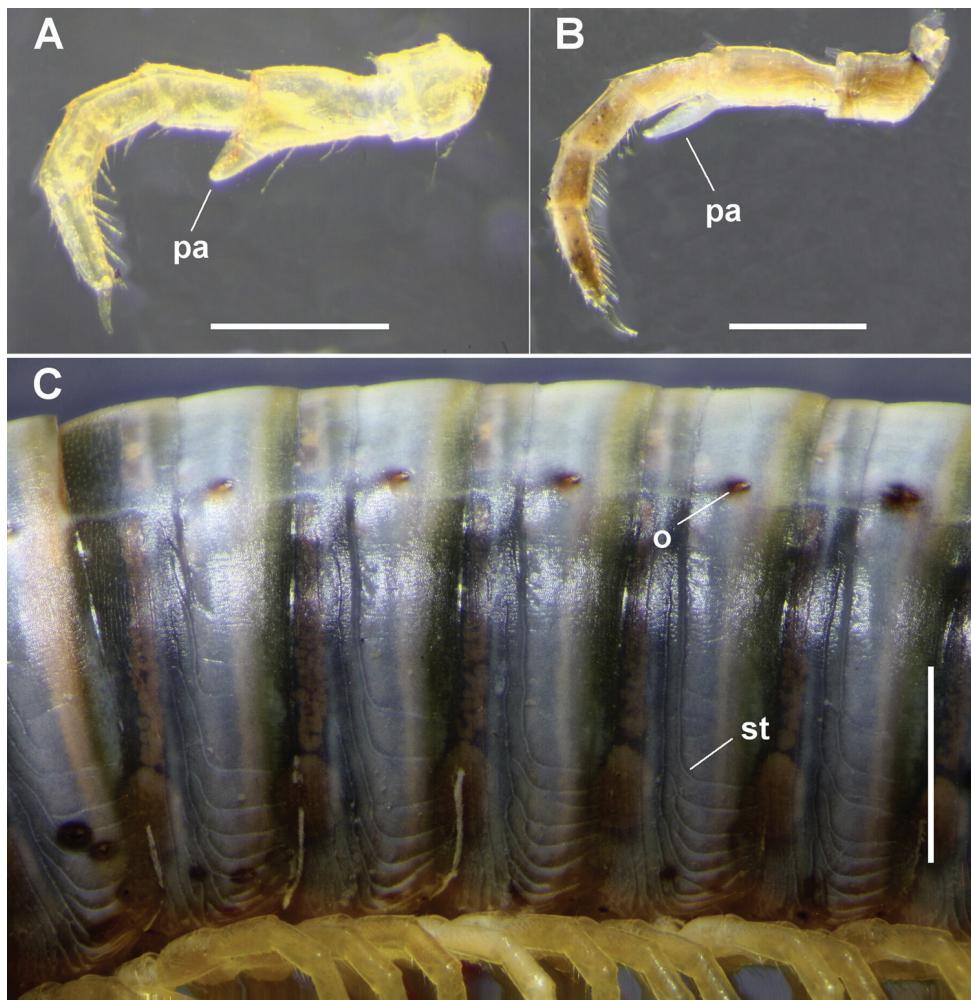


**Figure 4.** **A, B** Lateral view of right cardo of **A** *A. danpicola* sp. n., holotype, QVM 23:54377 and **B** *Amastigogonus fossuliger* Verhoeff, 1944, ex QVM 23:54468 **C–G** Posterior view of left leg 1 of **C** *Amastigogonus danpicola* sp. n., ex QVM 23:54390 **D** *A. hellyeri* sp. n., ex QVM 23:54470 **E** *A. michaelsae* sp. n., QVM 23:54387 **F** *A. tasmanianus* (Chamberlin, 1920), ex QVM 23:54344 and **G** *A. verreauxii* (Gervais, 1847), TMAG J5915. All scale bars = 0.5 mm.

**Remarks.** At least one male and one female of this species from the Lake Leake area were probably sent to Verhoeff by George Edward Nicholls, a Western Australian biologist who collected in Tasmania in 1928, 1929 and 1939 (Nicholls 1943). Verhoeff (1936: 14) had previously thanked Nicholls for providing specimens of an unrelated millipede species from Lake Leake.

I have trouble understanding the differences in the two anterior gonopods illustrated by Verhoeff (1944), both presumably from Lake Leake specimens and possibly from the same male. Verhoeff's fig. 6 shows a right gonopod tip in posterior view, fig. 7 a left gonopod tip in medial view. The thread-like pseudoflagellum in fig. 6 has a tooth-like extension on the shoulder and an intact posterobasal margin, while the shorter, tapered pseudoflagellum in fig. 7 has no tooth-like extension and a notched posterobasal margin. The remarkable thinness and fragility of the *A. fossuliger* pseudoflagellum may be the explanation for Verhoeff's difficulties in seeing and drawing these features. My Fig. 6C is based on a male from near the type locality, while the image in Fig. 3C is of a male from Ansons Bay, ca 100 km to the north. The only significant difference is the absence of a tooth-like extension in the latter.

*A. fossuliger* is more consistently and more obviously green than other *Amastigogonus* species, but the green colour varies in intensity from individual to individual.



**Figure 5.** **A, B** Male midbody leg of **A** *Amastigogonus tasmanianus* (Chamberlin, 1920), ex QVM 23:54344 and **B** *A. fossuliger* Verhoeff, 1944, ex QVM 23:54468, showing prefemoral pad (pa). **C** *Amastigogonus hardyi* (Chamberlin, 1920), male ex TMAG J5897, left lateral view of rings at ca 2/3 body length, showing position of topmost horizontal stria (st) relative to ozopore (o). Scale bars: **A, B** = 0.5 mm, **C** = 1.0 mm.

#### *Amastigogonus hardyi* (Chamberlin, 1920)

Figs 3A, B, D, E, 5C, 6D

*Euethogonus hardyi* Chamberlin 1920: 166. Jeekel 1971: 109.

*Amastigogonus hardyi* Hoffman 1972: 204 (new combination), figs 6–8. Jeekel 1981: 43. Korsós and Read 2012: 45.

*Amastigogonus nichollsii* Verhoeff 1944: 43, figs 1–5. Hoffman 1972: 204 (synonymised with *A. hardyi*).

**Holotype of *Euethogonus hardyi*.** Male, Tasmania, date unknown, G.H. Hardy, MCZ 4817. Illustrated by Hoffman (1972); not examined.

**Paratypes of *Euethogonus hardyi*.** At least 1 female, details as for holotype, MCZ 4818. Not examined.

**Lectotype of *A. nichollsii* (here designated).** Male (slide mount of gonopods), Mt Nelson, Tasmania, date and collector unknown, ZMB 12642a (= Verhoeff collection slide 3777). Illustrated by Verhoeff (1944); material examined as image.

**Paralectotypes of *A. nichollsii*.** 1 female, same collection details, ZMB 12642; not examined. Verhoeff (1944: 44) describes a second male specimen, but this has not been located; this male is another paralectotype.

**Other material.** 3 males and 3 females from 2 unique localities; details in Suppl. material 1.

**Diagnosis.** Like *A. fossuliger* in having the pseudoflagellum with a narrow, tapering, pointed tip; distinguished by the prostatic groove following a straight course on the pseudoflagellum rather than having an S-bend, and by the lack of a dense field of short setae on the telopodite behind the pseudoflagellum tip.

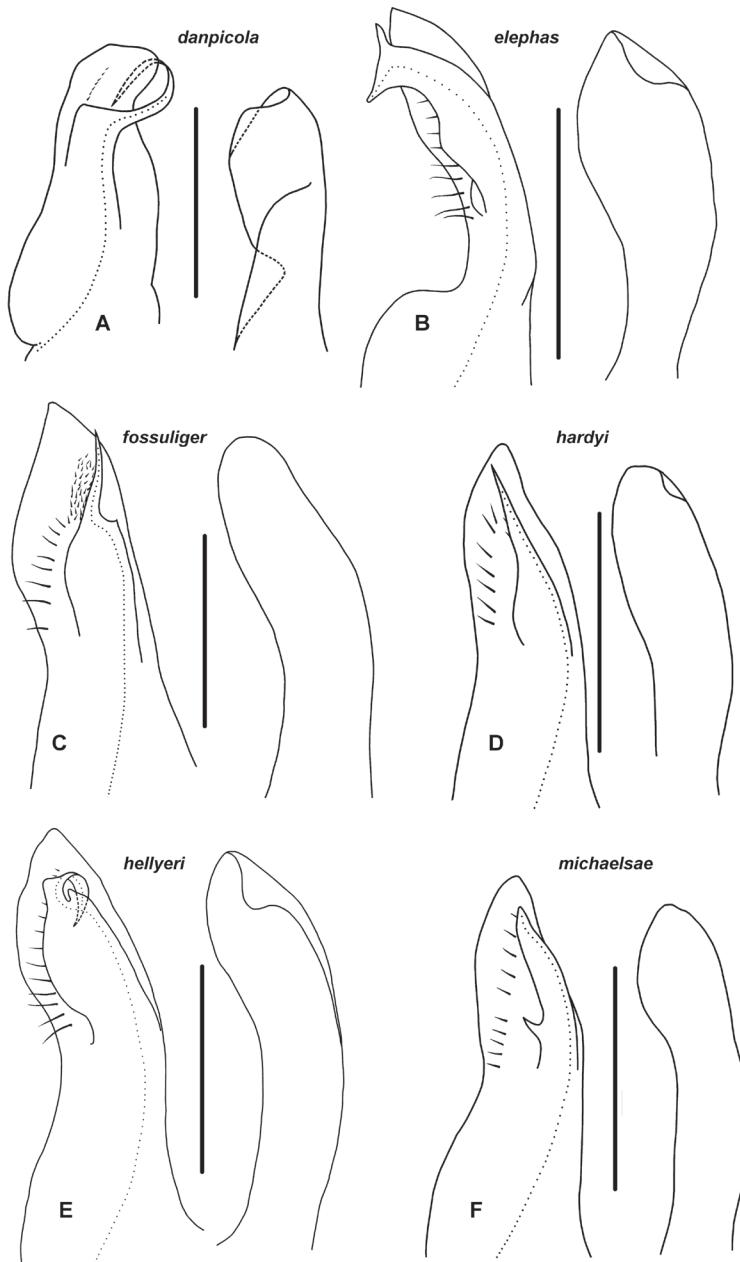
**Description.** Three mature males examined: (52+3) rings, 2.8 mm midbody diameter, (61+1) rings, 3.1 mm and (65+1) rings, 3.2 mm. Cardo not deeper posteriorly. Leg 7 (only) with elongated coxa. Prefemoral pad ca 1/2 femur length. Striae on posterior metazonites reaching ca 1/2 of ozopore height (Fig. 5C).

Coxite process on anterior gonopod (Fig. 6D) with small portion of posterodistal margin extended as rounded tab and folded over laterally. Telopodite with single row of prominent setae on posterior side of medial thickening and short row on anterior side near apex. Pseudoflagellum ca 1/2 telopodite width at base, slightly extended posteriorly at base, then gradually tapering to sharp, posterodistally directed point.

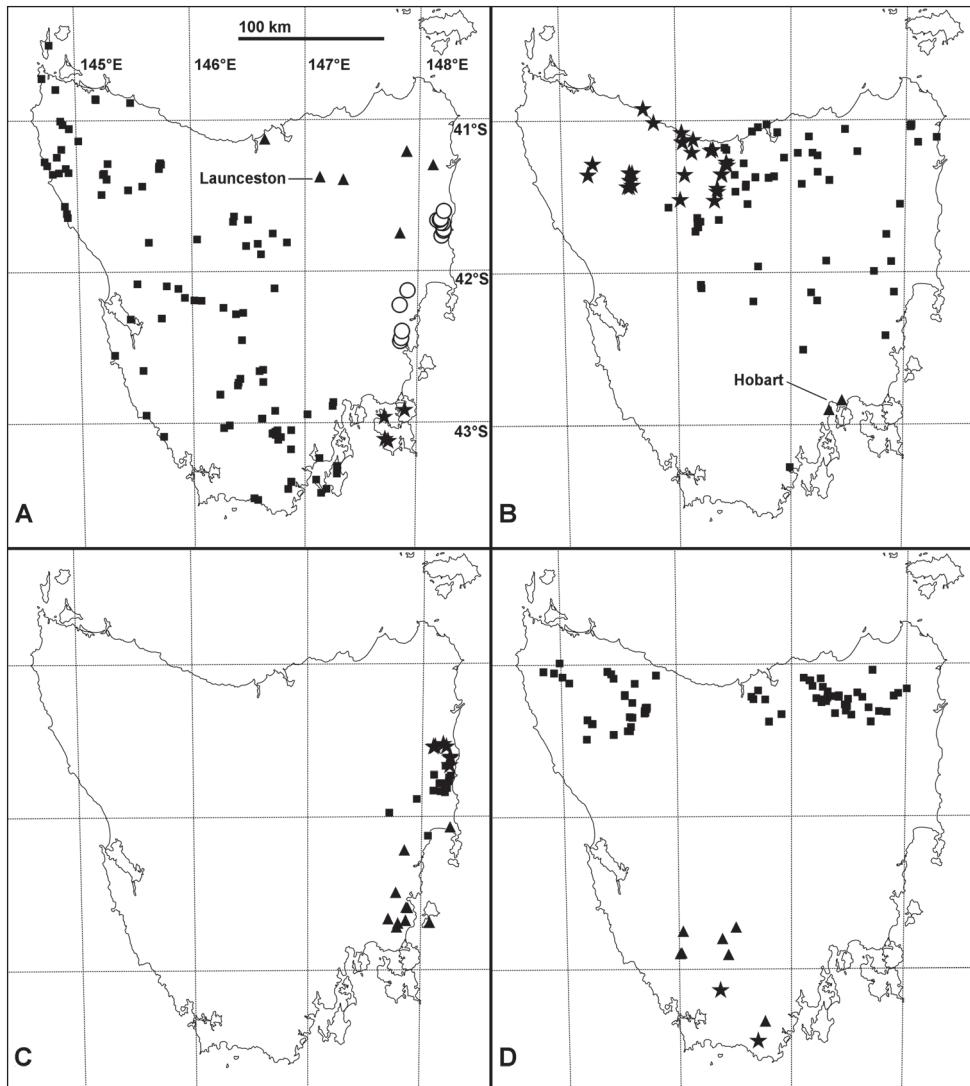
**Distribution.** Currently known only from eucalypt forest at two sites in the Hobart metropolitan area (Fig. 7B) in Tasmania: Mt Nelson (including 1973 collections at this type locality for *A. nichollsii*) and Mt Rumney.

**Remarks.** The types of *E. hardyi* were collected by the entomologist George H. H. Hardy, probably during Hardy's tenure as Assistant Curator of the Tasmanian Museum in Hobart, 1913–1917 (Marks 1991: 216). Hoffman (1972) examined and illustrated the *E. hardyi* holotype and assigned the species to *Amastigogonus*. The locality given for the types is simply "Tasmania" (Hoffman 1972: 204). Chamberlin (1920: 166–167) did not specify the number or gender of the *E. hardyi* paratypes.

Two males and one female of *A. nichollsii* were presumably sent to Verhoeff by G.E. Nicholls, collector of the *A. fossuliger* types. Hoffman (1972) synonymised *A. nichollsii* with *A. hardyi* after comparing Verhoeff's drawings of slide-mounted *nichollsii* gonopods with the unmounted gonopods of the *hardyi* holotype. After examining males from the *nichollsii* type locality, Mt Nelson (TMAG J5897 and J5926), I agree with Hoffman that *nichollsii* is a junior synonym of *hardyi*.



**Figure 6.** Right anterior gonopod, medial view of distal portion of telopodite (left) and lateral view of distal portion of coxite process (right); fo = fossa, cxp = coxite process, fl = posterobasal flange on telopodite, pg = prostatic groove, ps = pseudoflagellum, t = folded-over tab on coxite process, te = telopodite. Scale bars = 1 mm; dotted line indicates course of prostatic groove. **A** *Amastigogonus danpicola* sp. n., ex QVM 23:54378 **B** *A. elephas* sp. n., paratype, QVM 23:54369 **C** *A. fossuliger* Verhoeff, 1944, QVM 23:54406 **D** *A. hardyi* (Chamberlin, 1920), TMAG J5987 **E** *A. hellyeri* sp. n., paratype ex QVM 23:54515 **F** *A. michaelsae* sp. n., QVM 23:54387.



**Figure 7.** Known localities as of 14 July 2016 for Tasmanian Iulomorphidae; Mercator projections with approximate distance scale. **A** *Amastigogonus orientalis* sp. n. (open circles), *A. peninsulensis* sp. n. (stars), *A. tasmanianus* Brölemann, 1913 (triangles), *A. verreauxii* (Gervais, 1847) (squares) **B** *Amastigogonus fossuliger* Verhoeff, 1944 (squares), *A. hardyi* (Chamberlin, 1920) (triangles), *A. hellyeri* sp. n. (stars) **C** *Amastigogonus dampicola* sp. n. (squares), *A. elephas* sp. n. (stars), *A. michaelae* sp. n. (triangles) **D** *Atelomastix bonhami* sp. n. (triangles), *A. smithi* sp. n. (stars), *Equestrigonus tasmaniensis* gen. n., sp. n. (squares).

### *Amastigogonus hellyeri* sp. n.

<http://zoobank.org/FF20C7F6-F918-4BD8-B912-F25F8BDF1EF2>

Figs 4D, 6E

**Holotype.** Male, Keddies Creek area, Tas,  $-41.1704$   $146.0545 \pm 25$  m, 60 m a.s.l., 7 May 2016, R. Mesibov, QVM 23:54471.

**Paratypes.** 1 male, details as for holotype, QVM 23:54472; 2 males, same locality and collector but -41.1672 146.0569 ±250 m, 50-120 m a.s.l., 11 May 2016, tree trunks along Dial Road at night, QVM 23:54515.

**Other material.** 142 males and 10 females from 26 unique localities; details in Suppl. material 1.

**Diagnosis.** Like *A. orientalis* sp. n. in having a broad pseudoflagellum abruptly reduced apically; distinguished by having a smoothly curving rather than a subquadrate extension of the posterobasal telopodite margin, with a notch anteriorly at the base of the reduced pseudoflagellum tip and the tip relatively long and curving laterally or medially.

**Description.** Mature males observed with (40+4) rings, 2.5 mm midbody diameter to (63+1) rings, 3.9 mm. Cardo not deeper posteriorly. Leg 7 with elongated coxa, legs 10 and 11 with less elongated coxae. Prefemoral pad ca 1/2 femur length. Striae on posterior metazonites reaching ca 3/4 of ozopore height.

Coxite process on anterior gonopod (Fig. 6E) with posterodistal margin extended as rounded tab and sharply folded over laterally. Telopodite with single row of prominent setae on posterior side of medial thickening. Pseudoflagellum ca 2/3 telopodite width at base, posterior margin sometimes sinuous in transverse plane; abruptly narrowing apically with a shallow notch dividing the apex into small, rounded, anterior tooth and short, thinly laminar, acutely pointed extension, the latter usually folded over laterally and carrying the prostatic groove to its pointed tip.

**Distribution.** Eucalypt forest and cool temperate rainforest in northwest Tasmania (Fig. 7B), from near sea level to at least 760 m. Meets *A. fossuliger* parapatrically along the Mersey Break (Mesibov 1999) and overlaps to a small extent in far northwest Tasmania with *A. verreauxii*.

**Name.** For Henry Hellyer (1790-1832), explorer of northwest Tasmania; noun in the genitive case.

**Remarks.** The tip of the pseudoflagellum in preserved males is often bent laterally into the space between the pseudoflagellum and the rest of the telopodite, as shown in Fig. 6E. In other specimens it may be bent medially towards the coxite tip, or extend past the tip of the telopodite. This species otherwise varies little across its range.

#### *Amastigogonus michaelsae* sp. n.

<http://zoobank.org/EACF58B3-B650-4595-ADE9-69F25812F1EA>

Figs 4E, 6F

**Holotype.** Male, Douglas Creek, Tas, -42.5139 147.7767 ±100 m [label “EN 637 927” (= 55G 563700 5292700, AGD66)], 210 m a.s.l., 24 April 1991, R. Mesibov, QVM 23:54374; dissected, with head and anterior rings in genitalia vial.

**Paratypes.** 2 males, Montgomery Road, Tas, -42.6863 147.7111 ±50 m, 330 m a.s.l., 21 June 2016, R. Mesibov, QVM 23:54548.

**Other material.** 11 males and 1 probable female from 8 unique localities; details in Suppl. material 1.

**Diagnosis.** Like *A. peninsulensis* sp. n. in having a relatively broad, gently tapering pseudoflagellum; distinguished by the pseudoflagellum tip directed distally rather than posteriorly and with a prominent, posterodistally directed tooth basally on the posterior margin.

**Description.** Mature males observed with (55+1) rings, 3.3 mm midbody diameter to (66+1) rings, 3.4 mm. Cardo not deeper posteriorly. Leg 7 (only) with elongated coxa. Prefemoral pad ca 3/4 femur length. Striae on posterior metazonites reaching 3/4 ozopore height.

Coxite process on anterior gonopod (Fig. 6F) with posterodistal margin not extended and folded over. Telopodite without pronounced medial thickening, but with usual row of setae from near posterior margin to midline at telopodite apex, continued basally as group of sparse setae (not shown in Fig. 6F) behind tip of pseudoflagellum. Pseudoflagellum ca 1/3 telopodite width at base, curving slightly posteriorly and tapering gradually to rounded, posteriorly directed apex, and with short, sharp, posterodistally directed tooth at ca 1/4 pseudoflagellum height on posterior margin.

**Distribution.** Eucalypt forest in southeast Tasmania from Coles Bay south to the Nugent area, including Maria Island (Fig. 7C), from sea level to at least 590 m. Possibly parapatric with *A. danpicola* sp. n. near Swansea, parapatric or overlapping with *A. orientalis* sp. n. west of Triabunna.

**Name.** For the ecologist Karyl Michaels, who trapped specimens in the previously little-sampled dry forests of southeast Tasmania; noun in the genitive case.

**Remarks.** Most of the non-type males are partial or fragmented specimens.

### *Amastigogonus orientalis* sp. n.

<http://zoobank.org/8DAE3EF0-0CBE-4EEA-AF03-BFF855C47EA5>

Fig. 8A

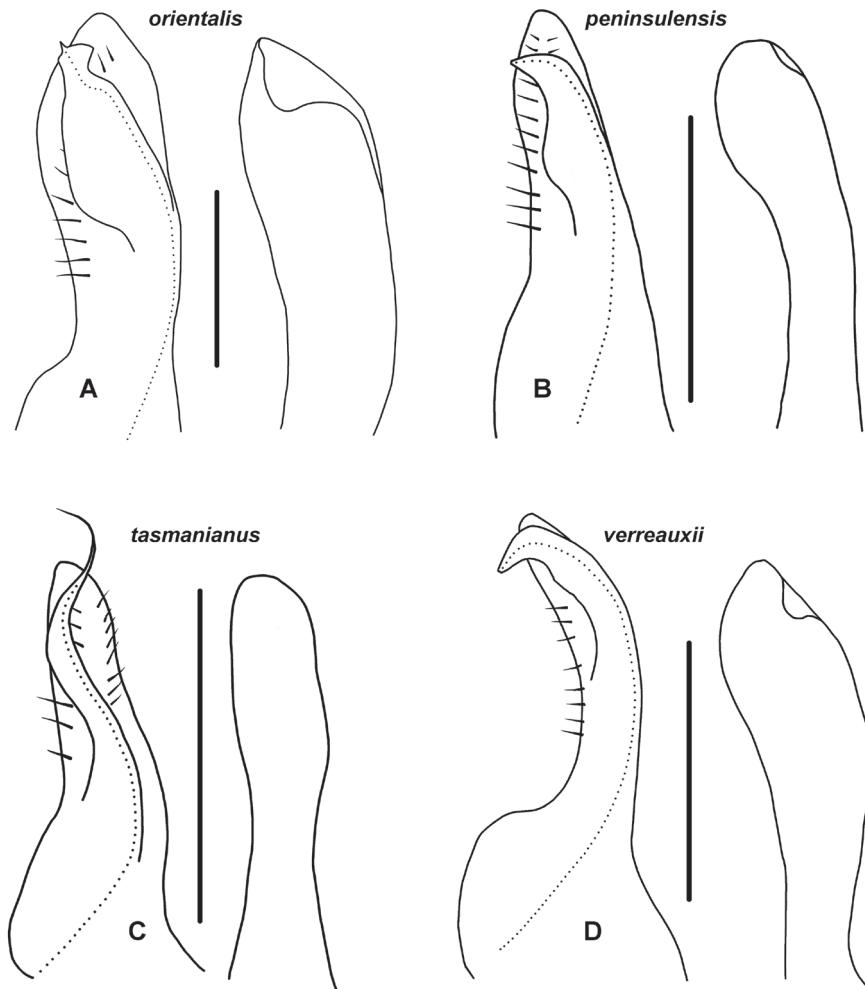
**Holotype.** Male, Maclaines Creek, Tas, -42.4628 147.8564 ±100 m [label “EN 703 983” (= 55G 570300 5298300, AGD66)], 260 m a.s.l., 26 April 1991, R. Mesibov, QVM 23:54523 (in 2 pieces).

**Paratypes.** 2 males, details as for holotype, QVM 23:54401.

**Other material.** 14 males and 3 probable females from 14 unique localities; details in Suppl. material 1.

**Diagnosis.** Like *A. hellyeri* sp. n. in having a broad pseudoflagellum abruptly narrowed apically; distinguished by having a subquadrate extension of the posterobasal telopodite margin, with the prostatic groove opening on a very short tooth-like extension of the reduced pseudoflagellum tip, rather than on a relatively long, flexible extension.

**Description.** Mature males observed with (43+3) rings, 2.6 mm midbody diameter to (67+0) rings, 4.2 mm. Cardo not deeper posteriorly. Leg 7 (only) with elongated



**Figure 8.** Right anterior gonopod, medial view of distal portion of telopodite (left) and lateral view of distal portion of coxite process (right); cxp = coxite process, fl = posterobasal flange on telopodite, pg = prosthetic groove, ps = pseudoflagellum, t = folded-over tab on coxite process, te = telopodite. Scale bars = 1 mm; dotted line indicates course of prosthetic groove. **A** *Amastigogonus orientalis* sp. n., paratype ex QVM 23:54401 **B** *A. peninsulensis* sp. n., QVM 23:54474 **C** *A. tasmanianus* Brölemann, 1913, ex QVM 23:54469 **D** *A. verreauxii* (Gervais, 1847), TMAG J5915.

coxa. Prefemoral pad ca 1/2 femur length. Striae on posterior metazonites reaching 3/4 ozopore height.

Coxite process on anterior gonopod (Fig. 8A) with posterodistal margin substantially extended as rounded tab and folded over laterally to ca 1/2 process width. Telopodite with posterobasal surface produced posteriorly as large rounded flange (Fig. 8A; fl) and with single row of prominent setae on posterior side of medial

thickening. Pseudoflagellum ca 1/2 width of telopodite at base, expanded slightly posteriorly, tapering gradually before expanding distally in wedge shape, often curving laterally, with very short pointed extension at middle of distal margin; prostatic groove making S-bend from anterior side of pseudoflagellum into tip, terminating in pointed extension. Posterior margin of pseudoflagellum sometimes sinuous in transverse plane.

**Distribution.** Eucalypt forest over ca 100 km linear extent in the Eastern Tiers of Tasmania (Fig. 7A) from ca 150 to at least 600 m elevation; the disjunction in the distribution map is likely to be a sampling artefact. Possibly parapatric with *A. elephas* sp. n. near Gray; overlapping to a small extent with *A. danpicola* sp. n. in the Douglas-Apsley National Park and with *A. fossuliger* northwest of Triabunna; parapatric or overlapping with *A. michaelsae* sp. n. in the southern Eastern Tiers.

**Name.** Latin *orientalis*, eastern; adjective. This species is restricted to the East Coast region of Tasmania.

***Amastigogonus peninsulensis* sp. n.**

<http://zoobank.org/2EB82B9E-9B71-4B83-864D-AE2AA906DBAF>

Fig. 8B

**Holotype.** Male, Coal Mine Hill, Tas, -42.9852 147.7113 ±25 m, 40 m a.s.l., 20 June 2016, R. Mesibov, QVM 23:54544.

**Paratypes.** 13 males and 5 females, details as for holotype, QVM 23:54545.

**Other material.** 3 males and 1 female from 3 unique localities; details in Suppl. material 1.

**Diagnosis.** Like *A. michaelsae* sp. n. in having a relatively broad, gently tapering pseudoflagellum, but with the tip directed distally and without a prominent tooth on the posterior margin.

**Description.** Mature males observed with (40+3) rings, 1.8 mm midbody diameter to (60+1) rings, 2.5 mm. Cardo not deeper posteriorly. Leg 7 (only) with elongated coxa. Prefemoral pad ca 3/4 femur length. Striae on posterior metazonites reaching 1/2 ozopore height.

Coxite process on anterior gonopod (Fig. 8B) with very small portion of postero-distal margin slightly extended as rounded tab, bent laterally rather than folded over. Telopodite with single row of prominent setae on posterior side of medial thickening and shorter row of similarly prominent setae on anterior side. Pseudoflagellum ca 1/2 width of telopodite at base, posterior margin a little expanded at 1/3-1/2 pseudoflagellum height, apex acuminate and directed posteriorly.

**Distribution.** Eucalypt forest on Forestier and Tasman Peninsulas (Fig. 7A) in Tasmania, from near sea level to at least 260 m.

**Name.** For the Tasman Peninsula, type locality of this species; adjective.

***Amastigogonus tasmanianus* Brölemann, 1913**

Figs 3F, 4F, 5A, 8C

*Amastigogonus tasmanianus* Brölemann 1913: 153, figs 32–37. Attems 1914: 293.

Chamberlin 1920: 167. Verhoeff 1944: 43. Jeekel 1971: 107; 1981: 40. Korsós and Read 2012: 45.

**Lectotype (here designated).** Male, Tasmania, date and collector unknown, AM KS.125304 (ex KS.37403). Intact specimen in 12 mm glass vial in 80% alcohol with original label “*Amastigogonus / tasmanianus m. / (H.W.B.)*”.**Paralectotypes.** Collection details as for lectotype, AM KS.37403. 1 female and parts of 2 dissected males: last 23 podous rings + apodous rings + telson, midbody 31 rings, head capsule + collum, and ring 7 (gonopods missing) and following 2 podous rings. Also 8 small filter-paper envelopes containing cleared body parts illustrated by Brölemann (1913). In 25 mm glass vial with original label “*Amastigogonus / tasmanianus m. / (H.W.B.)*”.**Other material.** 92 males, 1 probable female and 1 possible juvenile from 8 unique localities; details in Suppl. material 1.**Diagnosis.** Distinguished from all other *Amastigogonus* species by having a long, gradually tapering, narrowly ribbon-like pseudoflagellum.**Description.** Mature males observed with (46+2) rings, midbody diameter 2.5 mm to (67+1) rings, 3.4 mm. Cardo not deeper posteriorly. Leg 7 (only) with elongated coxa. Prefemoral pad 1/3-1/2 femur length (Fig. 5A). Striae on posterior metazonites reaching ca 1/2 of opopore height.

Coxite process on anterior gonopod (Fig. 8C) with posterodistal margin not extended and folded over. Telopodite with single row of prominent setae on posterior and anterior sides of medial thickening. Pseudoflagellum arising at 1/3-1/2 telopodite height, ca 1/2 width of telopodite at base, ribbon-like, curving sinuously first posterodistally, then anterodistally, tapering abruptly to sharp point (ribbon-like apex of pseudoflagellum shown edge-on in Fig. 8C).

**Distribution.** Eucalypt forest and cool temperate rainforest at scattered locations in northeast Tasmania (Fig. 7A), from ca 100 m elevation to at least 1000 m. Co-occurs with *A. fossuliger*.**Remarks.** The types were in excellent condition when examined in 2016. Because it is not possible to decide which of the two dissected male syntypes (or both) was illustrated by Brölemann, I am unable to follow Recommendation 74B (Preference for illustrated specimen) of the International Code of Zoological Nomenclature in choosing a lectotype, and instead have selected the intact male syntype. The lectotype is the third of the three males listed by Brölemann (1913: 154): “length 44 m/m; diameter 2.80 m/m; 56 segments; three segments apodous; 99 pair of legs”.

I suspect that the type locality is the Launceston area, and the QVM male illustrated in Figs 3F, 4F and 5A is from Mowbray in Launceston.

***Amastigogonus verreauxii* (Gervais, 1847)**

Figs 4G, 8D

*Iulus verreauxii* Gervais 1847: 175.*Julus Verreauxii* Preudhomme de Borre 1884: 62.*“Julus” verreauxii* Jeekel 1981: 43.*Amastigogonus verreauxii* Mauriès et al. 2001: 585 (new combination), fig. 3. Korsós and Read 2012: 45.

**Holotype.** Male, “De la Nouvelle-Hollande, sur le penchant du mont Wellington, par M. Jules Verreaux” (Gervais 1847: 175), MNHN GA031. Described and illustrated by Mauriès et al. (2001), specimen not re-examined.

**Other material.** 360 males, 100 probable females and 34 possible juveniles from 111 unique localities; details in Suppl. material 1.

**Diagnosis.** Like *A. elephas* sp. n. in having a telopodite with a subquadrate extension of the posterobasal margin and a posteriorly curving pseudoflagellum; distinguished from *A. elephas* sp. n. in the pseudoflagellum lacking a small, tooth-like, distally directed extension on the tip.

**Description.** Mature males observed with (38+4) rings, midbody diameter 2.2 mm to (55+1) rings, 3.2 mm in single 1-month pitfall sample, QVM 23:54197. Cardo not deeper posteriorly. Leg 7 (only) with elongated coxa. Prefemoral pad ca 3/4 femur length. Striae on posterior metazonites reaching ca 3/4 of ozopore height.

Coxite process on anterior gonopod (Fig. 8D) with small portion of posterodistal margin extended as rounded tab, sharply folded over laterally. Telopodite with posterobasal surface produced posteriorly as subquadrate flange (Fig. 8D; fl) and with single row of prominent setae on posterior side of medial thickening, on anterior side of thickening continued to telopodite apex as short row of more closely spaced setae (not shown in Fig. 8D). Pseudoflagellum arising at ca 2/3 telopodite height, ca 1/2 width of telopodite at base, curving posterodistally, the apex narrowing to truncate, posterobasally directed tip.

**Distribution.** Widespread in forested and some non-forested habitats in western and southern Tasmania and on the Central Plateau (Fig. 7A) from sea level to at least 1260 m; also found on Hunter Island in the Hunter Group in western Bass Strait. Overlaps (with some parapatry?) with *A. hellyeri* sp. n. in northwest Tasmania, and with *A. fossuliger* on the Central Plateau and possibly in far southern Tasmania (see distribution notes for *A. fossuliger*).

**Remarks.** Gervais (1847) described *Iulus Verreauxii* from material in the Muséum national d’Histoire naturelle in Paris. A presumed holotype was still in the Muséum more than 150 years later and was redescribed and illustrated by Mauriès, Golovatch and Hoffman (2001), who assigned the species to *Amastigogonus*. The type material had probably been collected on Mt Wellington by the naturalist Jules Pierre Verreaux ca 1843 during his residency in Tasmania (Maiden 1910: 153).

Mauriès, Golovatch and Hoffman (2001: 585) refer to a “very faint axial line” on the promentum of the *A. verreauxii* holotype. The line appears to be an artefact of long preservation, as I have not observed it in any *A. verreauxii* specimens.

*A. verreauxii* varies remarkably little in size or gonopod details over its large range.

### *Atelomastix* Attems, 1911

*Atelomastix* Attems 1911: 183 (in genus key), 192 (first description); 1926: 206; 1928: 312. Verhoeff 1913: 59; 1924: 74, 83; 1932: 1728, 1732, 1735, 1741; 1944: 33. Jeekel 1971: 107 (type species designated); 1985: 106; 2009: 31. Hoffman 1980: 91. Mauriès 1987: 196, 198. Korsós and Johns 2009: 3. Edward and Harvey 2010: 6. Korsós and Read 2012: 44.

**Type species.** *Atelomastix albanyensis* Attems, 1911, by subsequent designation.

**Other assigned species.** *A. albanyensis* Attems, 1911, *A. anancita* Edward & Harvey, 2010, *A. attemsi* Edward & Harvey, 2010, *A. bamfordi* Edward & Harvey, 2010, *A. bonhami* sp. n., *A. brennani* Edward & Harvey, 2010, *A. culleni* Edward & Harvey, 2010, *A. danksi* Edward & Harvey, 2010, *A. dendritica* Edward & Harvey, 2010, *A. ellenae* Edward & Harvey, 2010, *A. flavognatha* Edward & Harvey, 2010, *A. francesae* Edward & Harvey, 2010, *A. gibsoni* Edward & Harvey, 2010, *A. grandis* Edward & Harvey, 2010, *A. julianneae* Edward & Harvey, 2010, *A. lengae* Edward & Harvey, 2010, *A. longbottomi* Edward & Harvey, 2010, *A. mainae* Edward & Harvey, 2010, *A. melindae* Edward & Harvey, 2010, *A. montana* Edward & Harvey, 2010, *A. nigre-scens* Attems, 1911, *A. poustiei* Edward & Harvey, 2010, *A. priona* Edward & Harvey, 2010, *A. psittacina* Edward & Harvey, 2010, *A. rubricephala* Edward & Harvey, 2010, *A. sarahae* Edward & Harvey, 2010, *A. smithi* sp. n., *A. solitaria* Jeekel, 2009, *A. tigrina* Edward & Harvey, 2010, *A. tumula* Edward & Harvey, 2010.

### *Atelomastix bonhami* sp. n.

<http://zoobank.org/BD14A17E-4688-4E7E-AA1D-CF02AC0612F3>

Figs 9, 10A, C, D

**Holotype.** Male, White Spur, Tas,  $-42.7764$   $146.0369 \pm 100$  m [label “DN 211 634” (= 55G 421100 5263400, AGD66)], 320 m a.s.l., 2 February 1994, R. Mesibov, QVM 23:54460.

**Paratypes.** 1 male, 1 female, details as for holotype, QVM 23:54176.

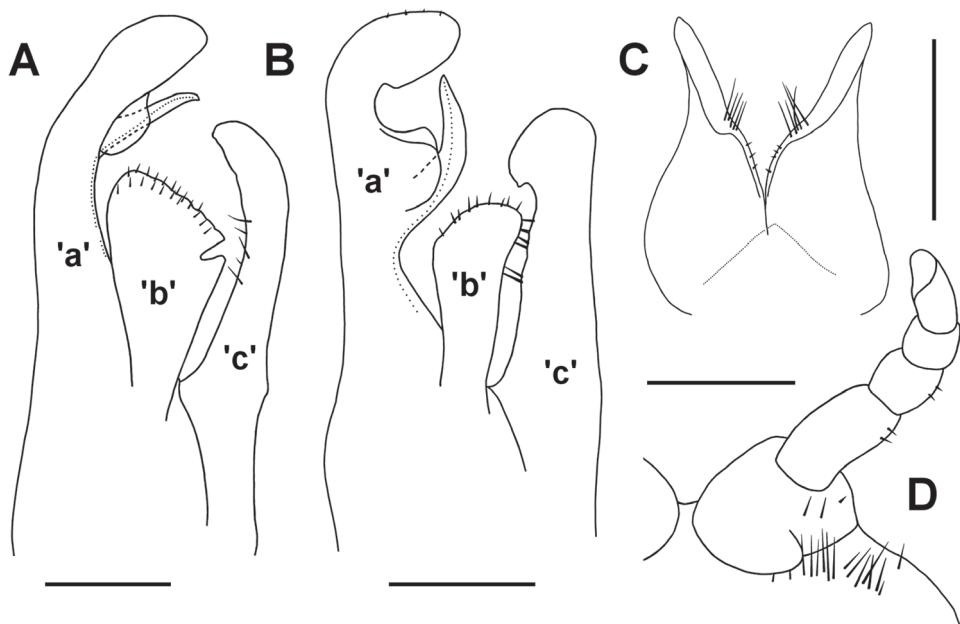
**Other material.** 7 males, 5 females and 5 juveniles from 7 unique localities in Tasmania; details in Suppl. material 1.

**Diagnosis.** Most similar to *A. gibsoni* Edward & Harvey, 2010 from the Ravensthorpe Ranges in Western Australia; both species have a wedge-shaped sclerite “b”



**Figure 9.** *Atelomastix bonhami* sp. n., males. **A** Left lateral view showing partly everted gonopods; QVM 23:54175 **B** Ventral view of partly dissected specimen showing legpair 1 in situ; at = anterior tab on prefemur; QVM 23:54174 **C** Left lateral view of telson; QVM 23:54140. Scale bars: **A, C** = 1.0 mm, **B** = 0.5 mm.

and a non-bifurcate sclerite “c”. Differences between *A. bonhami*/*A. gibsoni*: rounded tab present under sclerite “a” near pseudoflagellum/no tab; anterior corner of distal margin of sclerite “b” higher than posterior corner/anterior corner lower than posterior corner; sclerite “c” taller than sclerite “b”/ sclerite “c” shorter than sclerite “b”.



**Figure 10.** **A, C, D** *Atelomastix bonhami* sp. n., male, QVM 23:54174 **B** *A. smithi*, sp. n., male paratype, QVM 23:24959 **A, B** Left anterior gonopod, medial view; ps = pseudoflagellum, t = process “a” tab; dotted line indicates prostatic groove **C** Posterior gonopods, posterior view **D** Left leg 1, anterior view; at = anterior tab on prefemur. Scale bars = 0.25 mm.

**Description.** *Atelomastix* as a genus has been well characterised by Edward and Harvey (2010), who described or redescribed 27 species from Western Australia. *A. bonhami* sp. n. fits the genus description and only key details are noted here.

Colour in alcohol variable, dark blueish grey to dark brown anteriorly on metazonites, pale posteriorly; some specimens largely brown. Ocelli 30–40 in 4–5 horizontal rows. Mature males with (37+5) rings, 2.0 mm midbody diameter to (60+1) rings, 2.3 mm. Longitudinal striae on metazonites meeting suture almost at right angle. Female substantially more robust than male with similar ring number, e.g. male with (51+1) rings, midbody diameter 2.2 mm vs female with (52+1) rings, midbody diameter 2.8 mm, both in QVM 23:54140.

Male gonopod aperture with sides slightly raised (Fig. 9A). Anterior gonopods nearly touching along midline. Sclerite “a” (Fig. 10A) curving posteriorly with pseudoflagellum (Fig. 10A; ps) arising at ca 3/4 gonopod height, extending posteriorly and slightly distally and gradually tapering to rounded apex; a thin, rounded tab (Fig. 10A; t) arising just distal to pseudoflagellum origin along sclerite midline. Sclerite “b” arising medially at ca 1/3 gonopod height, ca 3x as wide distally as at origin, thickly lamellar with distal half slightly bent medially, the distal margin with rounded anterior corner, sloping posterobasally with small, rounded notch at posterior corner; a double row of small, short setae near distal margin. Sclerite “c” more or less cylindrical basally, the apex curving slightly anteriorly and spatulate, the concave surface

facing anterolaterally; a few long setae on anterior surface of sclerite at level of sclerite “b” distal margin.

Posterior gonopods (Fig. 10C) appressed basally along midline, 1/3-1/2 anterior gonopod height. Each posterior gonopod basally conical, tapering and with antero-lateral extension; extension slightly flattened with a few long, mediodistally directed setae near base of extension on posteromedial surface and a few short setae at ca 1/2 gonopod height on medial surface.

Leg 1 (Fig. 10D) with prefemur wider than long, slightly tapering, with triangular tab (Figs 9B, 10D; at) on anteromedial surface of prefemur; relative lengths of podomeres femur>prefemur>tarsus>postfemur>tibia; tarsus distally excavate on anteromedial surface; prefemur, femur and postfemur with a few small setae laterally. Legpair 1 clearly separated on coxosternite, the latter with a field of long setae anterolateral to each prefemur.

Posterolateral margin of preanal ring meets epiproct margin at obtuse angle, making anal valves appear more prominent in lateral view than in other Tasmanian Iulomorphidae (Fig. 9C).

**Distribution.** Known from wet forest, rainforest and scrub over ca 1500 km<sup>2</sup> in southwest Tasmania at elevations ca 300-1100 m (Fig. 7D).

**Name.** For Kevin Bonham, Tasmanian malacologist and diligent millipede hunter, who collected this species at two remote sites in 2016; noun in the genitive case.

**Remarks.** The posterior gonopod of *A. bonhami* sp. n. is similar to that of *A. nigrescens* as illustrated in figs 13, 14 and 118 of Edward and Harvey (2010), and leg 1 of *A. bonhami* sp. n. closely resembles leg 1 of *A. solitaria* as illustrated in fig. 2 of Jeekel (2009).

Jeekel (2009: figs 3, 4) does not show the *A. solitaria* anterior gonopod in lateral view, so the shapes of the sclerites are unclear. From Jeekel’s description of *A. solitaria* and his fig. 4, it appears that sclerite “c” is sharply bent with an acuminate apex, unlike the smoothly curving, apically rounded sclerite “c” of *A. bonhami* sp. n. and the following species, and is shorter than “b”, rather than longer as in *A. bonhami* sp. n. and the following species.

### *Atelomastix smithi* sp. n.

<http://zoobank.org/29E9625F-5B3F-4325-BF06-11694A4D9BC2>

Fig. 10B

**Holotype.** Male, Ooze Lake, Tas, -43.5003 146.7019 ±100 m [label “DM 758 834” (= 55G 475800 5183400, AGD66)], 870 m a.s.l., 16 February 1988, S.J. Smith, QVM 23:54179; dissected.

**Paratypes.** 2 males and 1 juvenile, details as for holotype, QVM 23:54484; 1 male, Promontory Lake, Tas, -43.1667 146.3653 ±1 km [label “DN 483 203” (= 55G 448300 5220300, AGD66)], 25 February 2004, P. Sugden, QVM 23:24959.

**Other material.** None.

**Diagnosis.** Readily distinguished from the otherwise similar *A. bonhami* sp. n. by the pseudoflagellum curving distally; this difference can be seen in undissected males.

**Description.** As for *A. bonhami* sp. n., but the two known males with 40-50 ocelli in 5-6 horizontal rows; holotype with (54+0) rings, 2.2 mm midbody diameter, paratype with (47+1) rings, 2.1 mm. Females (QVM 23:54484) more robust than males: (42+1) and (47+0) rings, both 2.5 mm in midbody diameter.

Anterior gonopod (Fig. 10B) with sclerite "a" bending posteriorly near bluntly rounded, thickened apex; pseudoflagellum (Fig. 10B; ps) arising at ca 3/4 gonopod height, curving smoothly distally, bending medially and terminating just beneath sclerite "a" apex; a longitudinally divided, thickened tab (Fig. 10B; t) arising just distal to pseudoflagellum origin along sclerite "a" midline. Sclerite "b" arising medially at ca 1/3 gonopod height, ca 2x as wide distally as at origin, thickly lamellar, the distal margin with rounded corners, sloping anterobasally; a double row of small, short setae near distal margin. Sclerite "c" more or less cylindrical, slightly tapered, apex thickened with shallow notch on anterior surface; a few long setae on anterior surface of sclerite at level of sclerite "b" apex.

**Distribution.** Known from two localities ca 45 km apart at ca 900 m elevation, south and west of the known range of *A. bonhami* sp. n. in southwest Tasmania (Fig. 7D). *A. smithi* sp. n. is likely to be more widely distributed in this little-sampled wilderness area.

**Name.** For Steven J. Smith, first collector of this species and formerly a senior zoologist with the Tasmanian Parks and Wildlife Service; noun in the genitive case.

### *Equestrigonus* gen. n.

<http://zoobank.org/0FB5A7A5-C4DE-4C93-A17A-8D857A7C9B4A>

**Diagnosis.** Like *Amastigogonus* and *Victoriocambala* Verhoeff, 1944 in having greatly reduced posterior gonopods with a single lateral process, and relatively simple, two-branched anterior gonopods with the prostatic groove entering a pseudoflagellum on the telopodite. Distinguished from the other two genera by the form of the anterior gonopods (Figs 11A, 13A): coxite process a bluntly pointed rod, longer than telopodite; telopodite slender with a distal, spreading crown of setae. Distinguished from all other Tasmanian Iulomorphidae by the posteroventral extension of the cardo (Fig. 12B; ce) in males.

**Type species.** *Equestrigonus tasmaniensis* sp. n., by present designation.

**Name.** From Latin *equestris*, genitive singular of *equester*, pertaining to horse-riding, plus *-gonus*, a suffix commonly used in millipede names, referring to the gonopods; masculine gender. The tips of the anterior gonopod of the type species (Fig. 11A) resemble the ends of prick and rowel spurs.

***Equestrigonus tasmaniensis* sp. n.**

<http://zoobank.org/3C11041C-35F8-415A-99C9-DE4872950642>

Figs 11, 12, 13

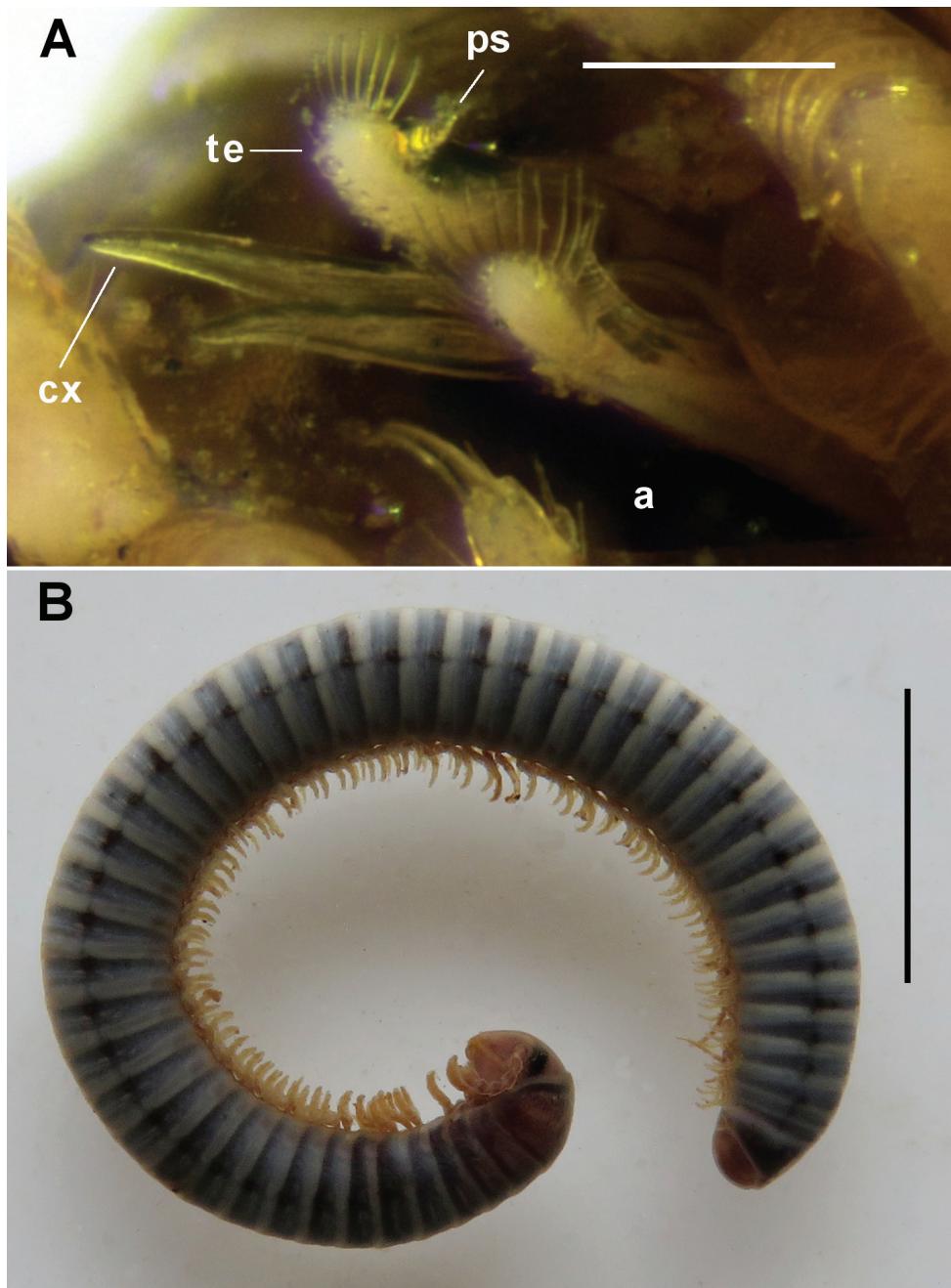
**Holotype.** Male, Sideling Range, Tas, -41.2358 147.4131 ±100 m [label “EQ 345 348” (= 55G 534500 5434800, AGD66)], 550 m a.s.l., 7 July 1993, T. Kingston, QVM 23:54173 (ex 23:11638).

**Paratypes.** 3 males, Sideling Range, Tas, -41.2303 147.4117 ±100 m [label “EQ 344 354” (= 55G 534400 5435400, AGD66)], 550 m a.s.l., 15 June 1992, T. Kingston and R. D’Orazio, QVM 23:12719; 6 males, same details but 13 September 1993, T. Kingston et al., QVM 23:54057; 6 males, same locality but -41.2411 147.4106 ±100 m [label “EQ 343 342” (= 55G 534300 5434200, AGD66)], 540 m a.s.l., 14 September 1993, T. Kingston et al., QVM 23:54094; 2 males, same locality but -41.2394 147.4083 ±100 m [label “EQ 341 344” (= 55G 534100 5434400, AGD66)], 500 m a.s.l., 14 September 1993, T. Kingston et al., QVM 23:54095; 1 male, details as for holotype, 23:11637; 1 male, details as for holotype, QVM 23:11638.

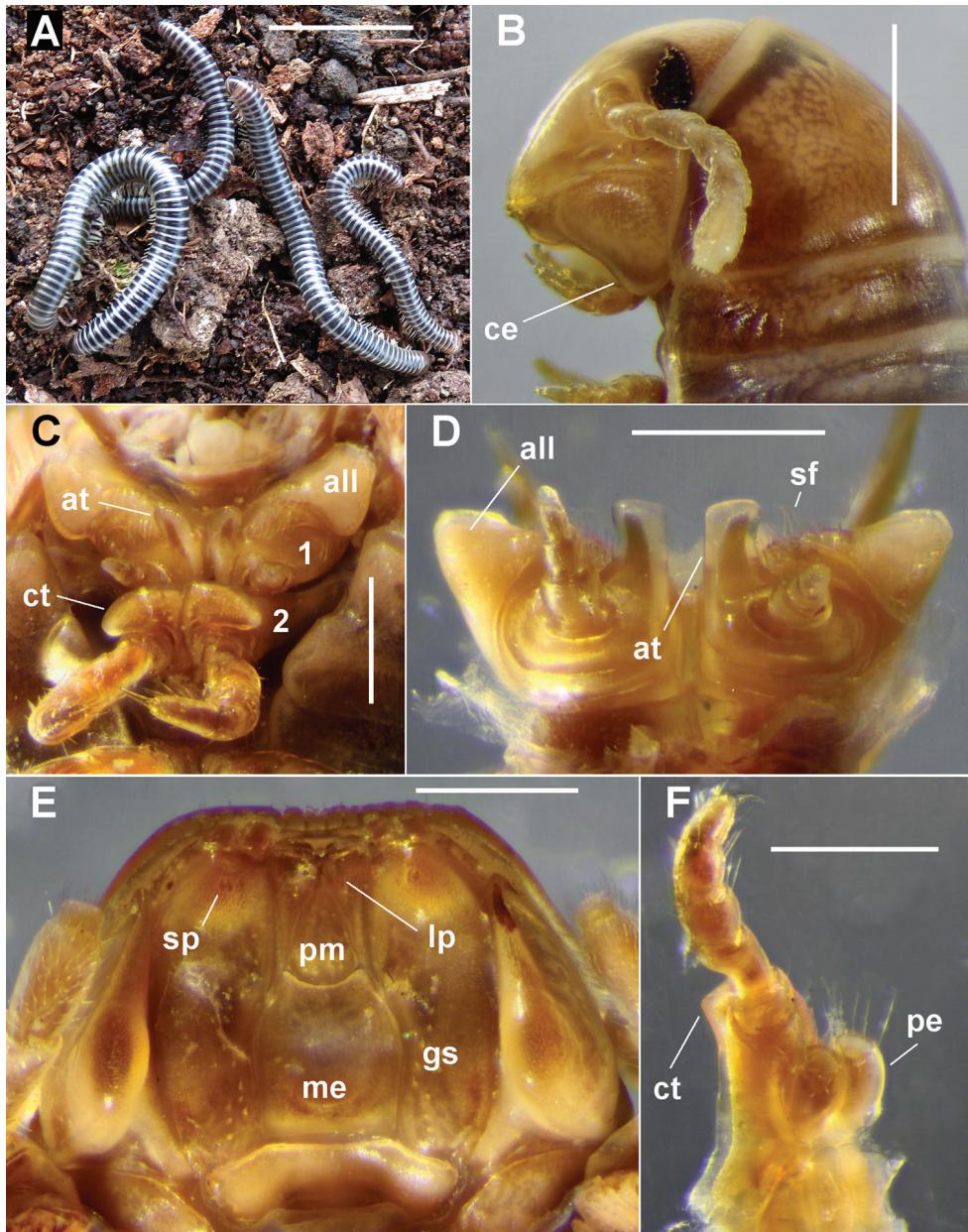
**Other material.** 1013 males, 82 probable females and 12 possible juveniles from 68 unique localities in Tasmania; details in Suppl. material 1.

**Description.** Living animals (Fig. 12A) have dark grey rings with annular pale band at rear of each metazonite; head, collum and last 1-2 rings before telson tinged with light brown; legs pale. With long storage in alcohol, ring colour fades to dark blue-grey, annular band darkens to light grey; often with brownish tinge on anterior rings; head and legs pale golden yellow (Fig. 11B).

Mature males (Fig. 11B) with (34+4) rings, 2.0 mm midbody diameter to (50+1) rings, 3.0 mm. Head (Fig. 12B) smooth, frons flattened, vertigial sulcus reaching to level of dorsalmost ocellar row. Posteroventral margin of cardo thickened and extended ventrally as large, rounded lobe (Fig. 12B; ce). Ocellar area narrow-triangular, triangle apex medial; ca 27 ocelli in 4 more or less regular horizontal rows, dorsal>ventral typically 9+8+6+4. Antennae short, barely reaching past posterior edge of collum when manipulated dorsally; relative antennomere lengths (2=3)>6>(4=5); antennomere 6 widest; 4 apical cones; socket ca 1 socket diameter from lateral margin of head capsule. Gnathochilarium (Fig. 12E) with lateral edges of mentum (Fig. 12E, me) slightly convex, mentum wider than combined lingual plates (Fig. 12E, lp); mentum-promentum (Fig. 12E, pm) junction nearly straight or slightly concave anteriorly; a prominent pit (Fig. 12E, sp) with small seta anteriorly on each gnathochilarial stipes (Fig. 12E, gs). Collum convex, laterally narrowing with rounded corner, margins straight. Ventral margin of ring 2 swollen posteriorly. Prozonites only slightly narrower than metazonites; prozonites with weakly defined annular striae anteriorly; suture weakly defined; fine longitudinal striae on lower half of metazonite, anterior end of each stria bent obliquely upwards towards suture; prozonites and metazonites with surface otherwise smooth, free of setae. Ozopores small, beginning ring 6, opening just above 1/2 ring height at ca 1/3 the distance between suture and posterior metazonite margin. Limbus lamellar, undivided. Preanal ring smooth, epiproct broadly rounded, extend-



**Figure 11.** *Equestrigonus tasmaniensis* gen. n., sp. n. **A** Gonopod aperture (a) of male paratype QVM 23:11638, left ventrolateral view, showing protruding tips of anterior gonopods. cx = right coxite tip ("prick spur"), te = right telopodite tip ("rowel spur"), ps = pseudoflagellum **B** Male holotype QVM 23:54173, habitus. Scale bars: **A** = 0.2 mm, **B** = 5 mm.



**Figure 12.** *Equestrigonus tasmaniensis* gen. n., sp. n. **A** Living animals before preservation in QVM 23:54467 **B–F** male paratype ex QVM 23:54094 **B** Head, left lateral view, showing ventral projection (ce) of cardo. **C** Dissection with head removed, ventral view, showing leg 1 complex and legs 2 in situ. all = anterolateral extension of leg 1 coxosternite, at = anterior tab of leg 1 prefemur, ct = coxal tab of leg 2 **D** Dissected leg 1 complex, posteroventral view; sf = field of setae **E** Gnathochilarium, ventral view; gs = gnathochilarial stipes, lp = lingual plate, me = mentum, pm = promentum, sp = pit on gnathochilarial stipes **F** Right leg 2, right posterolateral view (left leg removed for clarity); pe = left leg penis. Scale bars: **A** = 10 mm, **B** = 1.0 mm; **C–F** = 0.5 mm.

ing slightly over anal valves; hypoproct with margin slightly convex dorsally. Midbody legs short, ca 2/3 ring diameter when extended; relative podomere lengths (prefemur=emur)>tarsus>(postfemur=tibia), claw ca 1/2 tarsus length. Prefemur distally with ventral flattening and conical prefemoral pad ca 1/2 femur length on midbody legs; pads first appear on ring 5 legs, diminish in posterior 1/3 of body and are greatly reduced or absent on last few legpairs.

Legpair 1 (Fig. 12C, D) separate on coxosternite, each leg 1 composed of broad basal and leg-like distal portion. Basal portion here assumed to be prefemur; widest at base, tapering medially, extending anterolaterally at base as large lobe (Fig. 12D; all) with a few distal setae; prefemur marked with several quasi-annular chitinous ridges and anteriorly bearing small field of coarse setae (Fig. 12D; sf), with large subquadrate tab (Fig. 12D; at) extending anteriorly. Distal portion with 3 well-demarcated podomeres, here assumed to be femur, postfemur and fused tibia+tarsus; femur widest, the tibia+tarsus narrowest and longest and with faint annular subdivision; all 3 podomeres sparsely and shortly setose; no claw.

Leg 2 (Fig. 12C, F) incrassate with large claw, prefemur reduced, coxa expanded anteriorly and distally with thick, tab-like apex (Figs 12C, F; ct); penis (Fig. 12F; pe) arising basally on posterior coxal surface, barrel-shaped with a few long setae in distal, marginal crown.

Coxae not elongated on near-aperture legs. Rear portion of gonopod aperture flat, not raised behind gonopods.

Anterior gonopods (Figs 11A, 13A) with coxite process (Figs 11A, 13A; cx) tapering to blunt spine extending further distally than telopodite (Figs 11A, 13A; te), and with short, spine-like process (Fig. 13A; pr) arising on anterior surface at level of pseudoflagellum on telopodite and directed distally. Telopodite tapering strongly, apex spatulate with spreading, marginal crown of ca 15 long, well-spaced setae; pseudoflagellum (Figs 11A, 13A; ps) branching off at ca 3/4 telopodite height on anterior surface, tapering to blunt tip and curving medially to terminate proximal to telopodite apex.

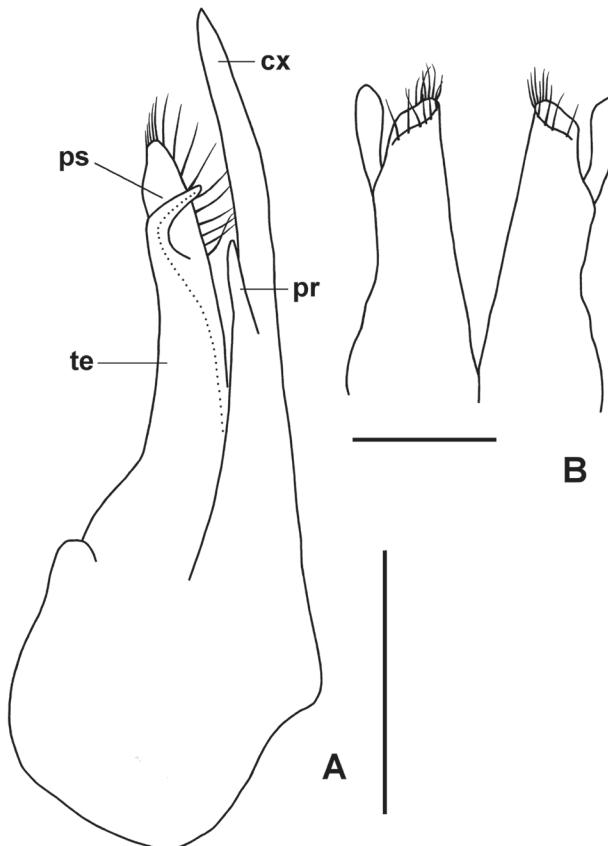
Posterior gonopods (Fig. 13B) ca 1/2 length of anterior gonopods, tapering from base, apex truncate distolaterally with apical crown of long setae; lateral process arising at ca 1/2 gonopod height, terminating at same level as body of gonopod, tip slightly expanded and flattened with convex distal margin.

Mature females (specimens in QVM 23:54050 and 23:54467) a little larger than males with same ring number; cardo not extended ventrally as in male.

**Distribution.** Wet eucalypt forest and cool temperate rainforest in northern Tasmania (Fig. 7D), from 50 m to at least 900 m elevation; not yet collected south of 41°30'S latitude. Wanders on the forest floor and climbs tree trunks at night; shelters during the day in and under rotting logs and in leaf litter.

**Name.** For the occurrence of this species in Tasmania; adjective.

**Remarks.** The distinctive tips of the anterior gonopods invariably protrude from the gonopod aperture (Fig. 11A), allowing males of *E. tasmaniensis* gen. n., sp. n. to be recognised without dissection. Western Tasmanian males are generally a little larger in diameter than eastern males.



**Figure 13.** *Equestrigonus tasmaniensis* gen. n., sp. n., QVM 23:54467. **A** Anterior and slightly medial view of left anterior gonopod; cx = coxite, pr = small process on coxite, te = telopodite, dotted line indicates prostatic groove ending on pseudoflagellum (ps) **B** Posterior view of posterior gonopods. Scale bars: **A** = 0.5 mm, **B** = 0.25 mm.

## Discussion

I am not certain that *Amastigogonus* and *Equestrigonus* gen. n. are endemic to Tasmania, because the iulomorphid fauna of mainland Australia is still very poorly known. The few well-described iulomorphids from the eastern Australian mainland, closest to Tasmania, were named from a small number of specimens mostly held in non-Australian collections: *Apocoptogonus* Jeekel, 2006 (two species from one locality each in New South Wales), *Atelomastix* (one species from one locality, Victoria), *Dimerogonus* Attems, 1903 (one species from one locality, New South Wales), *Merioproscelum* Verhoeff, 1924 (one species from one locality, Queensland), *Proscelomerion* Verhoeff, 1924 (one species from one locality, Queensland), *Thaumaceratopus* Verhoeff, 1924 (two species from one locality, Queensland) and *Victoriocambala* (one species from one locality, one species from six localities, Victoria) (Mesibov 2006–2017).

Like the dalodesmid Polydesmida genus *Tasmaniosoma* Verhoeff, 1936 (Mesibov 2010, 2015), *Amastigogonus* in Tasmania has its highest species diversity on the east coast of the main island, with several small-range endemics there and some mosaic parapatry. Parts of the east coast, and especially the surrounds of the city of Hobart, have unfortunately been degraded by almost 200 years of clearing, grazing and frequent burning. Native millipede populations have been greatly reduced or eliminated as a result, and in some places have been completely replaced by the introduced *Ommatoiulus moreleti* (Lucas, 1860) and other European julids. The iulomorphid most at risk may be the Hobart-area endemic *A. hardyi*, which has not yet been found in the city's larger conservation reserves.

The recognition of two *Atelomastix* species from a high-rainfall district in Tasmania is an interesting result of the present study. Jeekel (2009: 34) wrote that the discovery of *A. solitaria* was "a remarkable and unexpected extension of the known range of the genus *Atelomastix* from the south-western area of Western Australia to the western edge of Victoria" and considered it possible that the label locality was accidentally in error. It now seems possible that *Atelomastix* species could also occur in high-rainfall parts of eastern Victoria, and perhaps southern New South Wales.

Using a draft version of this paper, Henrik Enghoff (in litt., 26 July 2016) has identified *Amastigogonus tasmanianus* and *A. verreauxii* as millipede species that are parasitised by the fungus *Rickia candelabrum* Santamaria et al., 2016 and that were referred to as undetermined Iulomorphidae in Santamaria et al. (2016). The relevant records are included in Suppl. material 1.

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## Supplementary material I

### Specimen records of Tasmanian Iulomorphidae

Authors: Robert Mesibov

Data type: Tab Separated Value File (tsv).

Explanation note: Specimen records of Tasmanian Iulomorphidae as of 14 July 2016.

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# Cryptorchestia ruffoi sp. n. from the island of Rhodes (Greece), revealed by morphological and phylogenetic analysis (Crustacea, Amphipoda, Talitridae)

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## Abstract

A new *Cryptorchestia* species, *Cryptorchestia ruffoi* Latella & Vonk, **sp. n.** from the island of Rhodes in south-eastern Greece, can be distinguished on the basis of morphological and phylogenetic data. Morphological analysis and DNA sequencing of mitochondrial and nuclear protein-coding genes indicated that this species is related to *C. cavimana* (Cyprus) and *C. garbinii* (Mediterranean regions, with a recent northward expansion). Results supported a genetic separation between the *Cryptorchestia* species of the east Mediterranean regions and those of the northeast Atlantic volcanic islands examined in this study (*C. canariensis*, *C. gomeri*, *C. guancha*, and *C. stocki* from the Canary islands, *C. monticola* from Madeira, and *C. chevreuxi* from the Azores). The Mediterranean and Atlantic *Cryptorchestia* species appear to be also morphologically distinct. *Cryptorchestia ruffoi* **sp. n.**, *C. cavimana*, *C. garbinii*, and *C. kosswigi* (Turkish coast) clearly have a small lobe on the male gnathopod 1 merus. This character was the main diagnostic difference between *Cryptorchestia* (*sensu* Lowry, 2013) and *Orchestia*. However, among the six northeast Atlantic island *Cryptorchestia* species only *C. stocki* has a small lobe on the merus of gnathopod 1. Reduction or loss of the lobe in the Atlantic Island species cannot be ruled out; however, molecular phylogenetic analysis leads us to presume that this lobe independently evolved between the east Mediterranean *Cryptorchestia* species and *C. stocki* from Gran Canaria.

## Keywords

biogeography, freshwater, Greek islands, molecular phylogeny, taxonomy

## Introduction

The genus *Cryptorchestia* Lowry & Fanini, 2013 is partitioned from *Orchestia* Leach, 1814, and is associated with freshwater-soaked leaf litter (Lowry and Fanini 2013). *Cryptorchestia* species from the East Mediterranean region were found in riparian habitats (Ruffo et al. 2014; present study), while the species from the Canary Islands, Madeira, and Azores (North East Atlantic area) live in humid, evergreen broadleaf laurel forest (laurisilva) (Stock 1989; Stock and Boxshall 1989; Ruffo 1990; Stock and Abreu 1992; Villacorta et al. 2008).

Here *Cryptorchestia ruffoi* sp. n. is described from the island of Rhodes, Greece. Specimens were first collected during the military occupation of Rhodes by the Italian army in 1928: the geologist Angelo Pasa of the Museo Civico di Storia Naturale of Verona found two talitrid specimens in a spring on Monte Smith (Fig. 1). Sandro Ruffo subsequently identified the specimens as belonging to a probable new taxon with morphological resemblances to *Cryptorchestia cavimana* (Heller 1865) and stored them in the Amphipoda collection of the Verona Museum. In 2010, one of us (L.L.) organised an expedition to Rhodes to find more talitrid amphipods from freshwater springs and succeeded in collecting more than 30 specimens.

A morphological characterisation forms part of this study. In order to gain insight into its position in relation to other *Cryptorchestia* species of the Mediterranean and North East Atlantic areas, a phylogenetic analysis was performed on DNA sequences of both mitochondrial (mt) and nuclear gene fragments, cytochrome oxidase I (COI), and histone H3 (H3), respectively. In particular, focus was on *Cryptorchestia ruffoi* sp. n. from Rhodes, *C. cavimana* (Heller, 1865) from Cyprus, *C. garbini* Ruffo, Tarocco and Latella, 2014, from mainland Europe, *C. canariensis* (Dahl, 1950), *C. gomeri* (Stock, 1989), *C. guancha* (Stock & Boxshall, 1989), and *C. stocki* (Ruffo, 1990) from the Canary Islands, *C. monticola* (Stock & Abreu, 1992) from Madeira, and *C. chevreuxi* (De Guerne, 1887) from Terceira, Azores.

## Material and methods

**Morphology.** The specimens analysed were collected in two localities from Rhodes (Fig. 1) and stem from different years with a gap of 82 years between them. A total of 37 specimens was examined for the description and measurements of the new species. Thirty one specimens were preserved in 70% ethanol, two mounted in glass slides in Faure's medium, two mounted on stubs for scanning electronic microscope (SEM) photography, and two used for molecular analyses. SEM photographs were obtained with a Zeiss EVO 40 XVP Scanning Electronic Microscope at the MUSE-Science Museum of Trento. The



**Figure 1.** Occurrence of *Cryptorchestia ruffoi* sp. n. on Rhodes, Greece (MSNVR). In the north, near the town of Rhodes, the locality of 1928 on Monte Smith. The other place represents small streams in the vicinity of Psintos, Epta Pigies spring and stream.

photo of a male paratype (Fig. 2) was obtained with a stereo microscope Leica M 165c, mounted with a Leica DFC450 camera at the Museo Civico di Storia Naturale of Verona. Type material is deposited in the Museo Civico di Storia Naturale of Verona (MSNVR), Verona, Italy, and the Naturalis Biodiversity Center (RMNH), Leiden, The Netherlands.

**PCR amplification and DNA sequencing.** Specimens of *Cryptorchestia ruffoi* sp. n. from Rhodes, *C. cavimana* from Cyprus, *C. garbinii* from Europe and Macedonia, *C. canariensis*, *C. gomeri*, *C. guancha*, and *C. stocki* from the Canary Islands, *C. monotropa* from Madeira, and *C. chevreuxi* from Terceira, Azores were stored in ethanol (Table 1). *Platorchestia platensis* from Capri island, Italy, was included in this study as the outgroup species (Table 1).



**Figure 2.** *Cryptorchestia ruffoi* sp. n., paratype, male (MSNVR). Lateral view.

Genomic DNA was extracted from pereopods or whole organisms using QIAamp DNA Mini kit (QIAGEN). A PCR product of ca. 400 base pairs (bp) was amplified from the gene encoding the mt COI (some of our samples were old museum specimens in which mitochondrial DNA was degraded and consequently produced only short DNA sequences). The PCR-mediated reaction was performed using the primers BI-COI and SUBIR cited in Davolos and Maclean (2005). The PCR amplification conditions were 2 min at 95 °C, followed by 35 cycles, each consisting of 10–15s at 95 °C, 15s at 48–50 °C and 10s at 72 °C; the final PCR extension step lasted 10 min at 72 °C. The amplified fragments were checked by electrophoresis in 1% agarose gels and then used as templates for cycle sequencing reactions (BigDye chemistry) followed by DNA sequencing (ABI Prism 3130 capillary sequencer) using BI-COI and SUBIR primers. In addition, a fragment of ca. 350 bp of the gene encoding the nuclear histone H3, was PCR amplified using the primers H3Of and H3Or cited in Davolos and Pietrangeli (2014). The PCR cycling parameters were 2 min at 95 °C, followed by 35 cycles, each consisting of 10s at 95 °C, 10s at 48–52 °C and 5s at 72 °C; the final extension step lasted 10 min at 72 °C. The PCR products were verified and then sequenced using H3Of and H3Or primers, as above described.

**Bioinformatic analysis.** The nucleotides obtained in this study and the amino acid residues inferred were compared with sequence data accessible in the GenBank databases at the National Center for Biotechnology Information (NCBI; <http://www.ncbi.nlm.nih.gov>) using the BLASTN algorithm. The nucleotide sequence alignments were made in ClustalX (1.8) using the default parameters. Evolutionary analyses for the combined mt COI and nuclear histone H3 gene sequences were conducted in MEGA7 (Kumar et al. 2016). The evolutionary history was inferred by using the Maximum Likelihood

**Table I.** Mediterranean and North-East Atlantic *Cryptorchestia* species employed in the molecular analysis. Shown are the mitochondrial COI gene region (363 bp), the H3 histone gene fragment (330 bp), the sampling locations, and the GenBank accession number (acc. no.). *Platorchestia platenensis*, used in this study as outgroup species, is also reported. NA = not available.

Species	Sampling locality	COI	H3	acc. no.	Reference
<i>Cryptorchestia canariensis</i> (Dahl, 1950)	Gran Canaria, Canary Islands, Spain	KY225807	KY225817		present study
<i>Cryptorchestia cavimana</i> (Heller, 1865)	Troodos Mountains, Cyprus	KY225808	KY225818		present study
<i>Cryptorchestia chevreuxi</i> (de Guerne, 1887) (ZMA.CRUS.A.108.587; Leiden Museum)	Terceira, Azores, Portugal	NA	KY225819		present study
<i>Cryptorchestia garbini Ruffo, Tarocco &amp; Latella 2014</i>	Lake Ohrid, Macedonia	KY225809	KY225820		present study
	Dijon, France	KY225810	KY225821		present study
	Latium, Italy	KY225811	KY225822		present study
<i>Cryptorchestia gnancha</i> (Stock & Boxshall, 1989)	Zapata, Tenerife, Canary Islands, Spain	KY225812	KY225823		present study
<i>Cryptorchestia gomerae</i> (Stock, 1989)	La Gomera, Canary Islands, Spain	NA	AM748658		Villacorta et al. 2008
<i>Cryptorchestia monticola</i> (Stock & Abreu 1992) (paratype; Leiden Museum)	Madeira Island, Portugal	KY225813	KY225824		present study
<i>Cryptorchestia ruffoi Latella &amp; Vonk, sp. n.</i>	Rhodes Island, Greece	KY225814	KY225825		present study
<i>Cryptorchestia stocki</i> (Ruffo, 1990) (paratype; Museo Civico di Storia Naturale, Verona)	Gran Canaria, Canary Islands, Spain	KY225815	KY225826		present study
<i>Platorchestia platenensis</i> (Kroyer, 1845)	Capri Island, Italy	KY225816	KY225827		present study

method based on the General Time Reversible model (Nei and Kumar 2000). The tree with the highest log likelihood (-2646.1008) was used. Initial trees for the heuristic search were obtained automatically by applying Neighbor-Join and BioNJ algorithms to a matrix of pairwise distances estimated using the Maximum Composite Likelihood (MCL) approach, and then selecting the topology with superior log likelihood value (Fig. 10). A discrete Gamma distribution was used to model evolutionary rate differences among sites (5 categories (+G, parameter = 0.1808)). For Maximum Likelihood analysis, bootstrap resampling was performed with 1000 replications. The novel annotated sequences from the COI and the histone H3 genes from *Cryptorchestia* species of this study have been submitted to the GenBank (NCBI) database (Table 1).

## Systematics

**Order Amphipoda Latreille, 1816**

**Suborder Senticaudata Lowry & Myers, 2013**

**Family Talitridae Rafinesque, 1815**

**Genus *Cryptorchestia* Lowry & Fanini, 2013**

***Cryptorchestia ruffoi* Latella & Vonk, sp. n.**

<http://zoobank.org/1F792FCC-9F42-48A4-A445-2814E0B1F8FF>

Figs 2–9

**Type locality.** Island of Rhodes, Greece. A spring on Monte Smith and in streams flowing out of the springs called Epta Pyges (Seven Springs), Municipality of Archangelos.

**Etymology.** Species named after Sandro Ruffo (1915 – 2010), tutor to us all, who worked on Mediterranean talitrid amphipods from an early stage.

**Type specimens.** Holotype male (15.7 mm): Greece, Rhodes Island, Rhodes, Monte Smith, near a little spring, June 1928, (labelled: Rodi VI-928 Monte Smiti, vicino piccola sorgente) (MSNVRCr 589). Paratypes: 9 males, 25 females; Greece, Rhodes, Psintos, Epta Piges spring's stream, 36°15'10.9"N - 28°06'49.3"E, 7/8-VII-2010, A. & L. Latella, V. Lencioni leg.: 1 male (vial RMNH.CRUS.A.5070 + slides RMNH.CRUS.21512–21515), 1 female (slides RMNH.CRUS.21516–21518), 2 male, 5 female RMNH.CRUS.A.5071; 4 males, 17 females MSNVRCr 590–611)

**Additional material examined.** *Cryptorchestia garbinii* Ruffo, Tarocco & Latella, 2014 : Italy, Lombardy, Brescia province, Lake Garda, between Desenzano and Padenghe, 45°29'N–10°30'E, V-1895, A. Garbini leg.; Venetia, Verona province, Lake Garda, Peschiera, 45°26'51"N–10°41'39"E, 18-IV-2010 L. Latella, V. Lencioni leg.

*Cryptorchestia cavimana* (Heller, 1865): Cyprus, Troodos Mountains, Kaledonia falls, 1250 m a.s.l., 9-VI-2000 M. Tarocco leg.; Cyprus, Troodos Mountains, between Prodromos and Troditissa, 1300 m a.s.l., 10-VI-2000, M. Tarocco leg.

**Diagnosis.** Gnathopd 2 propodus sinusoid palmar margin with its strongest incursion close to the anterior side. Maxilla 1 with vestigial palp present on the outer

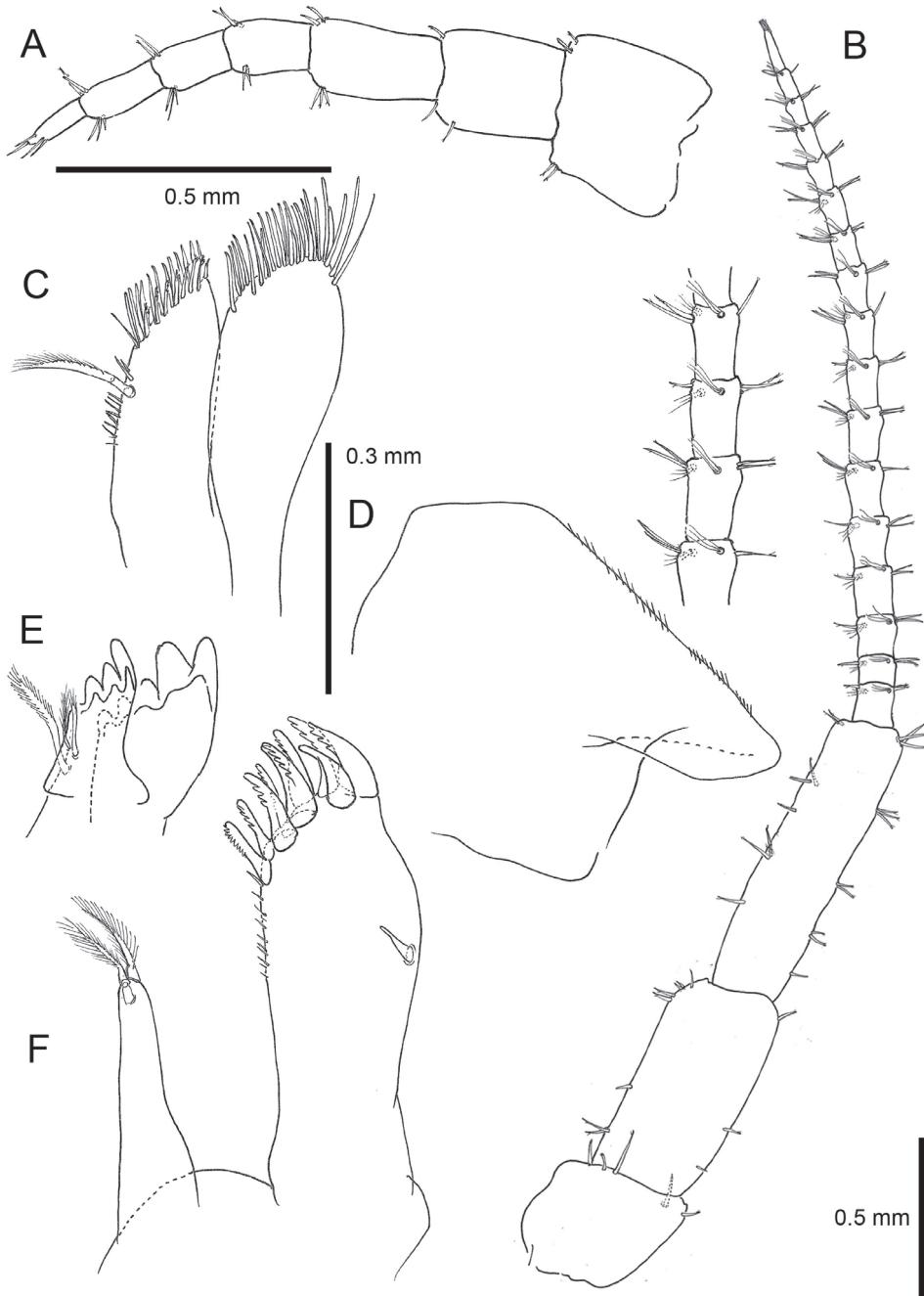
**Table 2.** *Cryptorchestia ruffoi* sp. n. Measurements of body length and antennae, showing differences in male and female individuals.

	<b>Total body length</b>	<b>Length of antenna 1</b>	<b>Length of antenna 2</b>
♂	11.60	1.37	4.75
♂ Holotype	15.70	1.64	5.99
♂	14.17	1.91	7.12
♂	10.77	1.29	4.11
♂	10.84	1.36	4.45
♂	10.14	1.21	3.80
<b>Mean</b>	<b>12.20</b>	<b>1.46</b>	<b>5.04</b>
♀	11.55	1.20	3.88
♀	12.42	1.54	4.75
♀	10.68	1.15	3.68
♀	11.00	1.00	3.89
♀	10.11	1.01	3.90
♀	11.98	1.16	4.20
♀	11.75	1.17	4.49
♀	10.38	1.00	4.00
♀	11.58	0.90	4.11
♀	10.95	1.04	3.68
<b>Mean</b>	<b>11.24</b>	<b>1.12</b>	<b>4.06</b>

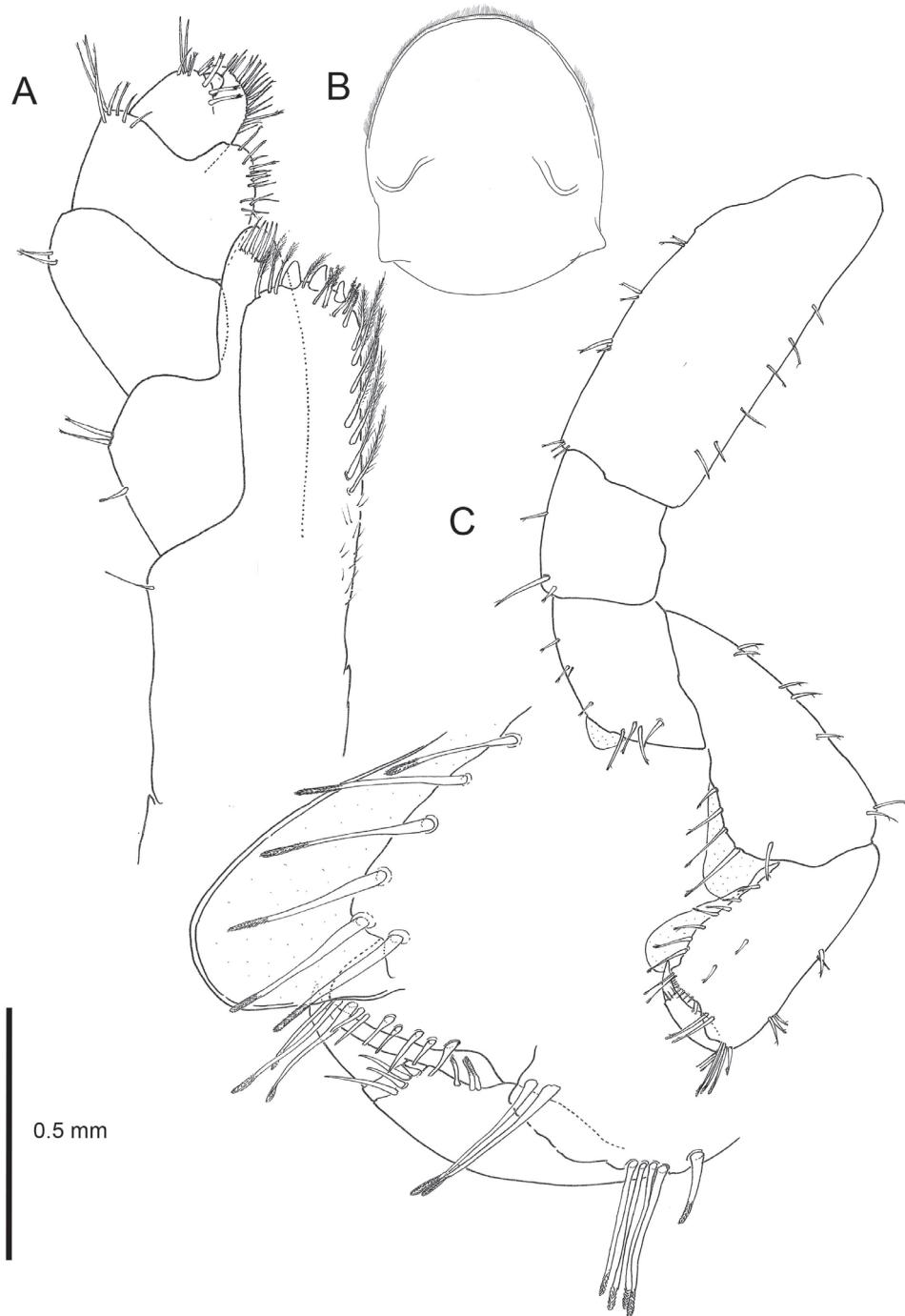
lobe. Pereopod 5 with four groups of setae on the posterior margin in females and five groups in the males. Antenna first flagellum segment sometimes fused with second, forming a longer unit.

**Description.** Based on adult males with an average length of 12.20 mm (Table 2). **Head.** Eyes large, subcircular, black. *Antenna 1* (Figs 2, 3A) short, 1.46 mm long in average, slightly longer than peduncle article 4 of antenna 2, peduncle segment 2 slightly shorter than segment 3, flagellum with four articles. *Antenna 2* (Figs 2, 3B) long, little shorter than half of the body length, article 5 longer than article 4, flagellar articles with four tufts of setae of which two spring from a hollow in a series of three fine setules, flagellum relatively short with 16–19 articles. In some antennae the first flagellum segment is fused with the second and forms a longer unit. *Labrum* (Fig. 4B) and *labium* (Fig. 3D) with very fine setules on anterior margin. *Mandible* (Fig. 3E) left with 4-dentate lacinia mobilis. *Maxilla 1* (Fig. 3F) with nine robust and crenelated setae on inner lobe of which the innermost has a fine comb. A very small vestigial palp is observed. *Maxilla 2* (Fig. 3C) with numerous apical setae, a double row on the inner lobe and a long, finely pinnate seta on its inner margin. *Maxilliped* (Fig. 4A) basal lobe with three blunt teeth on anterior margin, axial margin lined with robust setae armed with setules; palp article 4 reduced to a knob placed between two rows of setae.

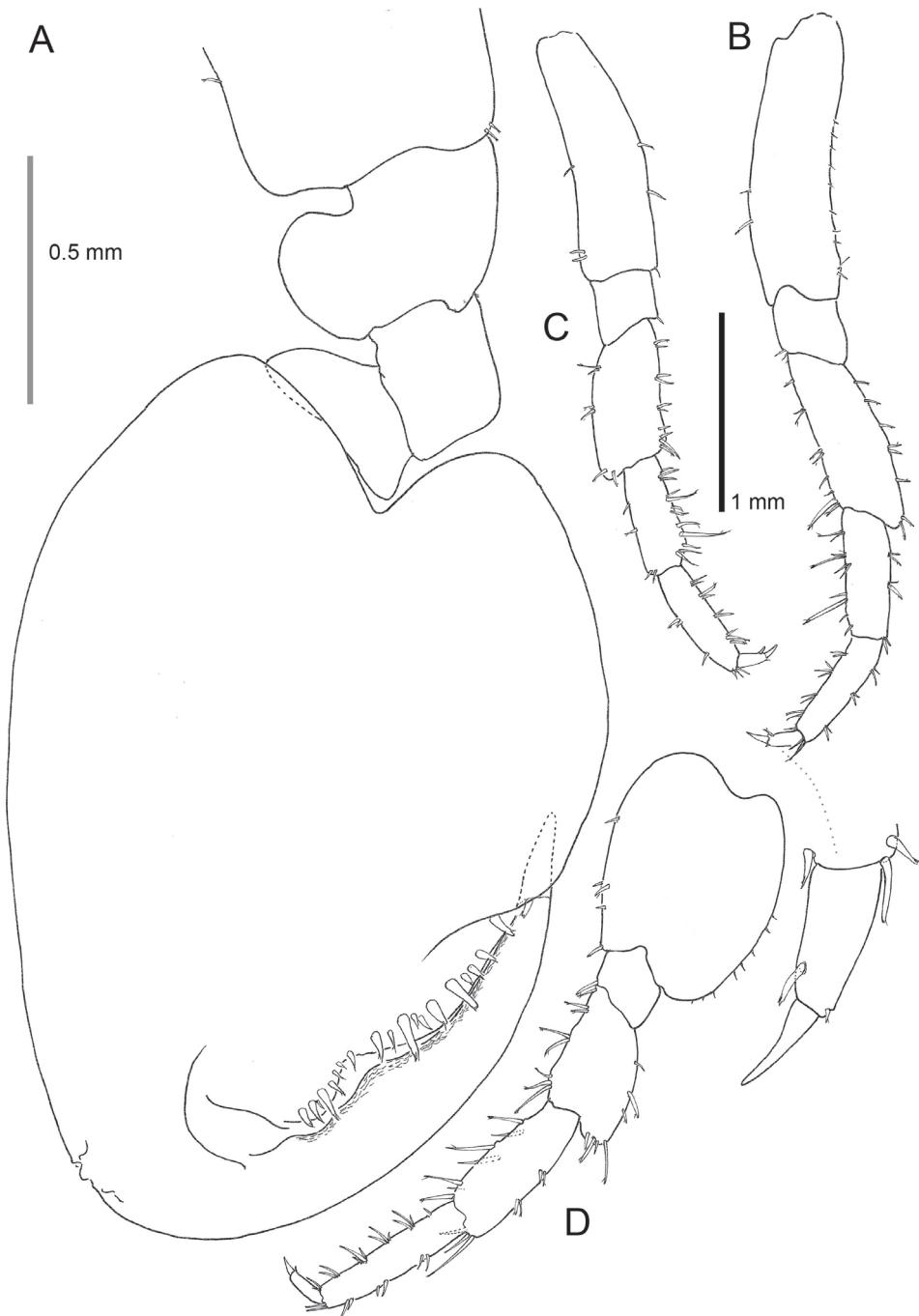
**Coxae.** Coxal plate 1 with numerous robust setae on distal margin. Coxal plates 2–4 wider than deep, plate 5 elongated, bilobate, plates 6 and 7 smaller.



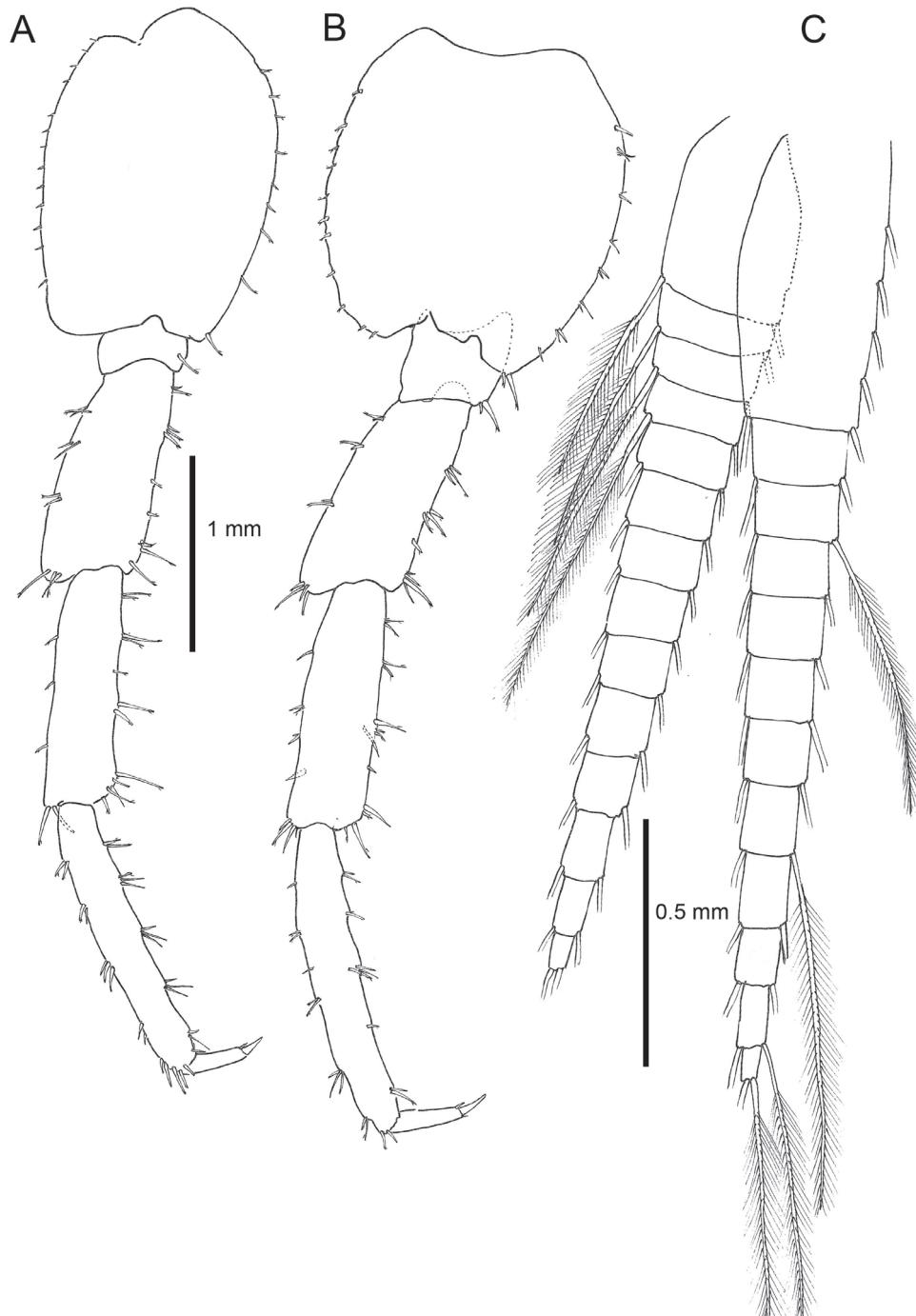
**Figure 3.** *Cryptorchestia ruffoi* sp. n., paratype male, 10.4 mm (RMNH) **A** antenna 1 **B** antenna 2 **C** maxilla 2 **D** lower lip **E** lacinia mobilis, left mandible **F** maxilla 1.



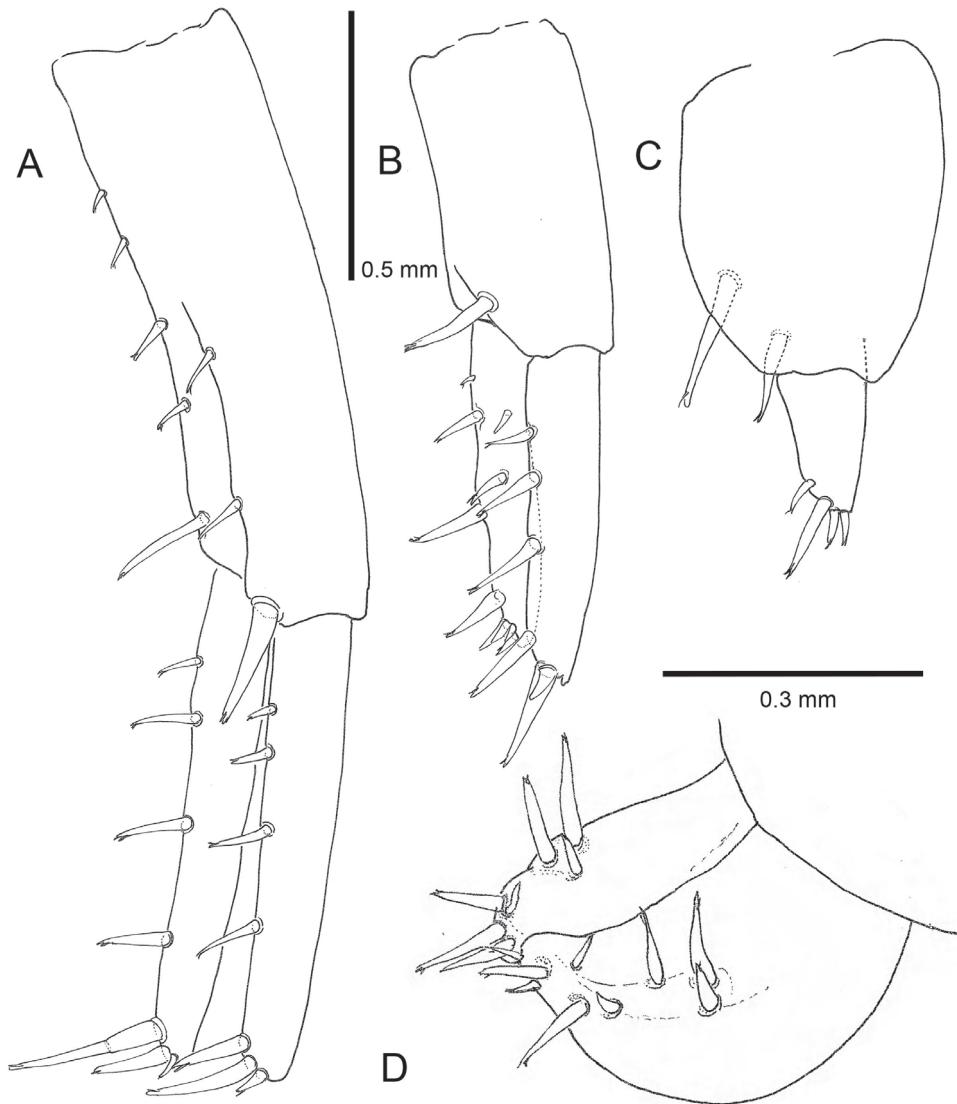
**Figure 4.** *Cryptorchestia ruffoi* sp. n., paratype male, 10.4 mm (RMNH) **A** maxilliped **B** upper lip **C** gnathopod 1.



**Figure 5.** *Cryptorchestia ruffoi* sp. n., paratype male 10.4 mm (RMNH) **A** gnathopod 2 **B** pereopod 4 **C** pereopod 3 **D** pereopod 5.

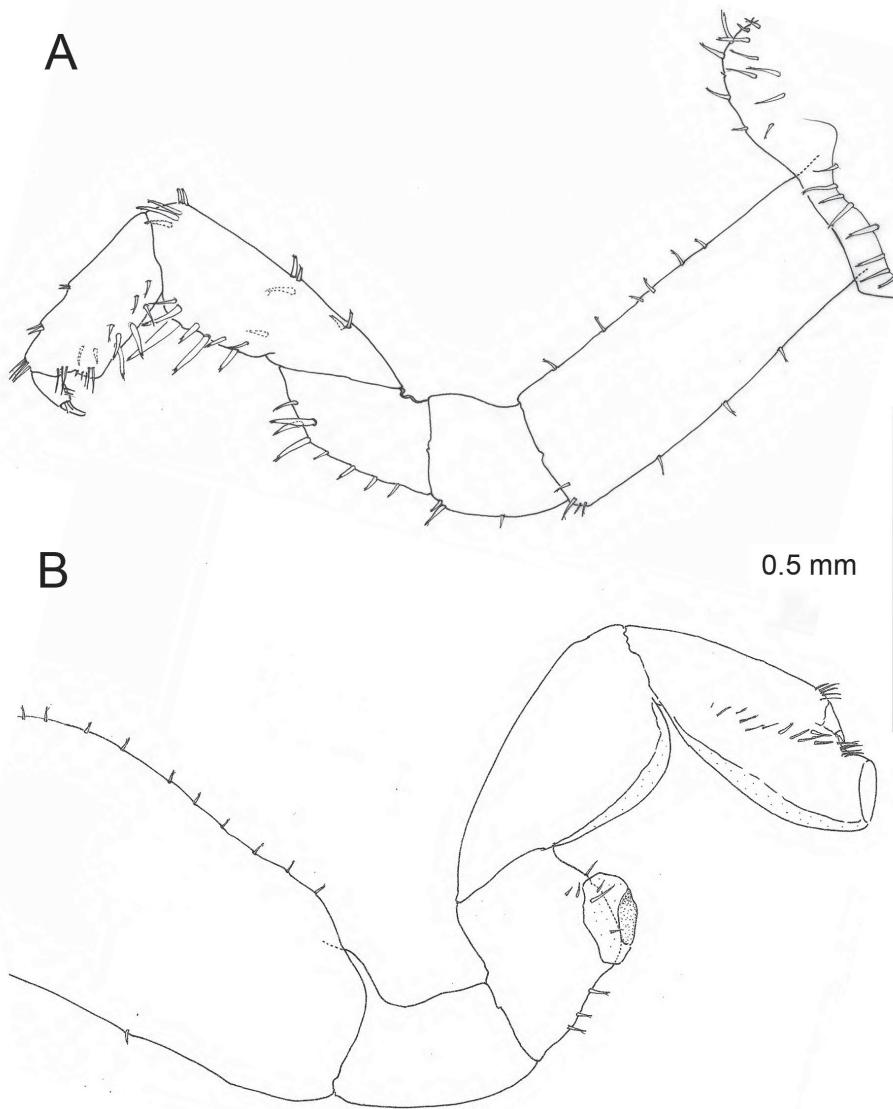


**Figure 6.** *Cryptorchestia ruffoi* sp. n., paratype male 10.4 mm (RMNH) **A** peropod 6 **B** pereopod 7 **C** pleopod 1.



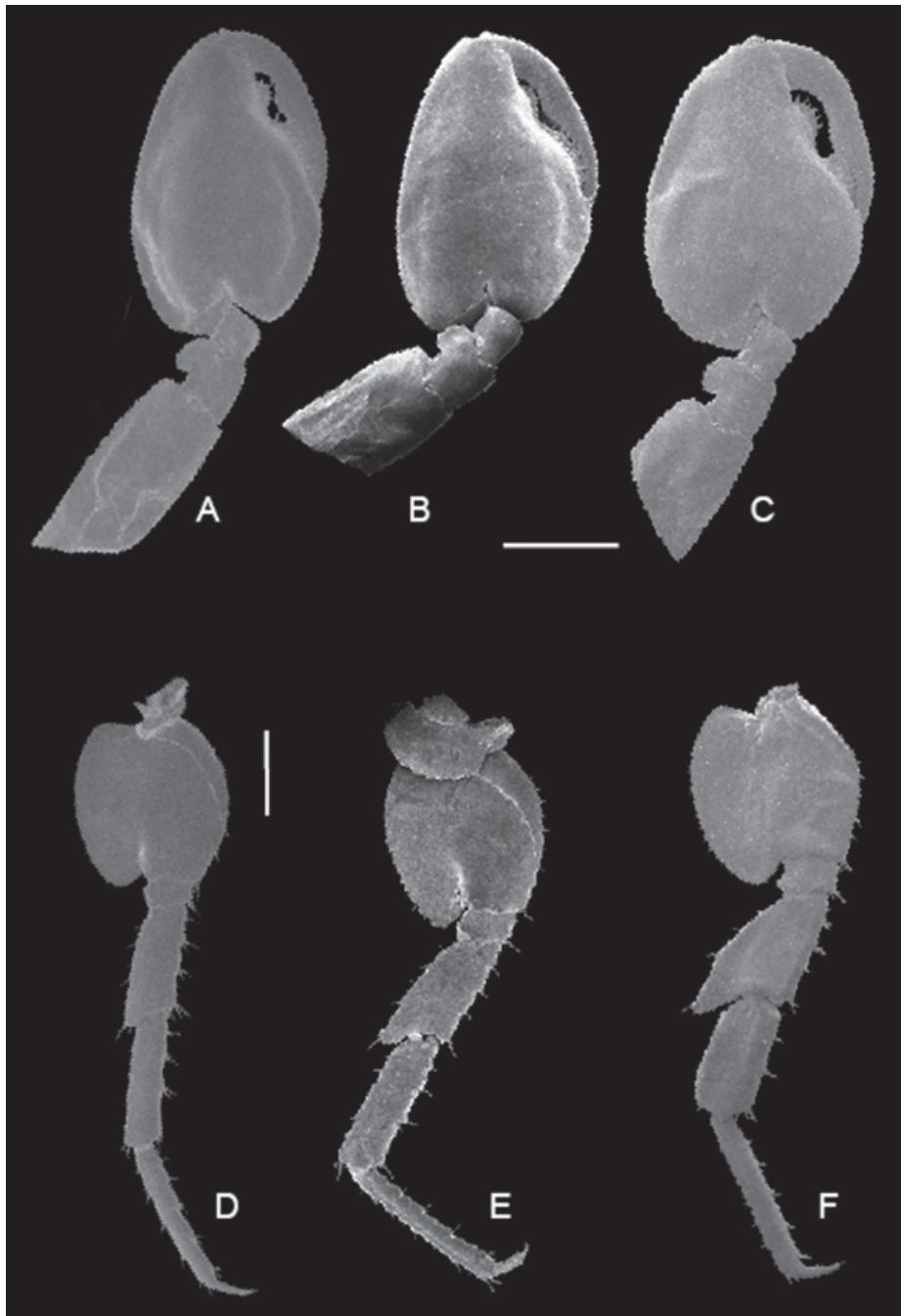
**Figure 7.** *Cryptorchestia ruffoi* sp. n., paratype male 10.4 mm (RMNH) **A** uropod 1 **B** uropod 2 **C** uropod 3 **D** telson.

**Pereon.** *Gnathopod 1* male (Fig. 4C) sexually dimorphic, subchelate; basis with anterior margin lined with six regularly spaced setae, posterior margin with four groups of setae; merus with small partly transparent lobe on posterior margin; carpus with five long setae, rugose at the tips, and placed at the posterior margin; propodus with transverse palm, and with a transparent lobe covering almost the entire palmar margin, and seven short setae lining the palmar margin; dactylus short, slightly longer than antero-lateral margin of the propodus. *Gnathopod 2* (Fig. 5A), subchelate; propodus oviform, stout with a rounded protuberance near dactylus insertion, palmar margin with large



**Figure 8.** *Cryptorchestia ruffoi* sp. n., paratype female 10.8 mm (RMNH) **A** gnathopod 1 **B** gnathopod 2.

sinus in the anterodistal part; dactylus somewhat longer than palm. *Pereopods 3–4* (Figs 5B, C) similar; merus of pereopod 3 shorter than that of pereopod 4; dactylus in pereopod 4 with straight inner margin. *Pereopod 5* (Fig. 5D) basis with posterodistal lobe not very wide; propodus with five groups of robust setae on anterior margin. *Pereopods 3–7* cuspidactylate. *Pereopod 6* (Fig. 6A) shorter than pereopod 7; basis elongate; propodus slightly longer than carpus, anterior margin with five groups of long robust setae. *Pereopod 7* (Fig. 6B) basis wide with distinct, rounded posterodistal lobe; merus and carpus not enlarged; propodus longer than carpus.



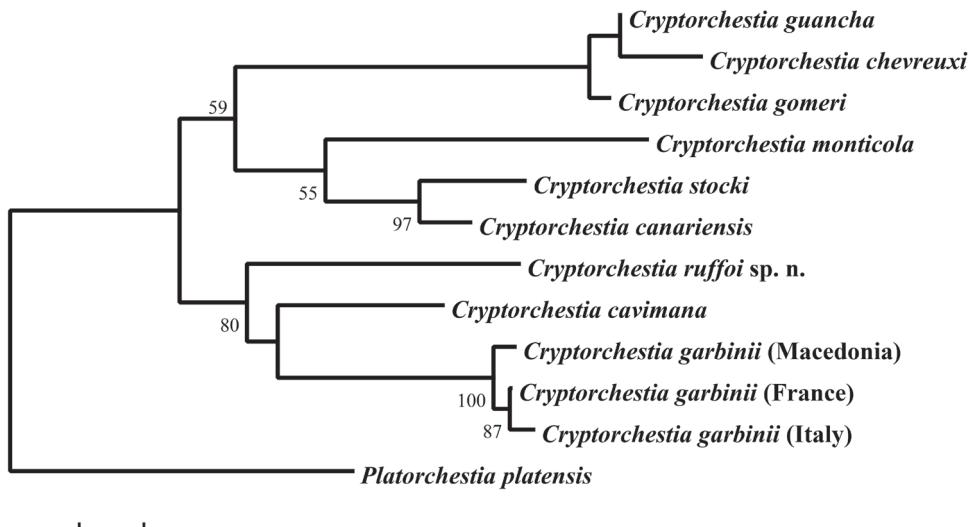
**Figure 9.** **A** *Cryptorchestia ruffoi* sp. n., gnathopod 2 male, 11.1 mm total body length **B** *Cryptorchestia garbinii* from Lake Garda, gnathopod 2 male, 18 mm total body length **C** *Cryptorchestia cavimana* from Cyprus, gnathopod 2 male, 14.8 mm total body length, scale bar 1 mm. **D** *Cryptorchestia ruffoi* sp. n. pereopod 7 male **E** *Cryptorchestia garbinii* from Lake Garda, pereopod 7 male **F** *Cryptorchestia cavimana* from Cyprus, gnathopod 2 male, scale bar 1 mm.

**Pleon.** Epimeral plate 2 with a small posteroventral tooth and almost smooth posterior margin. Pleopods 1–3 (Fig. 6C) well-developed, biramous, peduncle longer than rami; rami with slender setae; inner ramus slightly shorter than outer. Uropod 1 (Fig. 7A) with five axial and two medial setae on peduncle, one robust distolateral seta present; outer ramus subequal in length to inner ramus, both with four marginal setae and three apical setae (of which two robust and one small). Uropod 2 (Fig. 7B) peduncle with one robust distolateral seta, inner ramus subequal in length to outer, both with four lateral setae but inner one with two more setae not standing in line. Outer ramus with one strong apical seta and one smaller one, inner ramus with four apical setae. Uropod 3 (Fig. 7C) peduncle with two robust distolateral setae, ramus with four apical setae. Telson (Fig. 7D) longer than broad, dorsal midline entirely cleft, eight marginal and distal robust setae per lobe.

**Female.** Based on adult females with an average length of 11,24 mm (Table 2). Antenna 1 short, 1.1 mm length in average, flagellum with four articles. Antenna 2 long, 4 mm in average, flagellum with 15–16 articles. Gnathopod 1 (Fig. 8A) subchelate; coxal plate lower margin with numerous irregularly placed prominent setae; basis with several short setae, a regular row of three short robust setae on the posterior margin, a less regular row of six setae on the anterior margin; merus with two longer robust setae in a marginal row of 6 smaller ones; carpus with one very robust and long seta between several smaller on lower margin; propodus with three robust setae on lower margin and three bush-like groups on the palmar margin; dactylus slightly longer than palm. Gnathopod 2 (Fig. 8B), coxa curved, lower margin lined with small short setae; basis with at least 13 short strong setae on anterior margin, and only one in the middle of the posterior margin; ischium without setae; merus with conspicuous bulbous lobe, flattened or incurved at the end, three setae between lobe and proximal margin, some setae present inside lobe; carpus with lobe covering the entire lower margin; propodus with long lobe extending past the palmar margin towards the apex, lobe flattened at fore end; dactylus quite small, shorter than palm. Oostegites longer than wide; setae with simple straight tips.

**Remarks.** The specimens from Rhodes differ in three main characters in comparison to *C. cavimana* (Cyprus), *C. kosswigi* (Ruffo, 1949) (Turkish coast), and *C. garbini* (Garda Lake), in that they have the sinusoid palmar margin form in the propodus of gnathopod 2 of the male with the strongest incursion closer to the anterior side (Fig. 9A, B, C). *Cryptorchestia ruffoi* sp. n. differs also from *C. garbini* and *C. cavimana* in the morphology of pereopod 7 basis, merus and carpus (Fig. 9D, E, F). There is also a vestigial palp present on the outer lobe of maxilla 1. This reduced palp has been observed before in *C. monticola* (Madeira). Another regular difference is the presence of four groups of setae on the posterior margin of pereopod 5 in the female specimens and five groups in the males. Out of ten specimens there were three males with five groups and seven females with four groups. A variable difference, in males and females alike, is that in some antennae the first flagellum segment is fused with the second and then both form a longer unit.

Overall, the morphological differences are subtle and perhaps only have meaning in the combination with a unique genetic signature in its COI and H3 gene fragments.



**Figure 10.** Molecular phylogeny by Maximum Likelihood method obtained in a combined analysis using mitochondrial cytochrome oxidase I (COI) gene region (363 bp), and H3 histone (H3) gene fragment (330 bp) sequences (a total of 693 positions in the final dataset) from *Cryptorchestia ruffoi* sp. n. and other *Cryptorchestia* species reported in Table 1. *Platorchestia platensis* was used in this study as outgroup species. The tree is drawn to scale, with branch lengths measured in the number of substitutions per site. Nodes that have bootstrap values greater than 0.5 are labelled. The GenBank accession numbers of the newly determined sequences from the COI and the histone H3 genes used in this study are reported in Table 1.

## Results and discussion

The major objective of this molecular study, based on DNA sequences of the mt COI and nuclear histone H3 gene regions, was to estimate the evolutionary relationships of *Cryptorchestia ruffoi* sp. n. in relation to other *Cryptorchestia* species of the Mediterranean and North East Atlantic areas. DNA sequences from the mt region between the COI and COII genes were also analysed; all the species analysed here showed the peculiar rearrangement (data not shown), originally reported in Davolos and Maclean (2005). The phylogenetic scenario based on a Maximum Likelihood method suggested major diversification events, with evolutionary relationships between species generally well supported (Fig. 10). It is possible to recognise a well-supported group including *C. ruffoi*, *C. cavimana*, and *C. garbinii*. This monophyletic group points to a common origin of this *Cryptorchestia* lineage that currently appears to be limited to the East Mediterranean basin. Probably *C. garbinii* has recently colonised Europe, Macedonia (present study) and other regions by a northward expansion (Ruffo et al. 2014). The unique genetic Rhodean *Cryptorchestia* lineage agrees with the species rank of morphological differentiation identified in this study (see taxonomic section for *C. ruffoi* sp. n.). Another outcome of the analyses presented is the presence of a clade that contained the *Cryptorchestia* species (*sensu* Lowry, 2013) of the North East Atlantic area examined

in this study: the two closely related species endemic to Gran Canaria: *C. canariensis*, and *C. stocki* (a within-island speciation appears the most-parsimonious hypothesis), *C. monticola* from Madeira, *C. gomeri* from La Gomera, *C. guancha* from Tenerife, and *C. chevreuxi* from Terceira (Fig. 10).

Our results support the proposal by Lowry and Fanini (2013) in that the former *Orchestia cavimana* belongs to a new genus (*Cryptorchestia*). However, the North East Atlantic terrestrial talitrid species, formerly ascribed to *Orchestia*, apparently cannot be included within this new genus (Fig. 10). It is important to bear in mind that *C. ruffoi* sp. n., *C. cavimana*, *C. garbini*, and *C. kosswigi* from the east Mediterranean regions have a small lobe (probably used in rasping or scrubbing) on the male gnathopod 1 merus as well as on the carpus and propodus (see Ruffo 1949; Ruffo et al. 2014; present study). This character has been proposed to be the main diagnostic difference between *Cryptorchestia* (the type species being *O. cavimana*) and *Orchestia* (in the latter there is a palmate lobe only on male carpus and propodus of gnathopod 1). However, among the northeast Atlantic island terrestrial *Cryptorchestia* species apparently only *C. stocki* (endemic to Gran Canaria as well its closely related species *C. canariensis*) has a small lobe on the merus of gnathopod 1 (Dahl 1950; Stock 1989; Stock and Boxshall 1989; Ruffo 1990; Stock and Abreu 1992). Although previous studies did not reveal that small lobe in *C. canariensis*, a better study of its growth stages could provide further data. The present observations are in line with our DNA sequencing findings that clearly showed a genetic separation of the North-East Atlantic and the Mediterranean *Cryptorchestia* species (Fig. 10). An alternative hypothesis that postulates reduction or loss of the small posterior palmate lobe cannot be disproved, however, our analysis identified similarity in this small structure present on the male gnathopod 1 merus as independently convergent within the east Mediterranean *Cryptorchestia* species and *C. stocki*. Therefore, the occurrence of the small lobe among *Cryptorchestia* species seems to have no clear evolutionary information regarding inclusion in the genus. Overall, the diversification process of *Cryptorchestia* species is of particular interest for future studies. We aim at investigating their evolutionary history by using a larger dataset and multiple calibrations in different parts of a Bayesian inferred phylogeny.

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terstate scores of the new species. The costs for the molecular analysis of this work were supported by Sapienza University of Rome, Rome, Italy. We thank L. Hughes and J. Lowry (Australian Museum, Sydney) for their constructive review comments.

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# A literature-based review of Hymenoptera Parasitica and Chrysoidea from Reunion Island

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## Abstract

A review of the genera and species of Hymenoptera Parasitica and Chrysoidea reported so far from Reunion Island is provided with host information. Data presented here is based on a review of the existing literature by the authors. The list includes: (1) 156 species of Ichneumonoidea belonging to 65 genera and 25 subfamilies (Braconidae: Agathidinae, Alysiinae, Aphidiinae, Braconinae, Charmontinae, Cheloniinae, Doryctinae, Euphorinae, Gnamptodontinae, Microgastrinae, Opiinae; Ichneumonidae: Banchinae, Campopleginae, Cremastinae, Cryptinae, Diplazoninae, Ichneumoninae, Mesochorinae, Metopiinae, Ophioninae, Orthocentrinae, Pimplinae, Tersilochinae, Tryphoninae); (2) 121 species of Chalcidoidea belonging to 56 genera and 8 families (Agaonidae, Aphelinidae, Chalcididae, Encyrtidae, Eulophidae, Eupelmidae, Eurytomidae, Ormyridae, Pteromalidae, Signiphoridae, Torymidae and Trichogrammatidae); (3) seven species of Cynipoidea (family Figitidae); (4) six species of Chrysoidea in three families (Bethylidae, Chrysidae, Dryinidae); (5) five species of Platygastroidea (families Platygastriidae and Scoliidae); (6) five species of Diaprioidea (family Diapriidae); (7) four species of Ceraphronoidae (families Ceraphronidae and Megaspilidae); and (8) two species of Evanioidea (family Evaniiidae). This review records a total of 306 species.

## Keywords

Hymenoptera, checklist, Chalcidoidea, Ichneumonoidea, Diaprioidea, Cynipoidea, Evanioidea, Chrysoidea, Ceraphronoidea, Platygastroidea, Reunion Island

## Introduction

The parasitoids of the Hymenoptera Apocrita form one of the most species-rich groups of animals, potentially representing more than 20% of the world's insects (LaSalle and Gauld 1992). Furthermore, they play an important role in the regulation of insect pests and many of them are used in biological control programs all over the world. The failures and successes of their use in biocontrol have been extensively reviewed (e.g. DeBach 1964, Funasaki et al. 1988, DeBach and Rosen 1991, van Driesche and Bel-lows 1996, Smith 1996, Solomon et al. 2001).

To date, the diversity of Hymenoptera in La Réunion has been partially studied. There have been some studies on the hymenopteran diversity around 1950. Risbec (1957) and Benoit (1957) reviewed the Chalcidoidea/Proctotruoidea and the Ichneumonoidea, respectively. To our knowledge, after 1957 almost nothing was published on the hymenopteran diversity of Reunion Island (only Wiebes 1981 on the figwasps) until 2001 when Vayssiére et al. published a review of the pests and their natural enemies on several crops of the island. Two years later, this work was followed and updated by the publication of a book (Quilici et al. 2003). At this time, taxonomic work on Parasitica was far from exhaustive because it only dealt with parasitoids associated with important pests. In fact, a lot of work has been done to combat key pests such as Tephritid flies (Diptera: Tephritidae) in mango and cucurbit fruits. Nevertheless, the taxonomic review of the fauna from Reunion Island has been conducted for a few groups. Rousse and Villemant (2012) reviewed the Ichneumonidae and provided a key to species of the Island with 15 species new to science. Some subfamilies of Braconidae (Ichneumonoidea) have been reviewed: Madl (2007, Agathidinae), Fischer and Madl (2008, Opiinae), Rousse and Braet (2012, Euphorinae), Braet et al. (2012, Cheloninae), Rousse and Gupta (2013, Microgastrinae). Madl and van Achterberg (2014) published a catalogue of the Braconidae of Malagasy subregion, including Reunion Island. Fischer (2014) published an important paper on Alysiinae and Opiinae (Braconidae) with 12 species new to science. Until to now the study of Ichneumonoidea has added more than 140 species to the list of Benoit (1957).

Superfamilies other than the Ichneumonoidea were less studied. For example, the Chalcidoidea may have a diversity similar to or higher than that of the Ichneumonoidea. In fact, there are a lot of unpublished data from the work of Marc Attié (2001–2004). The material collected during his work is now at the CBGP in Montpellier (France).

By reviewing the published data, this work provides a first list of all the Hymenoptera Parasitica of Reunion Island and the superfamily Chrysidoidea (belonging to the Hymenoptera Aculeata). We think this work will be a valuable tool for future inventories or work on biological control. Indeed, this work allows the detection of new indigenous natural enemies (e.g. *Pristomerus river*, Ichneumonidae, parasitoid of *Prophantis smaragdina*, Lepidoptera) and invasive hyperparasitoid or parasitoid of predators (e.g. *Homalotylus eytelweinii*, Encyrtidae, a parasitoid of *Rodolia chermesina*, Coccinellidae).

## Arrangement of the checklist

In this review, superfamilies are treated according to their importance, the most diverse (Ichneumonoidea) presented first. Genera known so far from Reunion Island are grouped according to subfamilies, and family affiliation. For convenience, families, subfamilies, genera and species are listed in alphabetical order. Genera and species names are followed by the names of the author(s) and year of first description, then by the reference of the record and, when available, host data.

The review includes three tables summarizing (1) the Ichneumonoidea, (2) the Chrysoidea, (3) the records for the other superfamilies, each with general host information.

## Discussion

The present work is a literature-based review. Therefore, users should be aware that it might contain some mistakes present in the original literature. However, all references are listed so that the records can be validated.

This review lists 306 species of parasitoid Hymenoptera recorded from the island belonging to eight superfamilies. Of the species and genera reported from the island, at least 1 genus and 14 species of Ichneumonidae (Rousse and Villemant 2012), and 1 genus and 25 species of Braconidae (Madl 2007, Rousse and Braet 2012, Rousse and Gupta 2013), may be endemic as they currently only are recorded from Reunion Island. On the other hand, several species are now cosmopolitan in distribution due to their widespread use as biocontrol agents.

When compared with other geographical regions of the world, the study of hymenopteran parasitoid diversity in Reunion Island is still preliminary. Many new taxa will probably be found from the region in the future, and thus this checklist will need to be periodically updated.

## Checklist of Hymenoptera Parasitica and Chrysoidea from Reunion Island

**Superfamily: ICHNEUMONOIDEA**

**Family: BRACONIDAE**

**Subfamily: Agathidinae**

**Genus: *Biroia* Szépligeti, 1900**

*Biroia costata* (Brullé, 1846)

Recorded from: Granger 1949

Host information: Unknown

**Genus: *Camptothipsis*** Enderlein, 1920*Camptothipsis curticornis* Granger, 1949

Recorded from: Quilici et al. 2003

Host information: *Nephopterix beharella* (Lepidoptera, Pyralidae) (Quilici et al. 2003, Madl 2007)**Genus: *Coccygidium*** de Saussure, 1890*Coccygidium lutea* (Brullé, 1846)

Recorded from: Szépligeti 1904

Host information: *Condica conducta*, *Mythimna curvula*, *Mythimna loreyi* (Lepidoptera, Noctuidae) (Madl 2007)**Subfamily: Alysiinae****Genus: *Adelphenaldis*** Fischer, 2003*Adelphenaldis grimmorum* Fischer, 2014

Recorded from: Fischer 2014

Host information: Unknown

*Adelphenaldis nanocorpus* Fischer, 2014

Recorded from: Fischer 2014

Host information: Unknown

**Genus: *Aphaereta*** Förster, 1863*Aphaereta* sp.

Recorded from: Quilici et al. 2003

Host information: Diptera Cyclorrhapha (Gauld and Bolton 1988)

**Genus: *Asobara*** Förster, 1863*Asobara diadegmae* Fischer, 2014

Recorded from: Fischer 2014

Host information: Hyperparasitoid of *Diadegma* sp. (ex *Plutella xylostella*, Lepidoptera) (Fischer 2014)**Genus: *Cratospila*** Förster, 1863*Cratospila sinenotaialis* Fischer, 2014

Recorded from: Fischer 2014

Host information: Unknown

**Genus: *Dacnusa*** Haliday, 1833

*Dacnusa sibirica* Telenga, 1934

Recorded from: Vayssières et al. 2001

Host information: *Liriomyza* spp. (Diptera, Agromyzidae) (Vayssières et al. 2001)

*Dacnusa* sp.

Recorded from: Vayssières et al. 2001

Host information: Unknown, but *Dacnusa* spp. are parasitoids of *Liriomyza* spp. (Diptera, Agromyzidae) (Vayssières et al. 2001)

**Genus: *Dinotrema*** Förster, 1863

*Dinotrema candidiapex* Fischer, 2014

Recorded from: Fischer 2014

Host information: Unknown

**Genus: *Synaldis*** Förster, 1863

*Synaldis dugainensis* Fischer, 2014

Recorded from: Fischer 2014

Host information: Unknown

*Synaldis robusticeps* Fischer, 2014

Recorded from: Fischer 2014

Host information: Unknown

**Subfamily: Aphidiinae**

**Genus: *Aphidius*** Nees, 1818

*Aphidius camerunensis* Mackauer, 1966

Recorded from: Starý et al. 1994

Host information: *Sitobion* spp. (Hemiptera, Aphididae) (Todorov 2009)

*Aphidius colemani* Viereck, 1912

Recorded from: Vayssières et al. 2001

Host information: Hemiptera, Aphididae, Genera: *Aphis*, *Aulacorthum*, *Brachycaudus*, *Brevicorinae*, *Capitophorus*, *Dysaphis*, *Hialopterus*, *Hayhurstia*, *Hydaphis*, *Hypermizus*, *Macrostiphon*, *Melanaphis*, *Micromizus*, *Mizodes*, *Mizus*, *Pterocoma*, *Rhopalosiphum*, *Schizaphis*, *Thelaxis*, *Toxoptera* (Todorov 2009)

*Aphidius rosae* Haliday, 1833

Recorded from: Starý et al. 1977

Host information: *Macrosiphum rosae*, *Sitobion fragariae* (Hemiptera, Aphididae) (Mackauer and Starý 1967, Starý 1973)

*Aphidius seyrigi* Granger, 1949

Recorded from: Benoit 1957

Host information: Hemiptera, Aphididae

**Genus: *Diaeretiella*** Starý, 1960

*Diaeretiella rapae* (McIntosh, 1855)

Recorded from: Quilici et al. 1988

Host information: *Myzus persicae*, *Brevicoryne brassicae*, *Lipaphis erysimi* on cabbage, cauliflower, mustard, etc. *Aphis craccivora*, *Aphis fabae*, *Aphis gossypii*, *Brachycaudus helichrysi*, *Hysteroneura setariae*, and *Schizaphis graminum* (Hemiptera, Aphididae) (Raychaudhuri 1990)

**Genus: *Praon*** Haliday, 1833

*Praon* sp.

Recorded from: Vayssières et al. 2001

Host information: *Aphis* sp. (Vayssières et al. 2001) *Uroleucon sonchi*, *Hyperomyzus lactucae*, *Nasonovia ribisnigri*, *Macrosiphum euphorbiae* (Madl and van Achterberg 2014) (Hemiptera, Aphididae)

**Subfamily: Braconinae**

**Genus: *Bracon*** Fabricius, 1804

*Bracon* (*Habrobracon*) *hebetor* (Say, 1836)

Recorded from: Quilici et al. 2003

Host information: *Maruca vitrata* or *Maruca testulalis* (Lepidoptera, Crambidae), *Lampides boeticus* (Lepidoptera, Lycaenidae), *Corcyra cephalonica*, *Etiella zinckenella* (Lepidoptera, Pyralidae) (Madl and van Achterberg 2014)

**Genus: *Iphiaulax*** Förster, 1863

*Iphiaulax didymus* (Brullé, 1846)

Recorded from: Brullé 1846

Host information: Unknown

**Subfamily: Charmontinae**

**Genus: *Charmon*** Haliday, 1833

*Charmon ramagei* Rousse, 2013

Recorded from: Rousse 2013

Host information: Unknown

### Subfamily: Cheloninae

#### Genus: *Chelonus* Panzer, 1806

*Chelonus (Microchelonus) curvimaculatus* Cameron, 1906

Recorded from: Quilici et al. 2003, Braet et al. 2012

Host information: *Nephopterix beharella* (Lepidoptera, Pyralidae) (Quilici et al. 2003), *Pectinophora gossypiella* (Lepidoptera, Gelechiidae), *Trichoplusia ni* (Lepidoptera, Noctuidae) (Chiri and Legner 1982, Jones 1986)

*Chelonus (Microchelonus) matilei* Braet & Rousse, 2012

Recorded from: Braet et al. 2012

Host information: Unknown

*Chelonus (Chelonus) mayi* Braet & Rousse, 2012

Recorded from: Braet et al. 2012

Host information: Unknown

*Chelonus (Microchelonus) merdicus* Rousse & Braet, 2012

Recorded from: Braet et al. 2012

Host information: Unknown

*Chelonus* sp.

Recorded from: Quilici et al. 2003

Host information: Unknown

### Subfamily: Doryctinae

#### Genus: *Ipodoryctes* Granger, 1949

*Ipodoryctes* sp.

Recorded from: Zaldivar-Riveron et al. 2008

Host information: Parasitoid of xylophagus and stem-boring Coleoptera (Beyarslan 2015)

#### Genus: *Rinamba* Cameron, 1912

*Rinamba opacicollis* Cameron, 1912

Recorded from: Braet 2001

Host information: Parasitoid of xylophagus and stem-boring Coleoptera larvae (Beyarslan 2015)

## Subfamily: Euphorinae

### Genus: *Centistes* Haliday, 1835

*Centistes caloupile* Rousse & Braet, 2012

Recorded from: Rousse and Braet 2012

Host information: Unknown

### Genus: *Chrysopophthorus* Goidanich, 1948

*Chrysopophthorus* sp.

Recorded from: Semeria and Quilici 1986

Host information: Unknown, but *Chrysopophthorus* spp. are endoparasitoidss of Chrysopidae (Neuroptera) (Séméria 1976)

### Genus: *Cosmophorus* Ratzeburg, 1848

*Cosmophorus merdiculatus* Rousse & Braet, 2012

Recorded from: Rousse and Braet 2012

Host information: Unknown, but *Cosmophorus* spp. are endoparasitoidss of adult bark beetles (Coleoptera, Scolytinae) (Watanabe 1968)

### Genus: *Leiophron* Nees, 1819

*Leiophron sarahae* Rousse & Braet, 2012

Recorded from: Rousse and Braet 2012

Host information: Unknown, but *Leiophron* spp. are parasitoids of Miridae and Psocoptera (Simbolotti et al. 2002)

*Leiophron yaeli* Rousse & Braet, 2012

Recorded from: Rousse and Braet 2012

Host information: Unknown, but *Leiophron* spp. are parasitoids of Miridae and Psocoptera (Simbolotti et al. 2002)

### Genus: *Meteorus* Haliday, 1835

*Meteorus anthracnemis* de Saeger, 1946

Recorded from: Rousse and Braet 2012

Host information: Unknown, but *Meteorus* spp. are endoparasitoidss of Lepidoptera or Coleoptera (van Achterberg 1979; Zitani et al. 1997)

*Meteorus comonile* Rousse & Braet, 2012

Recorded from: Rousse and Braet 2012

Host information: Unknown, but *Meteorus* spp. are endoparasitoidss of Lepidoptera or Coleoptera (van Achterberg 1979; Zitani et al. 1997)

*Meteorus pulchricornis* Wesmael, 1835

Recorded from: Rousse and Braet 2012

Host information: Lepidoptera: Geometridae, Lasiocampidae, Lycaenidae, Lymantriidae, Noctuidae, Nolidae, Nymphalidae, (Huddleston 1980) Arctiidae, Papilionidae, (Maetô 1990) Plutellidae, (Okada 1989) and Tortricidae, (Berry 1997)

**Genus: *Syntretus*** Förster, 1863

*Syntretus massale* Rousse and Braet, 2012

Recorded from: Rousse and Braet 2012

Host information: Unknown, but *Syntretus* spp. are solitary endoparasitoidss of adult Hymenoptera (Ichneumonidae and Apidae (Rousse and Braet 2012)

**Subfamily: Microgastrinae**

**Genus: *Apanteles*** Förster, 1863

*Apanteles* aff. *acutissimus* Granger, 1949

Recorded from: Vayssières et al. 2001

Host information: *Diaphana indica* (Lepidoptera, Crambidae) (Vayssières et al. 2001)

*Apanteles bordagei* Giard, 1902

Recorded from: Rousse and Gupta 2013

Host information: Endoparasitoid of *Crobylophora daricella*, *Leucoptera caffinea*, *Leucoptera mayricki* (Lepidoptera, Lyonetiidae) (Ferrière 1936, Rousse and Gupta 2013)

*Apanteles fontinalis* de Saeger, 1944

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Apanteles* are endoparasitoids of Lepidotera larvae (Farahani et al. 2012)

*Apanteles galleriae* Wilkinson, 1932

Recorded from: Rousse and Gupta 2013

Host information: *Achroia grisella*, *Galleria mellonella* and *Vitula edmansii* (Lepidoptera, Pyralidae) (Rousse and Gupta 2013)

*Apanteles (Apanteles) minatchy* Rousse & Gupta, 2013

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Apanteles* are endoparasitoids of Lepidotera larvae (Farahani et al. 2012)

*Apanteles (Apanteles) nigrofemoratus* Granger, 1949

Recorded from: Rousse and Gupta 2013

Host information: *Tortyra* sp. (Lepidoptera, Choreutidae) (Rousse and Gupta 2013)

*Apanteles (Apanteles) phasma* Rousse, 2013

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Apanteles* spp. are endoparasitoids of Lepidoptera larvae (Farahani et al. 2012)

*Apanteles (Apanteles) romei* Rousse, 2013

Recorded from: Rousse and Gupta 2013

Host information: *Diaphina* sp. (Lepidoptera, Pyralidae) on *Momordica charantia* (Cucurbitaceae) (Rousse and Gupta 2013)

**Genus: *Cotesia* Cameron, 1891**

*Cotesia flavipes* Cameron, 1891

Recorded from: Kfir et al. 2002

Host information: About 30 lepidopteran species in Arctiidae, Brachodidae, Lymantriidae, Noctuidae, Pyralidae and Tortricidae, including major pests (Rousse and Gupta 2013)

*Cotesia plutellae* (Kurdumov, 1912)

Recorded from: Rousse and Gupta 2013

Host information: About 30 lepidopteran species in Arctiidae, Lasiocampidae, Lymantriidae, Noctuidae, Notodontidae, Nymphalidae, Pieridae, Plutellidae, Pterophoridae, Pyralidae and Tortricidae, including major pests (Rousse and Gupta 2013)

*Cotesia ruficrus* (Haliday, 1834)

Recorded from: Rousse and Gupta 2013

Host information: About 100 lepidopteran species in Arctiidae, Brachodidae, Dilobidae, Gelechiidae, Geometridae, Hesperiidae, Lasiocampidae, Lycaenidae, Lymantriidae, Noctuidae, Nymphalidae, Pieridae, Plutellidae, Pyralidae and Tortricidae (Rousse and Gupta 2013)

*Cotesia sesamiae* (Cameron, 1906)

Recorded from: Van Achterberg and Polaszek 1996

Host information: 15 species of Noctuidae and Pyralidae, including major pests (Rousse and Gupta 2013)

*Cotesia xavieri* Rousse, 2013

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Apanteles* spp. are endoparasitoids of Lepidoptera larvae (Rousse and Gupta 2013)

**Genus: *Diolcogaster*** Ashmead, 1900

*Diolcogaster austrina* (Wilkinson, 1929)

Recorded from: Aubert 1966

Host information: Unknown, but *Diolcogaster* spp. are endoparasitoids in 11 families of Lepidoptera including: Arctiidae, Geometridae, Lasiocampidae, Limacodidae, Lymantriidae, Noctuidae, Notodontidae, Plutellidae, Pyralidae, Tenthredinidae, and Thaumetopoeidae (Zeng et al. 2011)

*Diolcogaster curticornis* (Granger, 1949)

Recorded from: Rousse and Gupta 2013

Host information: *Brenthia leptocosma*, (Lepidoptera, Choreutidae) *Macalla* sp. (Lepidoptera, Pyralidae) (Rousse and Gupta 2013)

**Genus: *Distatrix*** Mason, 1981

*Distatrix belliger* (Wilkinson, 1929)

Recorded from: Rousse and Gupta 2013

Host information: *Helicoverpa armigera*, *Pseudaletia unipunctata* and *Mythimna* sp. (Lepidoptera, Noctuidae) (Rousse and Gupta 2013)

*Distatrix yunae* Rousse & Gupta, 2013

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Distatrix* spp. are endoparasitoids of Lepidoptera larvae (Rousse and Gupta 2013)

**Genus: *Dodogaster*** Rousse, 2013

*Dodogaster grangeri* Rousse, 2013

Recorded from: Rousse and Gupta 2013

Host information: Unknown

**Genus: *Dolichogenidea*** Viereck, 1911

*Dolichogenidea ashoka* Rousse, 2013

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Dolichogenidea* spp. are endoparasitoids of Lepidoptera larvae (Rousse and Gupta 2013)

*Dolichogenidea broadi* Rousse, 2013

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Dolichogenidea* spp. are endoparasitoids of Lepidoptera larvae (Rousse and Gupta 2013)

*Dolichogenidea lumba* Rousse & Gupta, 2013

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Dolichogenidea* spp. are endoparasitoids of Lepidoptera larvae (Rousse and Gupta 2013)

*Dolichogenidea uru* Rousse & Gupta, 2013

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Dolichogenidea* spp. are endoparasitoids of Lepidoptera larvae (Rousse and Gupta 2013)

*Dolichogenidea villemantae* Rousse, 2013

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Dolichogenidea* spp. are endoparasitoids of Lepidoptera larvae (Rousse and Gupta 2013)

**Genus: *Exoryza*** Mason, 1981

*Exoryza safranum* Rousse & Gupta, 2013

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Exoryza* spp. are endoparasitoids of Lepidoptera larvae (Rousse and Gupta 2013)

**Genus: *Glyptapanteles*** Ashmead, 1904

*Glyptapanteles antsirabensis* (Granger, 1949)

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Glyptapanteles* spp. are endoparasitoids of Lepidoptera larvae (Rousse and Gupta 2013)

*Glyptapanteles chidra* Rousse & Gupta, 2013

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Glyptapanteles* spp. are endoparasitoids of Lepidoptera larvae (Rousse and Gupta 2013)

*Glyptapanteles ficus* (Granger, 1949)

Recorded from: Rousse and Gupta 2013

Host information: *Naroma signifera* (Lepidoptera, Lymantriidae) (Rousse and Gupta 2013)

*Glyptapanteles subandinus* (Blanchard, 1947)

Recorded from: Rousse and Gupta 2013

Host information: *Achyra bifidalis* (Lepidoptera, Pyralidae), *Phthorimaea opercul-lela* and *Scrobipalpula absoluta* (Lepidoptera, Gelechiidae) on *Solanum tuberosum* (Solanaceae) (Rousse and Gupta 2013)

**Genus: *Microplitis*** Förster, 1863

*Microplitis subsulcatus* Granger, 1949

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Microplitis* spp. are endoparasitoids of Lepidoptera larvae (Rousse and Gupta 2013)

**Genus: *Nyereria*** Mason, 1981

*Nyereria ganges* Rousse & Gupta, 2013

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Nyereria* spp. are endoparasitoids of macrolepidoptera larvae (Rousse and Gupta 2013)

*Nyereria mayurus* Rousse & Gupta, 2013

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Nyereria* spp. are endoparasitoids of macrolepidoptera larvae (Rousse and Gupta 2013)

**Genus: *Parapanteles*** Ashmead, 1900

*Parapanteles covino* Rousse & Gupta, 2013

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Parapanteles* spp. are endoparasitoids in 7 families of Lepidoptera including: Arctiidae, Noctuidae, Notodontidae, Elachistidae, Saturniidae, Geometridae, Gelechiidae (Valerio et al. 2009)

*Parapanteles darignac* Rousse & Gupta, 2013

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Parapanteles* spp. are endoparasitoids in 7 families of Lepidoptera including: Arctiidae, Noctuidae, Notodontidae, Elachistidae, Saturniidae, Geometridae, Gelechiidae (Valerio et al. 2009)

**Genus: *Venanides*** Mason, 1981

*Venanides curticornis* (Granger, 1949)

Recorded from: Rousse and Gupta 2013

Host information: Unknown, but *Venanides* spp. are endoparasitoids of microlepidoptera larvae (Rousse and Gupta 2013)

**Genus: *Wilkinsonellus*** Mason, 1981

*Wilkinsonellus narangahus* Rousse & Gupta, 2013

Recorded from: Rousse and Gupta 2013

Host information: Unknown

**Subfamily: Gnamptodontinae**

**Genus: *Gnamptodon*** Haliday, 1833

*Gnamptodon legorskyi* Fischer, 2014

Recorded from: Fischer 2014

Host information: Unknown, but *Gnamptodon* spp. are parasitoids of Nepticulidae.

## Subfamily: Opiinae

**Genus: *Diachasmimorpha*** Viereck, 1913

*Diachasmimorpha fullawayi* (Silvestri, 1913)

Recorded from: Quilici et al. 2003

Host information: *Ceratitis capitata* (Diptera, Tephritidae) (Quilici et al. 2003, Fischer and Madl 2008)

*Diachasmimorpha tryoni* (Cameron, 1911)

Recorded from: Hurtrel et al. 1999

Host information: At least 6 species of Tephritidae (Diptera) (Ramadan et al. 1994, Wharton and Gilstrap 1983)

**Genus: *Fopius*** Wharton, 1987

*Fopius arisanus* (Sonan, 1932)

Recorded from: Quilici et al. 2003

Host information: *Bactrocera zonata*, *Ceratitis capitata*, *Ceratitis catoirii*, *Ceratitis rosa*, *Dacus ciliatus*, *Dacus demmerezi*, *Neoceratitis cyanescens* (Diptera, Tephritidae) (Fischer and Madl 2008)

**Genus: *Opius*** Wesmael, 1835

*Opius dissitus* Muesebeck, 1963

Recorded from: Vayssières et al. 2001

Host information: *Liriomyza* spp. (Diptera, Agromyzidae) (Stegmaier 1972, Schuster and Wharton 1993, Vayssières et al. 2001)

*Opius (Utetes) coriacitergum* Fischer, 2014

Recorded from: Fischer 2014

Host information: Unknown, but Opiinae are parasitoids of Cyclorrhapha (Diptera) larvae (Ameri et al. 2014)

*Opius (Tolbia) karlmayi* Fischer, 2014

Recorded from: Fischer 2014

Host information: Unknown, but Opiinae are parasitoids of Cyclorrhapha (Diptera) larvae (Ameri et al. 2014)

*Opius (Utetes) lareunionensis* Fischer, 2014

Recorded from: Fischer 2014

Host information: Unknown, but Opiinae are parasitoids of Cyclorrhapha (Diptera) larvae (Ameri et al. 2014)

*Opicus (Gastrosema) laticrenis* Fischer, 2014

Recorded from: Fischer 2014

Host information: Unknown, but Opiinae are parasitoids of Cyclorrhapha (Diptera) larvae (Ameri et al. 2014)

*Opicus (Opicus) raoiformis* Fischer, 2014

Recorded from: Fischer 2014

Host information: Unknown, but Opiinae are parasitoids of Cyclorrhapha (Diptera) larvae (Ameri et al. 2014)

*Opicus (Utetes) semipilosus* Fischer, 2014

Recorded from: Fischer 2014

Host information: Unknown, but Opiinae are parasitoids of Cyclorrhapha (Diptera) larvae (Ameri et al. 2014)

*Opicus (Gastrosema) waterloti* Granger, 1949

Recorded from: Fischer and Madl 2008

Host information: Unknown, but Opiinae are parasitoids of Cyclorrhapha (Diptera) larvae (Ameri et al. 2014)

**Genus: *Psyllalia*** Walker, 1860

*Psyllalia cosyrae* (Wilkinson, 1927)

Recorded from: Doubtful record. Fischer (1987) recorded it from Reunion because “Réunion, Mayotte” was indicated on the label.

Host information: *Dacus* sp. (Diptera, Tephritidae) (Fischer and Madl 2008)

*Psyllalia distinguenda* (Granger, 1949)

Recorded from: Wharton et al. 1999

Host information: *Ceratitis capitata* (Diptera, Tephritidae) (Quilici et al. 2003, Fischer and Madl 2008)

*Psyllalia fletcheri* (Sylvestri, 1916)

Recorded from: Hurtrel et al. 1999

Host information: *Bactrocera cucurbitae*, *Ceratitis capitata* and *Dacus ciliatus* (Diptera, Tephritidae) (Fischer and Madl 2008)

*Psyllalia insignipennis* (Granger, 1949)

Recorded from: Wharton et al. 1999

Host information: *Ceratitis capitata*, *Ceratitis catoirii* and *Neoceratitis cyanescens* (Diptera, Tephritidae) (Quilici et al. 2003, Fischer and Madl 2008)

*Psyttalia phaeostigma* (Wilkinson, 1927)

Recorded from: Fischer 1987

Host information: *Dacus ciliatus* and *Dacus demmerezi* (Diptera, Tephritidae) (Fischer and Madl 2008)

*Psyttalia sanctamarina* (Fischer, 1980)

Recorded from: Fischer 1980

Host information: *Spathulina aroleuca* (Diptera, Tephritidae) (Fischer and Madl 2008)

*Psyttalia subsulcata* (Granger, 1949)

Recorded from: Fischer and Madl 2008

Host information: *Spathulina aroleuca* (Diptera, Tephritidae) (Fischer and Madl 2008)

## Family: ICHNEUMONIDAE

### Subfamily: Banchinae

**Genus: *Himertosoma*** Schimeknecht, 1900

*Himertosoma bebourensis* (Benoit, 1957)

Recorded from: Benoit 1957

Host information: Unknown, but Banchinae are parasitoid of Lepidoptera larvae (Rousse and Villemant 2012)

*Himertosoma striata* (Seyrig, 1932)

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Banchinae are parasitoid of Lepidoptera larvae (Rousse and Villemant 2012)

### Subfamily: Campopleginae

**Genus: *Campoplex*** Gravenhorst, 1829

*Campoplex techer* Rousse & Villemant, 2012

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Campopleginae are generally parasitoids of Lepidoptera and Symphyta but they sometimes parasitize Coleoptera and Neuroptera (Rousse and Villemant 2012)

**Genus: *Diadegma*** Förster, 1869

*Diadegma insulare* (Cresson, 1865)

Recorded from: Rousse and Villemant 2012

Host information: *Plutella xylostella*, *Plutella opercula*, *Plutella omissa*, *Plutella armoraciae* (Lepidoptera, Plutellidae) and *Hellula undalis* (Lepidoptera, Pyralidae) (Sourakov and Mitchell 2000, Rousse and Villemant 2012)

*Diadegma mollipla* (Holmgren, 1868)

Recorded from: Vayssières et al. 2001

Host information: *Plutella xylostella*, (Lepidoptera, Plutellidae) and *Phthorimaea operculella* (Lepidoptera, Gelechiidae) (Rousse and Villemant 2012)

**Genus: *Dusona* Cameron, 1901**

*Dusona douraguia* Rousse & Villemant, 2012

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Campopleginae are generally parasitoids of Lepidoptera and Symphyta but they sometimes parasitize Coleoptera and Neuroptera (Rousse and Villemant 2012)

*Dusona pauliani* (Benoit, 1957)

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Campopleginae are generally parasitoids of Lepidoptera and Symphyta but they sometimes parasitize Coleoptera and Neuroptera (Rousse and Villemant 2012)

**Genus: *Enytus* Cameron, 1905**

*Enytus huet* Rousse & Villemant, 2012

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Campopleginae are generally parasitoids of Lepidoptera and Symphyta but they sometimes parasitize Coleoptera and Neuroptera (Rousse and Villemant 2012)

**Genus: *Eriborus* Förster, 1869**

*Eriborus cadjee* Rousse & Villemant, 2012

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Campopleginae are generally parasitoids of Lepidoptera and Symphyta but they sometimes parasitize Coleoptera and Neuroptera (Rousse and Villemant 2012)

*Eriborus pallipes* (Brullé, 1846)

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Campopleginae are generally parasitoids of Lepidoptera and Symphyta but they sometimes parasitize Coleoptera and Neuroptera (Rousse and Villemant 2012)

**Genus: *Hyposoter*** Förster 1869*Hyposoter reunionis* (Benoit, 1957)

Recorded from: Benoit 1957

Host information: Unknown, but Campopleginae are generally parasitoids of Lepidoptera and Symphyta but they sometimes parasitize Coleoptera and Neuroptera (Rousse and Villemant 2012)

**Genus: *Venturia*** Schrottky, 1902*Venturia canescens* (Gravenhorst, 1829)

Recorded from: Rousse and Villemant 2012

Host information: 23 species belonging to the families Pyralidae, Noctuidae, Tortricidae, Gelechiidae, Tineidae and Yponomeutidae (Lepidoptera) (Rousse and Villemant 2012)

**Genus: *Xanthocampoplex*** Morley, 1913*Xanthocampoplex huberti* Rousse & Villemant, 2012

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Campopleginae are generally parasitoids of Lepidoptera and Symphyta but they sometimes parasitize Coleoptera and Neuroptera (Rousse and Villemant 2012)

**Subfamily: Cremastinae****Genus: *Pristomerus*** Curtis, 1836*Pristomerus rivier* Rousse & Villemant, 2012

Recorded from: Rousse and Villemant 2012

Host information: *Plutella xylostella* (Plutellidae) (Rousse and Villemant 2012) and *Prophantis smaragdina* (Chartier et al. 2013, Identified by Rousse 2012 unpublished data)**Genus: *Temelucha*** Meyrick, 1909*Temelucha basiornata* (Cameron, 1911)

Recorded from: Rousse and Villemant 2012

Host information: Unidentified rice stem borer, probably *Diopsis* sp. (Diptera, Diopsidae) (Zwart 1998)*Temelucha labusi* Rousse & Villemant, 2012

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Cremastinae are endoparasitoids of Lepidoptera or Coleoptera larvae in leave folds, tunnels, buds, galls or other concealed situations (Rousse and Villemant 2012)

*Temelucha minuta* (Morley, 1912)

Recorded from: Rousse and Villemant 2012

Host information: *Grapholita critica* (Lepidoptera, Tortricidae), *Etiella behrii* (Lepidoptera, Pyralidae), *Bilobata subsecivella* (Lepidoptera, Gelechiidae) on peanut, *Phthorimaea operculella* (Lepidoptera, Gelechiidae) on potato (Gauld 1980, Rousse and Villemant 2012)

*Temelucha pestifer* (Morley, 1913)

Recorded from: Benoit 1957

Host information: An unidentified stem borer on *Oryza sativa* (Poaceae) field (Rousse and Villemant 2012)

*Temelucha talibarti* Rousse, Villemant & Seyrig, 2011

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Cremastinae are endoparasitoids of Lepidoptera or Coleoptera larvae in leave folds, tunnels, buds, galls or other concealed situations (Rousse and Villemant 2012)

*Temelucha* sp. 1

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Cremastinae are endoparasitoids of Lepidoptera or Coleoptera larvae in leave folds, tunnels, buds, galls or other concealed situations (Rousse and Villemant 2012)

*Temelucha* sp. 2

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Cremastinae are endoparasitoids of Lepidoptera or Coleoptera larvae in leave folds, tunnels, buds, galls or other concealed situations (Rousse and Villemant 2012)

**Genus: *Trathala* Cameron, 1899**

*Trathala annulicornis* (Tosquinet, 1896)

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Cremastinae are endoparasitoids of Lepidoptera or Coleoptera larvae in leave folds, tunnels, buds, galls or other concealed situations (Rousse and Villemant 2012)

*Trathala flavoorbitalis* (Cameron, 1907)

Recorded from: Rousse and Villemant 2012

Host information: Seventy-eight host records, all Lepidoptera (Gelechoidea, Noc-tuoidea, Pyraloidea, Tineoidea and Tortracoidea) (Rousse and Villemant 2012)

## Subfamily: Cryptinae

### Genus: *Acrolyta* Förster, 1868

*Acrolyta dindar* Rousse & Villemant, 2012

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Cryptinae generally are ectoparasitoids of Holometabola pupae or prepupae. Some species are endoparasitoids, and some species parasitize the egg masses of Araneae and Pseudoscorpionida. (Rousse and Villemant 2012)

### Genus: *Diatora* Förster, 1868

*Diatora albiscapus* (Seyrig, 1952)

Recorded from: Rousse and Villemant 2012

Host information: *Apanteles* sp. (Hymenoptera, Braconidae) ex *Napta serratilinea* (Lepidoptera, Lasiocampidae) and *Nephela densoi* (Lepidoptera, Sphingidae) on mimosa (*Mimosa* sp.) (Seyrig 1952, Rousse and Villemant 2012)

### Genus: *Paraphylax* Förster, 1869

*Paraphylax mussar* Rousse & Villemant, 2012

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but *Paraphylax* spp. are parasitoids of *Heliothis armigera* (Lepidoptera, Noctuidae) (Choudhary et al. 1983)

*Paraphylax transversatoria* (Seyrig, 1952)

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but *Paraphylax* spp. are parasitoids of *Heliothis armigera* (Lepidoptera, Noctuidae) (Choudhary et al. 1983)

### Genus: *Phygadeuon* Gravenhorst, 1829

*Phygadeuon nativel* Rousse & Villemant, 2012

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but *Phygadeuon* spp. are parasitoids of *Musca domestica* (Diptera, Muscidae) and *Rhagoletis cerasi* (Diptera, Tephritidae) (Rousse and Villemant 2012)

## Subfamily: Diplazontinae

### Genus: *Diplazon* Nees, 1918

*Diplazon laetatorius* (Fabricius, 1781)

Recorded from: de Saussure 1892

Host information: Parasitoid of a wide range of Diptera, especially aphidophagous syrphid flies (more than 50 host species reported in Syrphidae) (Rousse and Villemant 2012)

### **Subfamily: Ichneumoninae**

#### **Genus: *Crytea* Cameron, 1906**

*Crytea albitrochanterata* (Heinrich, 1938)

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Ichneumoninae are endoparasitoids of Lepidoptera larvae or pupae (Rousse and Villemant 2012)

#### **Genus: *Ichneumon* Fabricius, 1798**

*Ichneumon unicinctus* Brullé, 1846

Recorded from: Rousse and Villemant 2012

Host information: *Charadrina* sp., *Sciomesia biluma*, *Sesamia calamistis* (Lepidoptera, Noctuidae, Amphipyrinae) (Zwart 1998)

### **Subfamily: Mesochorinae**

#### **Genus: *Mesochorus* Gravenhorst, 1829**

*Mesochorus cariniferus* Benoit, 1955

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Mesochorinae are hyperparasitoids of Ichneumonoidea (Hymenoptera) or Tachinidae (Diptera) (Rousse and Villemant 2012)

*Mesochorus* sp.

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Mesochorinae are hyperparasitoids of Ichneumonoidea (Hymenoptera) or Tachinidae (Diptera) (Rousse and Villemant 2012)

### **Subfamily: Metopiinae**

#### **Genus: *Triclistus* Förster, 1869**

*Triclistus aitkeni* (Cameron, 1897)

Recorded from: Rousse and Villemant 2012

Host information: *Cnaphalocrocis medinalis* (Guenée) (Lepidoptera: Pyralidae) on rice (*Oryza sativa*) (Rousse and Villemant 2012)

## Subfamily: Ophioninae

**Genus: *Enicospilus* Stephens, 1835**

*Enicospilus angustatus* (Brullé, 1846)

Recorded from: Bordage 1914

Host information: Unknown, but *Enicospilus* spp. are nocturnal endoparasitoids of Lepidoptera (Rousse and Villemant 2012)

*Enicospilus betanimenus* (Saussure, 1892)

Recorded from: Rousse and Villemant 2012

Host information: *Achaea faber*, *Dysgonia pudica*, *Dysgonia triplocyma*, *Heliophisma klugii*, and *Tatorinia rufipennis* (Lepidoptera, Noctuidae) (Rousse and Villemant 2012)

*Enicospilus dolosus* (Tosquinet, 1896)

Recorded from: Rousse and Villemant 2012

Host information: *Anomis leona* (Lepidoptera, Noctuidae) and *Haritalodes dero-gate* (Lepidoptera, Crambidae) (Rousse and Villemant 2012)

*Enicospilus dubius* (Tosquinet, 1896)

Recorded from: Rousse and Villemant 2012

Host information: *Anomis leona*, *Chrysodeixis chalcites* (Lepidoptera, Noctuidae) and *Plusia* sp. (Lepidoptera, Plusiidae) (Gauld and Mitchell 1978)

*Eniscopilus grandiflavus* Townes, 1973

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but *Enicospilus* spp. are nocturnal endoparasitoids of Lepidoptera (Rousse and Villemant 2012)

*Enicospilus helvolus* Gauld & Mitchell, 1978

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but *Enicospilus* spp. are nocturnal endoparasitoids of Lepidoptera (Rousse and Villemant 2012)

*Enicospilus hova* Gauld & Mitchell, 1978

Recorded from: Gauld and Mitchell 1978

Host information: Unknown, but *Enicospilus* spp. are nocturnal endoparasitoids of Lepidoptera (Rousse and Villemant 2012)

*Enicospilus mauritii* (de Saussure, 1892)

Recorded from: Bordage 1914

Host information: *Chilo sacchariphagus* (Lepidoptera, Pyralidae), *Leucania loreyi* (Lepidoptera, Noctuidae, Hadeninae), *Mythimna loreyi* (Lepidoptera, Noctuidae), *Olethreutes schistaceanus*, *Tetramoera schistacea* (Lepidoptera, Tortricidae, Olethreutinae), *Procherata sacchariphaga*, *Procerata venostata* (Lepidoptera, Brachodidae), *Sesamia calamistis*, *Sesamia inferens*, *Sesamia nonagrioides*, *Speia vuteria* (Lepidoptera, Noctuidae, Amphipyrinae) (Rousse and Villemant 2012)

*Enicospilus rufus* (Brullé, 1846)

Recorded from: Benoit 1957

Host information: *Ctenoplusia limbirena*, *Trigonodes hyppasia* (Lepidoptera, Noctuidae) (Rousse and Villemant 2012).

*Enicospilus ruscus* Gauld & Mitchell, 1978

Recorded from: Rousse and Villemant 2012

Host information: *Mythimna loreyi*, *Sesamia botanephaga*, *Sesamia vulturaria*, (Lepidoptera, Noctuidae) (Rousse and Villemant 2012)

*Enicospilus sesamiae* Delobel, 1974

Recorded from: Zwart 1998

Host information: *Procerata venosata* (Lepidoptera, Brachodidae) (Gauld and Mitchell 1978), *Busseola fusca*, *Sesamia calamistis* and *Sesamia vuteria* (Lepidoptera, Noctuidae) (Zwart 1998)

*Enicospilus transvaalensis* Cameron, 1911

Recorded from: Rousse and Villemant 2012

Host information: *Mythimna* sp. and *Sesamia calamistis* (Lepidoptera, Noctuidae) (Rousse and Villemant 2012)

*Enicospilus vitry* Rousse & Villemant, 2012

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but *Enicospilus* spp. are nocturnal endoparasitoids of Lepidoptera (Rousse and Villemant 2012)

## Subfamily: Orthocentrinae

### Genus: *Megastylus* Schiødte, 1838

#### *Megastylus vagabundus* Seyrig, 1934

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Orthocentrinae are endoparasitoids of Mycetophilidae and Sciaridae (Diptera) (Rousse and Villemant 2012)

**Genus: *Orthocentrus*** Gravenhorst, 1829

*Orthocentrus urbanus* Seyrig, 1934

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Orthocentrinae are endoparasitoids of Mycetophilidae and Sciaridae (Diptera) (Rousse and Villemant 2012)

**Genus: *Pantisarthrus*** Förster, 1871

*Pantisarthrus isolatus* (Benoit, 1957)

Recorded from: Benoit 1957

Host information: Unknown, but Orthocentrinae are endoparasitoids of Mycetophilidae and Sciaridae (Diptera) (Rousse and Villemant 2012)

**Genus: *Proclitus*** Förster, 1869

*Proclitus ligatus* (Seyrig, 1934)

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Orthocentrinae are endoparasitoids of Mycetophilidae and Sciaridae (Diptera) (Rousse and Villemant 2012)

**Genus: *Stenomacrus*** Förster, 1869

*Stenomacrus payet* Rousse & Villemant, 2012

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Orthocentrinae are endoparasitoids of Mycetophilidae and Sciaridae (Diptera) (Rousse and Villemant 2012)

**Genus: *Tariqia*** Rousse and Villemant, 2012

*Tariqia stellaris* Rousse & Villemant, 2012

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Orthocentrinae are endoparasitoids of Mycetophilidae and Sciaridae (Diptera) (Rousse and Villemant 2012)

**Subfamily: Pimplinae****Genus: *Echthromorpha*** Holmgren, 1868

*Echthromorpha spinator* (Fabricius, 1798)

Recorded from: Rousse and Villemant 2012

Host information: *Nagia linteola* (Lepidoptera, Noctuidae) (Rousse and Villemant 2012)

**Genus: *Itoplectis*** (Förster, 1869)

*Itoplectis albipes* Seyrig 1932

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but morphological studies indicate that *Itoplectis albipes* uses echolocation when foraging for hosts (Broad and Quicke 2000)

**Genus: *Xanthophenax*** Saussure, 1892

*Xanthophenax defector* Seyrig, 1932

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Pimplinae are generally ectoparasitoids of pupae and larvae of Holometabola. Some species parasitize adult and egg sacs of Araneae (Rousse and Villemant 2012)

*Xanthophenax pacificator* Seyrig, 1932

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Pimplinae are generally ectoparasitoids of pupae and larvae of Holometabola. Some species parasitize adult and egg sacs of Araneae (Rousse and Villemant 2012)

*Xanthophenax xanthomelas* (Brullé, 1846)

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Pimplinae are generally ectoparasitoids of pupae and larvae of Holometabola. Some species parasitize adult and egg sacs of Araneae (Rousse and Villemant 2012)

**Genus: *Xanthopimpla*** de Saussure, 1892

*Xanthopimpla stemmator* (Thunberg, 1824)

Recorded from: Kfir et al. 2002

Host information: More than 30 species of Pyralidae (Lepidoptera) (Rousse and Villemant 2012)

**Genus: *Zatypota*** Förster, 1869

*Zatypota inexpectata* (Seyrig, 1932)

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but Pimplinae are generally ectoparasitoids of pupae and larvae of Holometabola. Some species parasitize adult and egg sacs of Araneae (Rousse and Villemant 2012)

**Subfamily: Tersilochinae**

**Genus: *Aneuclis*** Förster, 1869

*Aneuclis larga* Khalaim, 2009

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but most Tersilochinae are endoparasitoids of Coleoptera (generally Curculionidae and Chrysomelidae). Some species parasitize Symphyta (Hymenoptera) (Rousse and Villemant 2012)

**Genus: *Diaparsis*** Förster, 1869*Diaparsis ramassamy* Rousse & Villemant, 2012

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but most Tersilochinae are endoparasitoids of Coleoptera (generally Curculionidae and Chrysomelidae). Some species parasitize Symphyta (Hymenoptera) (Rousse and Villemant 2012)

**Subfamily: Tryphoninae****Genus: *Netelia*** Gray, 1860*Netelia melanopus* (Brullé, 1846)

Recorded from: de Saussure 1892

Host information: *Mythimna loreyi*, *Sesamia calamistis*, *Sesamia inferens* (Lepidoptera, Noctuidae), *Olethreutes schistaceanus* (Lepidoptera, Tortricidae) and *Chilo sacchariphagus* (Lepidoptera, Pyralidae) (Rousse and Villemant 2012)*Netelia* sp.

Recorded from: Rousse and Villemant 2012

Host information: Unknown, but *Netelia* spp. are ectoparasitoids of Lepidoptera larvae (Rousse and Villemant 2012)**Table 1.** List of Ichneumonoidea recorded from Reunion Island.

Family	Subfamily	Genus / Species	General host information	Recorded from
BRACONIDAE	Agathidinae	<i>Biroia costata</i> (Brullé, 1846)	Unknown	Granger 1949
		<i>Camptothipsis curticornis</i> Granger, 1949	<i>Nephopterix beharella</i>	Quilici et al. 2003
		<i>Coccygidium lutea</i> (Brullé, 1846)	<i>Condica conducta</i> <i>Mythimna curvivula</i> <i>Mythimna loreyi</i>	Brullé 1846
	Alysiinae	<i>Adelphenaldis grimmorum</i> Fischer, 2014	Unknown	Fischer 2014
		<i>Adelphenaldis nanocorpus</i> Fischer, 2014	Unknown	Fischer 2014
		<i>Aphaereta</i> sp.	Diptera Cyclorrhapha	Quilici et al. 2003
		<i>Asobara diadegmae</i> Fischer, 2014	<i>Diadegma</i> sp. (Ichneumonidae)	Fischer 2014
		<i>Cratospila sinenotaulus</i> Fischer, 2014	Unknown	Fischer 2014
		<i>Dacnusa sibirica</i> Telenga, 1934	Agromyzidae	Vayssières et al. 2001
		<i>Dacnusa</i> sp.	Agromyzidae	Vayssières et al. 2001

Family	Subfamily	Genus / Species	General host information	Recorded from
BRACONIDAE	Alysiinae	<i>Dinotrema candidiapex</i> Fischer, 2014	Unknown	Fischer 2014
		<i>Synaldis dugainensis</i> Fischer, 2014	Unknown	Fischer 2014
		<i>Synaldis robusticeps</i> Fischer, 2014	Unknown	Fischer 2014
	Aphidiinae	<i>Aphidius camerunensis</i> Mackauer, 1966	<i>Sitobion</i>	Stary et al. 1994
		<i>Aphidius colemani</i> Viereck, 1912	Aphidiidae	Vayssières et al. 2001
		<i>Aphidius rosae</i> Haliday, 1833	<i>Macrosiphum rosae</i> <i>Sitobion fragariae</i>	Stary et al. 1977
		<i>Aphidius seyrigi</i> Granger 1949	Aphidiidae	Benoit 1957
		<i>Diaeretiella rapae</i> (McIntosh, 1855)	Aphidiidae	Quilici et al. 1988
		<i>Praon</i> sp.	<i>Aphis</i> sp.	Vayssières et al. 2001
	Braconinae	<i>Bracon (Habrobracon) hebetor</i> (Say, 1836)	Crambidae, Lycaenidae, Pyralidae (Lep.)	Quilici et al. 2003
		<i>Iphiaulax didymus</i> (Brullé, 1846)	Unknown	Brullé 1846
	Charmontinae	<i>Charmon ramagei</i> Rousse, 2013	Unknown	Rousse 2013
	Cheloninae	<i>Chelonus (Microchelonus) curvimaculatus</i> Cameron, 1906	<i>Pectinophora gossypiella</i> , <i>Trichoplusia ni</i>	Quilici et al. 2003 Braet et al. 2012
		<i>Chelonus (Microchelonus) matilei</i> Braet & Rousse, 2012	Unknown	Braet et al. 2012
		<i>Chelonus (Chelonus) mayi</i> Braet & Rousse, 2012	Unknown	Braet et al. 2012
		<i>Chelonus (Microchelonus) merdicus</i> Rousse & Braet, 2012	Unknown	Braet et al. 2012
		<i>Chelonus</i> sp.	Unknown	Quilici et al. 2003
	Doryctinae	<i>Ipodoryctes</i> sp.	Coleoptera	Zaldivar-Riveron et al. 2008
		<i>Rinamba opacicollis</i> Cameron, 1912	Coleoptera	Braet 2001
	Euphorinae	<i>Centistes caloupile</i> Rousse & Braet, 2012	Unknown	Rousse and Braet 2012
		<i>Chrysopophthorus</i> sp.	Chrysopidae	Semeria and Quilici 1986
		<i>Cosmophorus merdicolatus</i> Rousse & Braet, 2012	Scolytinae	Rousse and Braet 2012
		<i>Leiophron sarahae</i> Rousse & Braet, 2012	Miridae or Psocoptera	Rousse and Braet 2012
		<i>Leiophron yaeli</i> Rousse & Braet, 2012	Miridae or Psocoptera	Rousse and Braet 2012
		<i>Meteorus anthracnemis</i> de Saeger, 1946	Lepidoptera	Rousse and Braet 2012
		<i>Meteorus comonile</i> Rousse & Braet, 2012	Lepidoptera	Rousse and Braet 2012
		<i>Meteorus pulchricornis</i> Rousse & Braet, 2012	Lepidoptera	Rousse and Braet 2012

Family	Subfamily	Genus / Species	General host information	Recorded from
BRACONIDAE	Euphorinae	<i>Syntretus massale</i> Rousse & Braet, 2012	Hymenoptera	Rousse and Braet 2012
	Gnamptodontinae	<i>Gnamptodon legorskyi</i> Fischer, 2014	Nepticulidae	Fischer 2014
	Microgastrinae	<i>Apanteles aff. acutissimus</i> Granger, 1949	<i>Diaphana indica</i>	Vayssières et al. 2001
		<i>Apanteles bordagei</i> Giard, 1902	<i>Crobylophora daricella</i> <i>Leucoptera cafféina</i> <i>Leucoptera mayricki</i>	Rousse and Gupta 2013
		<i>Apanteles fontinalis</i> de Saeger, 1944	Lepidoptera	Rousse and Gupta 2013
		<i>Apanteles galleriae</i> Wilkinson, 1932	Lepidoptera, Pyralidae	Rousse and Gupta 2013
		<i>Apanteles minutatty</i> Rousse & Gupta, 2013	Lepidoptera	Quilici et al. 2003
		<i>Apanteles nigromemoratus</i> Granger, 1949	Lepidoptera, Cheurotidae	Rousse and Gupta 2013
		<i>Apanteles phasma</i> Rousse, 2013	Lepidoptera	Rousse and Gupta 2013
		<i>Apanteles romei</i> Rousse, 2013	<i>Diaphina</i> sp.	Rousse and Gupta 2013
		<i>Cotesia flavipes</i> Cameron, 1891	Lepidoptera	Kfir et al. 2002
		<i>Cotesia plutellae</i> (Kurdumov, 1912)	Lepidoptera	Rousse and Gupta 2013
		<i>Cotesia ruficrus</i> (Haliday, 1834)	Lepidoptera	Rousse and Gupta 2013
		<i>Cotesia sesamiae</i> (Cameron, 1906)	Lepidoptera, Noctuidae, Pyralidae	Van Achterberg and Polaszek 1996
		<i>Cotesia xavieri</i> Rousse, 2013	Lepidoptera	Rousse and Gupta 2013
		<i>Diolcogaster austriana</i> (Wilkinson, 1929)	Lepidoptera	Aubert 1966
		<i>Diolcogaster curticornis</i> (Granger, 1949)	Lepidoptera	Rousse and Gupta 2013
		<i>Distatrix belliger</i> (Wilkinson, 1929)	Lepidoptera	Rousse and Gupta 2013
		<i>Distatrix yunae</i> Rousse & Gupta, 2013	Lepidoptera	Rousse and Gupta 2013
		<i>Dodogaster grangeri</i> Rousse, 2013	Lepidoptera	Rousse and Gupta 2013
		<i>Dolichogenidea ashoka</i> Rousse, 2013	Lepidoptera	Rousse and Gupta 2013
		<i>Dolichogenidea broadi</i> Rousse, 2013	Lepidoptera	Rousse and Gupta 2013
		<i>Dolichogenidea lumba</i> Rousse & Gupta, 2013	Lepidoptera	Rousse and Gupta 2013
		<i>Dolichogenidea uru</i> Rousse & Gupta, 2013	Lepidoptera	Rousse and Gupta 2013

Family	Subfamily	Genus / Species	General host information	Recorded from
BRACONIDAE	Microgastrinae	<i>Dolichogenidea villemantae</i> Rousse, 2013	Lepidoptera	Rousse and Gupta 2013
		<i>Exoryza safranum</i> Rousse & Gupta, 2013	Lepidoptera	Rousse and Gupta 2013
		<i>Glyoptapanteles antsirabensis</i> (Granger, 1949)	Lepidoptera	Rousse and Gupta 2013
		<i>Glyptapanteles chidra</i> Rousse & Gupta, 2013	Lepidoptera	Rousse and Gupta 2013
		<i>Glyptapanteles ficus</i> (Granger, 1949)	<i>Naroma signifera</i>	Rousse and Gupta 2013
		<i>Glyptapanteles subandinus</i> (Blanchard, 1947)	<i>Achyra bifidalis</i> <i>Phthorimaea operculella</i> <i>Scrobipalpula absoluta</i>	Rousse and Gupta 2013
		<i>Microplitis subsulcatus</i> Granger, 1949	Lepidoptera	Rousse and Gupta 2013
		<i>Nyereria ganges</i> Rousse & Gupta, 2013	Lepidoptera	Rousse and Gupta 2013
		<i>Nyereria mayurus</i> Rousse & Gupta, 2013	Lepidoptera	Rousse and Gupta 2013
		<i>Parapanteles covino</i> Rousse & Gupta, 2013	Lepidoptera	Rousse and Gupta 2013
		<i>Parapanteles darignac</i> Rousse & Gupta, 2013	Lepidoptera	Rousse and Gupta 2013
		<i>Venanides curticornis</i> (Granger, 1949)	Lepidoptera	Rousse and Gupta 2013
		<i>Wilkinsonellus narangabus</i> Rousse & Gupta, 2013	Unknown	Rousse and Gupta 2013
	Opiinae	<i>Diachasmimorpha fullawayi</i> (Silvestri, 1913)	<i>Ceratitis capitata</i>	Quilici et al. 2003
		<i>Diachasmimorpha tryoni</i> (Cameron, 1911)	Diptera, Tephritidae	Hurtrel et al. 1999
		<i>Fopius arisanus</i> (Sonan, 1932)	Diptera, Tephritidae	Quilici et al. 2003
		<i>Opius dissitus</i> Muesebeck, 1963	Diptera, Agromyzidae	Vayssières et al. 2001
		<i>Opius (Utetes) coriacitergum</i> Fischer, 2014	Diptera Cyclorrhapha	Fischer 2014
		<i>Opius (Tolbia) karlmayi</i> Fischer, 2014	Diptera Cyclorrhapha	Fischer 2014
		<i>Opius (Gastrosema) laticrenis</i> Fischer, 2014	Diptera Cyclorrhapha	Fischer 2014
		<i>Opius (Opius) naiiformis</i> Fischer, 2014	Diptera Cyclorrhapha	Fischer 2014
		<i>Opius (Utetes) semipilosus</i> Fischer, 2014	Diptera Cyclorrhapha	Fischer 2014
		<i>Opius (Gastrosema) waterloti</i> Granger, 1949	Diptera Cyclorrhapha	Fischer and Madl 2008
		<i>Syntalla cosyrae</i> [1] (Wilkinson, 1927)	<i>Dacus</i> sp.	–

Family	Subfamily	Genus / Species	General host information	Recorded from
BRACONIDAE	Opiinae	<i>Pyttalia distinguenda</i> (Granger, 1949)	Diptera Cyclorrhapha	Wharton et al. 1999
		<i>Pyttalia fletcheri</i> (Sylvestri, 1916)	Diptera Cyclorrhapha	Hurtrel et al. 1999
		<i>Pyttalia insignipennis</i> (Granger, 1949)	<i>Ceratitis capitata</i> <i>Ceratitis catoirii</i> <i>Neoceratitis cyanescens</i>	Wharton et al. 1999
		<i>Pyttalia phaeostigma</i> (Wilkinson, 1927)	<i>Dacus ciliatus</i> <i>Dacus demmerezii</i>	Fischer 1987
		<i>Pyttalia sanctamarina</i> (Fischer, 1980)	<i>Spathulina aroleuca</i>	Fischer 1980
		<i>Pyttalia subsulcata</i> (Granger, 1949)	<i>Spathulina aroleuca</i>	Fischer and Madl 2008
	Banchinae	<i>Himertosoma bebourensis</i> (Benoit, 1957)	Lepidoptera, Tortricidae, Gelechiidae	Benoit 1957
ICHNEUMONIDAE	Campopleginae	<i>Himertosoma striata</i> (Seyrig, 1932)	Lepidoptera, Tortricidae, Gelechiidae	Rousse and Villemant 2012
		<i>Campoplex teccher</i> Rousse & Villemant, 2012	Lepidoptera, Coleoptera or Hymenoptera	Rousse and Villemant 2012
		<i>Diadegma insulare</i> (Cresson, 1865)	Lepidoptera, Plutellidae, Pyralidae	Rousse and Villemant 2012
		<i>Diadegma mollipla</i> (Holmgren, 1868)	Lepidoptera, Plutellidae, Gelechiidae	Vayssières et al. 2001
		<i>Dusona douraguia</i> Rousse & Villemant, 2012	Sympyta or Lepidoptera	Rousse and Villemant 2012
		<i>Dusona pauliani</i> (Benoit, 1957)	Sympyta or Lepidoptera	Rousse and Villemant 2012
		<i>Enyrtus huet</i> Rousse & Villemant, 2012	Lepidoptera, Coleoptera or Hymenoptera	Rousse and Villemant 2012
		<i>Eriborus cadjee</i> Rousse & Villemant, 2012	Unknown.	Rousse and Villemant 2012
		<i>Eriborus pallipes</i> (Brullé, 1846)	Unknown.	Rousse and Villemant 2012
		<i>Hyposoter reunionis</i> (Benoit, 1957)	Lepidoptera, Coleoptera or Hymenoptera	Benoit 1957
	Cremastinae	<i>Venturia canescens</i> (Gravenhorst, 1829)	Lepidoptera	Rousse and Villemant 2012
		<i>Xanthocampoplex huberti</i> Rousse & Villemant, 2012	Lepidoptera, Gracillariidae, Pyralidae	Rousse and Villemant 2012
		<i>Pristomerus rivier</i> Rousse & Villemant, 2012	<i>Plutella xylostella</i> , <i>Prophantis smaragdina</i>	Rousse and Villemant 2012
		<i>Temelucha basiornata</i> (Cameron, 1911)	Diptera, Diopsidae	Rousse and Villemant 2012
		<i>Temelucha labusi</i> Rousse & Villemant, 2012	Lepidoptera	Rousse and Villemant 2012
		<i>Temelucha minuta</i> (Morley, 1912)	Lepidoptera	Rousse and Villemant 2012

Family	Subfamily	Genus / Species	General host information	Recorded from
ICHNEUMONIDAE	Cremastinae	<i>Temelucha pestifer</i> (Morley, 1913)	Lepidoptera	Benoit 1957
		<i>Temelucha talibarti</i> Rousse, Villemant & Seyrig, 2011	Lepidoptera	Rousse and Villemant 2012
		<i>Temelucha</i> sp. 1	Lepidoptera	Rousse and Villemant 2012
		<i>Temelucha</i> sp. 2	Lepidoptera	Rousse and Villemant 2012
		<i>Trathala annulicornis</i> (Tosquinet, 1896)	<i>Leucinodes orbonalis</i>	Rousse and Villemant 2012
		<i>Trathala flavoorbitalis</i> (Cameron, 1907)	<i>Leucinodes orbonalis</i>	Rousse and Villemant 2012
	Cryptinae	<i>Acrolyta dindar</i> Rousse & Villemant, 2012	Unknown.	Rousse and Villemant 2012
		<i>Diatora albiscapus</i> (Seyrig, 1952)	<i>Apanteles</i>	Rousse and Villemant 2012
		<i>Paraphylax mussar</i> Rousse & Villemant, 2012	<i>Heliothis armigera</i>	Rousse and Villemant 2012
		<i>Paraphylax transversatoria</i> (Seyrig, 1952)	<i>Heliothis armigera</i>	Rousse and Villemant 2012
	Diplazoninae	<i>Phygadeuon nativel</i> Rousse & Villemant, 2012	<i>Musca domestica</i> <i>Rhagoletis cerasi</i>	Rousse and Villemant 2012
		<i>Diplazon laetatorius</i> (Fabricius, 1781)	Diptera, Syrphidae	Saussure 1892
	Ichneumoninae	<i>Crytea albitrochanterata</i> (Heinrich, 1938)	<i>Aletia pallens</i> <i>Despressaria heracliana</i>	Rousse and Villemant 2012
		<i>Ichneumon unicinctus</i> Brullé, 1846	Lepidoptera, Noctuidae, Amphipyriinae	Rousse and Villemant 2012
	Mesochorinae	<i>Mesochorus cariniferus</i> Benoit, 1955	<i>Phryganidia californica</i>	Rousse and Villemant 2012
		<i>Mesochorus</i> sp.	<i>Phryganidia californica</i>	Rousse and Villemant 2012
	Metopiinae	<i>Triclistus aitkeni</i> (Cameron, 1897)	Unknown.	Rousse and Villemant 2012
	Ophioninae	<i>Enicospilus angustatus</i> (Brullé, 1846)	Lepidoptera	Bordage 1914
		<i>Enicospilus betanimenus</i> (de Saussure, 1892)	Lepidoptera, Noctuidae	Rousse and Villemant 2012
		<i>Enicospilus dolosus</i> (Tosquinet, 1896)	Lepidoptera, Noctuidae, Crambidae	Rousse and Villemant 2012
		<i>Enicospilus dubius</i> (Tosquinet, 1896)	Lepidoptera, Noctuidae, Plusiidae	Rousse and Villemant 2012
		<i>Enicospilus grandiflavus</i> Townes, 1973	Lepidoptera	Rousse and Villemant 2012
		<i>Enicospilus helvolus</i> Gauld & Mitchell, 1978	<i>Anomis leona</i>	Rousse and Villemant 2012
		<i>Enicospilus hova</i> Gauld & Mitchell, 1978	Lepidoptera	Gauld and Mitchell 1978

Family	Subfamily	Genus / Species	General host information	Recorded from
ICHNEUMONIDAE	Ophioninae	<i>Enicospilus mauritii</i> (de Saussure, 1892)	Lepidoptera	Bordage 1914
		<i>Enicospilus rufus</i> (Brullé, 1846)	<i>Ctenoplusia limbirena</i> <i>Trigonodes hyppasia</i>	Benoit 1957
		<i>Enicospilus ruscus</i> Gauld & Mitchell, 1978	Lepidoptera, Noctuidae	Rousse and Villemant 2012
		<i>Enicospilus sesamiae</i> Delobel, 1974	Lepidoptera, Brachodidae, Noctuidae	Zwart 1998
		<i>Enicospilus transvaalensis</i> Cameron, 1911	<i>Mythimna</i> sp. <i>Sesamia calamistis</i>	Rousse and Villemant 2012
		<i>Enicospilus vitry</i> Rousse & Villemant, 2012	Lepidoptera	Rousse and Villemant 2012
ICHNEUMONIDAE	Orthocentrinae	<i>Megastylus vagabundus</i> Seyrig, 1934	Diptera or Hymenoptera	Rousse and Villemant 2012
		<i>Orthocentrus urbanus</i> Seyrig, 1934	Diptera, Coleoptera or Hymenoptera	Rousse and Villemant 2012
		<i>Pantisarthrus isolatus</i> (Benoit, 1957)	Unknown.	Benoit 1957
		<i>Proclitus ligatus</i> (Seyrig, 1934)	Diptera or Lepidoptera	Rousse and Villemant 2012
		<i>Stenomacrus payet</i> Rousse & Villemant, 2012	Unknown.	Rousse and Villemant 2012
		<i>Tariqia stellaris</i> Rousse & Villemant, 2012	Unknown.	Rousse and Villemant 2012
ICHNEUMONIDAE	Pimplinae	<i>Echthromorpha spinator</i> (Fabricius, 1798)	<i>Nagia linteola</i>	Rousse and Villemant 2012
		<i>Itoplectis albipes</i> Seyrig, 1932	Unknown.	Rousse and Villemant 2012
		<i>Xanthophenax defector</i> Seyrig, 1932	<i>Hypsipyla scabruscellea</i>	Rousse and Villemant 2012
		<i>Xanthophenax pacificator</i> Seyrig, 1932	<i>Hypsipyla scabruscellea</i>	Rousse and Villemant 2012
		<i>Xanthophenax xanthomelas</i> (Brullé, 1846)	<i>Hypsipyla scabruscellea</i>	Rousse and Villemant 2012
		<i>Xanthopimpla stemmator</i> (Thunberg, 1824)	Lepidoptera, Pyralidae	Kfir et al. 2002
		<i>Zatypota inexpectata</i> Seyrig, 1932	Araneae or Lepidoptera	Rousse and Villemant 2012
ICHNEUMONIDAE	Tersilochinae	<i>Aneuclis larga</i> Khalaim, 2009	Unknown.	Rousse and Villemant 2012
		<i>Diaparsis ramassamy</i> Rousse & Villemant, 2012	Coleoptera, Symphyta	Rousse and Villemant 2012
ICHNEUMONIDAE	Tryphoninae	<i>Netelia melanopus</i> (Brullé 1846)	Lepidoptera, Tortricidae, Pyralidae, Noctuidae	Saussure 1892
		<i>Netelia</i> sp.	Lepidoptera	Rousse and Villemant 2012

[1] Fischer (1987) recorded it from Reunion, because «Réunion, Mayotte» is indicated on the label

**Superfamily: CHALCIDOIDEA**

**Family: AGAONIDAE**

**Subfamily: Agaoninae**

**Genus: *Elisabethiella*** Grandi, 1928

*Elisabethiella reflexa* Wiebes, 1975

Recorded from: Wiebes 1975

Host information: *Ficus reflexa* Thunb. (Moraceae) and *Ficus aldabrensis* Baker C.C. Berg (Wiebes 1975)

**Genus: *Nigeriella*** Wiebes, 1974

*Nigeriella avicola* Wiebes, 1975

Recorded from: Wiebes 1975

Host information: *Ficus rubra* Vahl (Moraceae) (Wiebes 1975)

**Genus: *Platyscapa*** Motschoulsky, 1863

*Platyscapa etiennei* Wiebes, 1977

Recorded from: Wiebes 1977

Host information: *Ficus salicifolia* Vahl (Moraceae) (Wiebes 1977)

**Subfamily: Kradibiinae**

**Genus: *Ceratosolen*** Mayr, 1885

*Ceratosolen coecus* (Coquerel, 1855)

Recorded from: Coquerel 1855

Host information: *Ficus mauritiana* Lam. (Moraceae) (Coquerel 1855)

**Genus: *Kradibia*** Saunders, 1883

*Kradibia etiennei* Wiebes, 1990

Recorded from: Wiebes and Gompton 1990

Host information: *Ficus lateriflora* Vahl (Moraceae) (Wiebes and Gompton 1990)

**Subfamily: Sycophaginae**

**Genus: *Sycophaga*** Westwood, 1840

*Sycophaga explorator* (Coquerel, 1855)

Recorded from: Coquerel 1855

Host information: Unknown. But *Sycophaga* are parasites of figs (Coquerel 1855)

**Family: APHELINIDAE****Subfamily: Aphelininae**

**Genus: *Aphelinus*** Dalman, 1820

*Aphelinus asychis* Walker, 1839

Recorded from: Vayssières et al. 2001

Host information: Hemiptera, Aphididae (Vayssières et al. 2001)

*Aphelinus gossypii* Timberlake, 1924

Recorded from: Quilici et al. 2003

Host information: Aphididae (Hemiptera) (Vayssières et al. 2001)

*Aphelinus mariscusae* (Risbec, 1957)

Recorded from: Risbec 1957

Host information: Aphididae (Hemiptera) and particularly *Micromyzus (Kugegania) ageni* (Polaszek and Hayat 1989)

*Aphelinus varipes* (Förster, 1841)

Recorded from: Vayssières et al. 2001

Host information: Aphididae (Hemiptera) (Vayssières et al. 2001)

**Genus: *Aphytis*** Howard, 1900

*Aphytis africanus* Quednau, 1964

Recorded from: Quilici et al. 2003

Host information: *Aonidiella aurantii* (Hemiptera, Diaspididae) (Triapitsyn and Kim 2008)

*Aphytis coheni* DeBach, 1960

Recorded from: Quilici et al. 2003

Host information: *Aspidiotus nerii* (Hemiptera, Diaspididae) (Triapitsyn and Kim 2008)

*Aphytis holoxanthus* DeBach, 1960

Recorded from: Quilici et al. 2003

Host information: *Chrysomphalus aonidum* (Hemiptera, Diaspididae) (Triapitsyn and Kim 2008)

*Aphytis lepidosaphes* Compere, 1955

Recorded from: Quilici et al. 2003

Host information: *Lepidosaphes beckii* (Hemiptera, Diaspididae) (Triapitsyn and Kim 2008)

*Aphytis lignanensis* Compere, 1955

Recorded from: Quilici et al. 2003

Host information: *Aonidiella aurantii*, *Pseudaulacaspis pentagona* (Hemiptera, Diaspididae) (Luck and Podoler 1985)

*Aphytis melinus* DeBach, 1959

Recorded from: Quilici et al. 2003

Host information: *Aonidiella aurantii* (Hemiptera, Diaspididae) (Luck and Podoler 1985)

**Genus: Marietta** Motschulsky, 1863

*Marietta leopardina* Motschulsky, 1863

Recorded from: Quilici et al. 2003

Host information: Hyperparasitoid of 48 hemiptera and scales parasitic hymenoptera species (Shabaan 2003)

**Subfamily: Calesinae**

**Genus: Cales** Howard, 1907

*Cales noacki* Howard, 1907

Recorded from: Etienne 1977

Host information: *Aleurothrixus floccosus*, (Miret and Garcia-Mari 2001) *Aleurotrachelus atratus* (Borowiec et al. 2007) (Hemiptera, Aleyrodidae)

**Subfamily Coccophaginae**

**Genus: Coccophagus** Westwood, 1833

*Coccophagus ceroplastae* (Howard, 1985)

Recorded from: Quilici et al. 2003

Host information: *Coccus viridis*, *Coccus hesperidum*, *Saissetia coffeae*, *Ceroplastes* spp., *Pulvinaria psidii*, *Pulvinaria polygonata* (Hemiptera, Coccoidea), scales and mealybugs belonging to Diaspididae and Pseudococcidae (Hemiptera) have also been recorded as hosts (Hayat 1998)

*Coccophagus cowperi* Girault, 1917

Recorded from: Quilici et al. 2003

Host information: *Saissetia oleae* (Clausen 1956), *Saissetia coffeae* (Shabaan 2005) (Hemiptera, Coccidae)

*Coccophagus rusti* Compere, 1928

Recorded from: Quilici et al. 2003

Host information: *Saissetia oleae* (Hemiptera, Coccidae) (Daane et al. 1991)

**Genus: *Encarsia*** Förster, 1878

*Encarsia acaudaleyrodis* Hayat, 1976

Recorded from: Vayssières et al. 2001

Host information: *Acaudaleyrodes rachipora*, *Trialeurodes leguminicola*, *Bemisia tabaci* (Hemiptera, Aleyrodidae) (Ghahari et al. 2011)

*Encarsia brasiliensis* (Hempel, 1904)

Recorded from: Vayssières et al. 2001

Host information: *Aleurodicus dispersus* *Bemisia tabaci*, *Lecanoideus floccissimus* *Trialeurodes vaporarium* (Homoptera, Aleyrodidae) (Magnet and Onillon 1997, Hernandez-Suarez et al. 2000)

*Encarsia citrina* (Craw, 1891)

Recorded from: Vayssières et al. 2001

Host information: Several Coccoidea (Hemiptera) (Viggiani 1987)

*Encarsia diaspadicola* (Silvestri, 1909)

Recorded from: Quilici et al. 2003

Host information: *Pseudaulacaspis pentagona* (Hemiptera, Diaspididae) (Liebregts et al. 1989)

*Encarsia formosa* Gahan, 1924

Recorded from: Vayssières et al. 2001

Host information: About 20 species in 8 genera of Aleyrodidae (Hemiptera) (Polaszek et al. 1992, Schauff et al. 1996)

*Encarsia lounsburyi* (Berlese & Paoli, 1916)

Recorded from: Quilici et al. 2003

Host information: *Parlatoria ziziphi*, *Aonidiella citrina* and *Parlatoria pergandii* (Hemiptera, Coccoidea) (Ghahari et al. 2004)

*Encarsia luteola* Howard, 1895

Recorded from: Vayssières et al. 2001

Host information: *Bemisia argentifolii*, *Bemisia tabaci* (Hemiptera, Aleyrodidae) (Gerling et al. 1987, Heinz and Parrella 1994)

*Encarsia nigriceps* Dozier, 1937

Recorded from: Vayssières et al. 2001

Host information: *Trialeurodes abulitonius*, *Trialeurodes floridensis*, *Trialeurodes vaporariorum* (Polaszek et al. 1999)

*Encarsia perniciosi* (Tower, 1913)

Recorded from: Quilici et al. 2003

Host information: *Quadrastrirototus perniciosus* (Baroffio 1997)

*Encarsia sophia* (Girault & Dodd, 1915)

Recorded from: Vayssières et al. 2001

Host information: *Bemisia tabaci*, *Trialeurodes vaporarium* (Hemiptera, Aleyrodidae) (Vayssières et al. 2001, Luo and Liu 2011)

*Encarsia tabacivora* Viggiani, 1985

Recorded from: Vayssières et al. 2001

Host information: 14 species from 9 genera of Aleyrodidae (Hemiptera) (Polaszek et al. 1992, Schauff et al. 1996)

### Subfamily: Eretmocerinae

**Genus: *Eretmocerus*** Haldeman, 1850

*Eretmocerus hayati* Zolnerowich & Rose, 1998

Recorded from: Vayssières et al. 2001

Host information: *Bemisia tabaci*, *Trialeurodes vaporarium* (Hemiptera, Aleyrodidae) (Vayssières et al. 2001)

*Eretmocerus mundus* Mercet, 1931

Recorded from: Vayssières et al. 2001

Host information: *Bemisia argentifolii* (Hemiptera, Aleyrodidae) (Walker et al. 1999), *Bemisia tabaci*, *Trialeurodes vaporarium* (Hemiptera, Aleyrodidae) (Vayssières et al. 2001)

### Family: CHALCIDIDAE

#### Subfamily: Chalcidinae

**Genus: *Brachymeria*** Westwood, 1829

*Brachymeria nephantidis* Gahan, 1930

Recorded from: Ramage et al. 2011

Host information: *Nephantis serinopa* (Lepidoptera, Xylorictidae) (Joy et al. 1978), *Corcyra cephalonica* (Lepidoptera, Pyralidae) (Kapadia 1999)

*Brachymeria podagrion* (Fabricius, 1787)

Recorded from: Ramage et al. 2011

Host information: Moths in several families and Calyptrate Diptera such as: *Chrysomya albiceps* (Diptera, Calliphoridae) (Marchiori et al. 2002a) and *Sarcodexia lambens* (Diptera, Sarcophagidae) (Marchiori et al. 2002b)

### Subfamily: Dirhinae

**Genus: *Dirhinus*** Dalman, 1818

*Dirhinus galesusaeformis* (Risbec, 1957)

Recorded from: Risbec 1957

Host information: Unknown

*Dirhinus giffardii* Silvestri, 1913

Recorded from: Vayssières et al. 2001

Host information: Diptera, Tephritidae (Noyes 2013)

*Dirhinus himalayanus* Westwood, 1836

Recorded from: Ramage et al. 2011

Host information: *Sarcophaga bullata* (Diptera, Sarcophagidae), *Hydrotaea aeneocincta*, *Stomoxys calcitrans*, and *Musca domestica* (Diptera, Muscidae) (Geden et al. 2006, Srinivasan and Amalraj 2003). *Dirhinus hymalayanus* is also a parasitoid of some Tephritidae (Diptera) pupae (Grissell and Schauff 1990, Sivinsky et al. 1997)

### Subfamily: Epitraninae

**Genus: *Epitranus*** Walker, 1834

*Epitranus erythrogaster* Cameron, 1888

Recorded from: Ramage et al. 2011

Host information: *Corcyra cephalonica* (Lepidoptera, Pyralidae) (Boucek 2007)

*Epitranus evanioides* (Westwood, 1835)

Recorded from: Ramage et al. 2011

Host information: Unknown

**Subfamily: Haltichellinae**

**Genus: *Antrocephalus*** Kirby, 1883

*Antrocephalus crassipes* Masi, 1940

Recorded from: Ramage et al. 2011

Host information: Unknown

*Antrocephalus dividens* (Walker, 1860)

Recorded from: Ramage et al. 2011

Host information: Unknown

**Genus: *Hockeria*** Walker, 1834

*Hockeria fulvipes* Masi, 1917

Recorded from: Ramage et al. 2011

Host information: Unknown

**Genus: *Proconura*** Dodd, 1915

*Proconura eublemmae* (Steffan, 1951)

Recorded from: Ramage et al. 2011

Host information: *Eublemma gayneri* (Lepidoptera, Noctuidae) (Gahukar 1981)

**Family: ENCYRTIDAE**

**Subfamily: Encyrtinae**

**Genus: *Ageniaspis*** Dahlbom, 1857

*Ageniaspis citricola* Logvinovskaya, 1983

Recorded from: Quilici et al. 2003

Host information: *Phyllocoptis citrella* (Lepidoptera, Gracillariidae) (Edward and Hoy 1998, Hoy and Jessey 2004)

*Ageniaspis fuscicallis* (Dalman, 1920)

Recorded from: Quilici et al. 2003

Host information: *Yponomeuta malinellus* (Lepidoptera, Yponomeutidae) (Kuhlmann et al. 1998), *Acrolepia assetella* (Lepidoptera, Acrolepiidae) (Pralavorio et al. 1977)

**Genus: *Aloencyrtus*** Prinsloo, 1978

*Aloencyrtus obscuratus* (Waterston, 1917)

Recorded from: Quilici et al. 2003

Host information: Unknown. But *Aloencyrtus* appear to be exclusively parasitic in Coccidae (Hemiptera) (Prinsloo 2010)

**Genus: *Arrhenophagus*** Aurivillius, 1888*Arrhenophagus chionaspidis* Aurivillius, 1888

Recorded from: Quilici et al. 2003

Host information: *Pseudaulacaspis pentagona* (Hemiptera, Diaspididae) (Kreiter et al. 2000, Goebel 1987)**Genus: *Cheiloneurus*** Westwood, 1833*Cheiloneurus cyanonotus* Waterston, 1917

Recorded from: Risbec 1957

Host information: *Phenacoccus manihoti* (Hemiptera, Pseudococcidae) (Fabres and Matile-Ferrero 1986)**Genus: *Comperiella*** Howard, 1906*Comperiella bifasciata* Howard, 1906

Recorded from: Quilici et al. 2003

Host information: *Aonidiella citrina*, *Aonidiella aurantii*, *Aspidiotus destructor* (Hemiptera, Diaspididae) (Flanders 1944, Tandon and Srivastava 1980)**Genus: *Copidosoma*** Ratzeburg, 1844*Copidosoma koehleri* Blanchard, 1940

Recorded from: Vayssières et al. 2001

Host information: *Phtorimea operculella* (Lepidoptera, Gelechiidae) (Dalaya and Patil 1973)**Genus: *Diaphorencyrtus*** Hayat, 1981*Diaphorencyrtus aligarhensis* (Shafee, Alam & Agarwal, 1975)

Recorded from: Quilici et al. 2003

Host information: *Diaphorina citri* (Hemiptera, Psyllidae) (Prinsloo 1985, Hoy and Nguyen 1998)**Genus: *Habrolepis*** Förster, 1856*Habrolepis rouxi* Compere, 1936

Recorded from: Quilici et al. 2003

Host information: *Anonidiella aurantii* (Hemiptera, Diaspididae) (Flanders 1942)**Genus: *Homalotylus*** Mayr, 1876*Homalotylus eytelweinii* (Ratzeburg, 1844)

Recorded from: Delpoux et al. 2013

Host information: Coccinellidae (Coleoptera) from the tribes Coccinellini, Chilocorini, and Psylloborini (Kuznetsov 1975, 1987, Trjapitzin 2011)

**Genus: *Metaphycus*** Mercet, 1917

*Metaphycus galbus* Annecke, 1964

Recorded from: Quilici et al. 2003

Host information: *Protopulvinaria pyriformis* (Hemiptera, Coccidae) (Robertson and De Villiers 1986)

**Genus: *Microterys*** Thomson, 1876

*Microterys nietneri* (Motschulsky, 1859)

Recorded from: Quilici et al. 2003

Host information: Hemiptera, Coccidae especially on citrus (Triapitsyn et al. 2008)

**Genus: *Psyllaephagus*** Ashmead, 1900

*Psyllaephagus pulvinatus* (Waterston, 1922)

Recorded from: Aubert 1975

Host information: *Trioza eryteae* (Homoptera, Psyllidae) (MacDaniel and Moran 1972)

**Genus: *Syrphophagus*** Ashmead, 1900

*Syrphophagus africanus* (Gahan, 1932)

Recorded from: Vayssières et al. 2001

Host information: Hyperparasitoid of some aphid parasitoids (e.g. *Lysiphlebus testaceipes*, *Phelinus ficusae*) (Saethre et al. 2011)

**Subfamily: Tetracneminae**

**Genus: *Coccidoxenoides*** Girault, 1915

*Coccidoxenoides perminutus* Girault, 1915

Recorded from: Quilici et al. 2003

Host information: *Planococcus ficus* (Hemiptera, Pseudococcidae) (Walton and Pringle 2005)

**Family: EULOPHIDAE**

**Subfamily: Entedoninae**

**Genus: *Chrysocharis*** Förster, 1856

*Chrysocharis bedius* (Walker, 1842)

Recorded from: Vayssières et al. 2001

Host information: *Liriomyza* species (Diptera, Agromyzidae) (Vayssières et al. 2001)

*Chrysocharis* sp.

Recorded from: Vayssières et al. 2001

Host information: *Liriomyza* species (Diptera, Agromyzidae) (Vayssières et al. 2001)

**Genus: *Chrysonotomyia* Ashmead, 1904***Chrysonotomyia pulcherrima* (Kerrich, 1970)

Recorded from: Quilici et al. 2003

Host information: *Procontarinia matteiana* (Diptera, Cecidomyiidae) (Sankaran and Mjeni 1985)

**Genus: *Neochrysocharis* Kurdjumov, 1912***Neochrysocharis formosa* (Westwood, 1833)

Recorded from: Vayssières et al. 2001

Host information: *Liriomyza* species (Diptera, Agromyzidae) (Vayssières et al. 2001)

*Neochrysocharis* sp.

Recorded from: Vayssières et al. 2001

Host information: *Liriomyza* species (Diptera, Agromyzidae) (Vayssières et al. 2001)

**Genus: *Platocharis* Kerrich, 1969***Platocharis coffeae* (Ferrière, 1936)

Recorded from: Kerrich 1969

Host information: Coffee leaf-miners (*Leucoptera* spp.) (Kerrich 1969)

**Subfamily: Eulophinae****Genus: *Cirrospilus* Westwood, 1832***Cirrospilus cinctiventris* Ferrière, 1936

Recorded from: Quilici et al. 2003

Host information: Leaf-miners from genus *Leucoptera* (Lepidoptera, Lyonetiidae) (Ferrière 1936)

*Cirrospilus crowei* Kerrich, 1969

Recorded from: Quilici et al. 2003

Host information: *Phyllocoptis citrella* (Lepidoptera, Gracillariidae) (Schauff et al. 1998)

**Genus: *Elachertus* Spinola, 1811***Elachertus insularis* (Risbec, 1957).

Recorded from: Risbec 1957

Host information: Unknown

**Genus: *Elasmus*** Westwood, 1833

*Elasmus masii* Ferrière, 1929

Recorded from: Risbec 1957

Host information: Recorded as both, primary and secondary parasitoid of Lepidoptera (Noyes and Yu 2012)

**Genus: *Euplectrus*** Westwood, 1832

*Euplectrus bebourensis* Risbec, 1957

Recorded from: Risbec 1957

Host information: Unknown. But *Euplectrus* are parasitoid of Lepidoptera larvae (Schauff and Janzen 2001)

**Genus: *Hamonia*** Risbec, 1957

*Hamonia reunionensis* Risbec, 1957

Recorded from: Risbec 1957

Host information: Unknown

*Hamonia sexdentata* Risbec, 1957

Recorded from: Risbec 1957

Host information: Unknown

*Hamonia sylvatica* Risbec, 1957

Recorded from: Risbec 1957

Host information: Unknown

**Genus: *Hemiptarsenus*** Westwood, 1833

*Hemiptarsenus varicornis* Girault, 1913

Recorded from: Vayssières et al. 2001

Host information: *Liriomyza trifolii* and other *Liriomyza* species (Diptera, Agromyzidae) (Arakaki and Kinjo 1998, Vayssières et al. 2001)

**Genus: *Notanisomorphella*** Girault, 1913

*Notanisomorphella borborica* (Giard, 1903)

Recorded from: Quilici et al. 2003

Host information: Leaf-miners from genus *Leucoptera* (Lepidoptera, Lyonetiidae) (Ferrière 1936)

**Genus: *Stenomesius*** Westwood, 1833

*Stenomesius belouvi* (Risbec, 1957)

Recorded from: Risbec 1957

Host information: Unknown

*Stenomesius masii* (Risbec, 1957)

Recorded from: Risbec 1957

Host information: Unknown

### Subfamily: Tetrastichinae

**Genus: *Aprostocetus*** Westwood, 1833

*Aprostocetus ceroplastae* (Girault, 1916)

Recorded from: Quilici et al. 2003

Host information: *Ceroplastes destructor* (Hemiptera, Coccidae) (Wakgari and Gilio-mee 2001)

*Aprostocetus toddaliae* (Risbec, 1958)

Recorded from: Quilici et al. 2003

Host information: *Ceroplastes rusci* (Hemiptera, Coccidae) (Talebi et al. 2011)

**Genus: *Gyrolasia*** Förster, 1856

*Gyrolasia hellburgi* (Risbec, 1957)

Recorded from: Risbec 1957

Host information: Unknown

**Genus: *Nesolynx*** Ashmead, 1905

*Nesolynx phaeosoma* (Waterston, 1915)

Recorded from: Quilici et al. 2003

Host information: Hyperparasitoid on *Nephopterix beharella* (Lepidoptera, Pyralidae) (Quilici et al. 2003)

**Genus: *Oomyzus*** Rondani, 1870

*Oomyzus sokolowskii* (Kurdjumov, 1912)

Recorded from: Vayssières et al. 2001

Host information: *Plutella xylostella* (Lepidoptera, Yponomeutoidea) (Vayssières et al. 2001)

**Genus: *Quadrastichus*** Girault, 1913

*Quadrastichus erythrinae* Kim, 2004

Recorded from: Kim et al. 2004

Host information: Gall-inducer on *Erythrina* (Kim et al. 2004)

**Genus: *Tamaraxia*** Mercet, 1924

*Tamaraxia dryi* (Waterston, 1922)

Recorded from: Etienne and Aubert 1980

Host information: Ectoparasitoid of Psyllid larvae (Hemiptera, Psyllidae) (Quilici et al. 2003)

*Tamaraxia radiata* (Waterston, 1922)

Recorded from: Aubert et al. 1979

Host information: Ectoparasitoid of Psyllid larvae (Hemiptera, Psyllidae) (Quilici et al. 2003)

**Genus: *Tetrastichus*** Haliday, 1844

*Tetrastichus giffardianus* Silvestri, 1915

Recorded from: Vayssières et al. 2001

Host information: Endoparasitoids of several Tephritid larvae (Diptera) (Clausen et al. 1965)

*Tetrastichus gyrolasiaeformis* Risbec, 1957

Recorded from: Risbec 1957

Host information: Unknown

*Tetrastichus sesamiae* Risbec, 1951

Recorded from: Risbec 1957

Host information: Parasitoid of Lepidoptera (Noyes and Yu 2012)

**Familij: EUPELMIDAE**

**Subfamilj: Eupelminae**

**Genus: *Eupelmus*** Dalman, 1820

*Eupelmus* sp.

Recorded from: Vayssières et al. 2001

Host information: Unknown. But *Eupelmus* can be extremely polyphagous (Gibson 2011)

**Familij: EURYTOMIDAE**

**Subfamilj: Eurytominae**

**Genus: *Eurytoma*** Illiger, 1807

*Eurytoma ivohibei* Risbec, 1957

Recorded from: Risbec 1957

Host information: Unknown

*Eurytoma reunionensis* Risbec, 1957

Recorded from: Risbec 1957

Host information: Unknown

## Familiy: ORMYRIDAE

**Genus:** *Ormyrus* Westwood, 1832

*Ormyrus australis* Risbec, 1957

Recorded from: Risbec 1957

Host information: Unknown

## Family: PTEROMALIDAE

### Subfamily: Eunotinae

**Genus:** *Mesopeltita* Ghesquière, 1946

*Mesopeltita truncatipennis* (Waterston, 1917)

Recorded from: Quilici et al. 2003

Host information: *Ceroplastes* sp., *Saissetia oleae*, *Saissetia somereni* and *Saissetia* sp.  
(Hemiptera, Coccidae) (Myartseva et al. 2004)

**Genus:** *Moranila* Cameron, 1883

*Moranila californica* (Howard, 1881)

Recorded from: Quilici et al. 2003

Host information: *Saissetia oleae*, *Ceroplastes floridensis* (Hemiptera: Coccidae)  
(Flanders 1958, Argov et al. 1992)

### Subfamily: Miscogasterinae

**Genus:** *Halticoptera* Spinola, 1811

*Halticoptera* sp.

Recorded from: Vayssières et al. 2001

Host information: *Melanagromyza phaseoli*, *Liriomyza* spp. (Diptera, Agromyzidae)  
(Abul-Nasr and Assem 1968, Vayssières et al. 2001)

### Subfamily: Pteromalinae

**Genus: *Muscidifurax*** Girault & Sanders, 1910

*Muscidifurax raptor* Girault & Sanders, 1910

Recorded from: Quilici et al. 2003

Host information: *Musca domestica*, *Stomoxys calcitrans* and other Synanthropic filth-breeding Diptera (Diptera, Muscidae) (Legner 1967, Zchori-Fein et al. 2000)

*Muscidifurax uniraptor* Kogan & Legner, 1970

Recorded from: Quilici et al. 2003

Host information: *Musca domestica*, *Stomoxys calcitrans* and other Synanthropic filth-breeding Diptera (Diptera, Muscidae) (Legner 1967, Zchori-Fein et al. 2000)

**Genus: *Pachyneuron*** Walker, 1833

*Pachyneuron* sp.

Recorded from: Vayssières et al. 2001

Host information: Unknown. But *Pachyneuron* are mostly Hyperparasitoid of Hemiptera, Aphididae, and some Diptera (Gibson 2001)

*Pachyneuron longiradius* Silvestri, 1915

Recorded from: Delvare G. unpublished determination (2013)

Host information: The identified *Dendrocerus* emerged from a specimen of *Rodolia chermesina* (Coleoptera, Coccinellidae) (Delvare 2013, unpublished data)

**Genus: *Ploskana*** Boucek, 1976

*Ploskana tenuis* Boucek, 1976

Recorded from: Vayssières et al. 2001

Host information: *Bactrocera cucurbitae* (Diptera, Tephritidae) (Vayssières et al. 2001)

**Genus: *Pteromalus*** Swederus, 1795

*Pteromalus* sp.

Recorded from: Vayssières et al. 2001

Host information: Unknown. But all species of *Pteromalus* are parasitoids of larvae and pupae of various holometabolous insects, for instance Lepidoptera, Coleoptera, gall forming Hymenoptera (Cynipidae, Tenthredinidae) and Diptera (Tephritidae) (Baur 2015)

**Genus: *Spodophagus*** Delvare & Rasplus, 1994

*Spodophagus lepidopterae* (Risbec, 1952)

Recorded from: Risbec 1952

Host information: *Spodoptera littoralis* (Lepidoptera, Noctuidae) (Risbec 1952, Delvare and Rasplus 1994)

**Genus: *Trichomalopsis* Crawford, 1913***Trichomalopsis* sp.

Recorded from: Vayssières et al. 2001

Host information: Diptera, Muscidae (Gibson and Floate 2001)

**Subfamily: Spalangiinae****Genus: *Spalangia* Latreille, 1805***Spalangia endius* Walker, 1839

Recorded from: Vayssières et al. 2001

Host information: *Musca domestica* (Diptera, Muscidae) (Ables and Shepard 1974), *Dacus ciliatus* (Diptera, Tephritidae) (Vayssières et al. 2001)*Spalangia gemina* Boucek, 1963

Recorded from: Vayssières et al. 2001

Host information: Diptera, Muscidae (Morgan et al. 1991), Tephritidae (Vayssières et al. 2001)

*Spalangia seyrigi* Risbec, 1952

Recorded from: Vayssières et al. 2001

Host information: *Dacus ciliatus* (Diptera, Tephritidae) (Vayssières et al. 2001)**Subfamily: Sycoecinae****Genus: *Seres* Waterston, 1919***Seres bouceki* (Wiebes, 1981)

Recorded from: Wiebes 1981

Host information: *Ficus reflexa reflexa* Thunb. and *Ficus reflexa aldabrensis* (Baker)

C.C. Berg (Wiebes 1981)

**Subfamily: Sycoryctinae****Genus: *Apocrypta* Coquerel, 1855***Apocrypta perplexa* Coquerel, 1855

Recorded from: Coquerel 1855

Host information: *Ficus mauritiana* Lam. (Moraceae) (Coquerel 1855)

**Genus: *Sycoryctes*** Mayr, 1885

*Sycoryctes anceps* Wiebes, 1981

Recorded from: Wiebes 1981

Host information: *Ficus densifolia* Miq. (Moraceae) (Wiebes 1981)

*Sycoryctes caelebs* Wiebes, 1975

Recorded from: Wiebes 1975

Host information: *Ficus densifolia* Miq. and *Ficus rubra* (Moraceae) (Wiebes 1981)

*Sycoryctes comparabilis* Wiebes, 1981

Recorded from: Wiebes 1981

Host information: *Ficus densifolia* Miq. (Moraceae) (Wiebes 1981)

*Sycoryctes remus* Wiebes, 1981

Recorded from: Bouček et al. 1981

Host information: *Ficus reflexa reflexa* Thunb. and *Ficus burkei* (Miq.) Miq. (Moraceae) (Bouček et al. 1981)

**Genus: *Sycoscapter*** Saunders, 1883

*Sycoscapter gibbus* Saunders, 1883

Recorded from: Saunders 1883

Host information: *Ficus politoria* Lam. and *Ficus lateriflora* Vahl (Moraceae) (Saunders 1883)

*Sycoscapter tibialis* Wiebes, 1981

Recorded from: Wiebes 1981

Host information: *Ficus rubra* Vahl (Moraceae) (Wiebes 1981)

**Genus: *Philotrypesis*** Förster, 1878

*Philotrypesis cnephaea* Wiebes, 1981

Recorded from: Wiebes 1981

Host information: *Ficus reflexa reflexa* Thunb. (Moraceae) (Wiebes 1981)

**Genus: *Watshamiella*** Wiebes, 1981

*Watshamiella fictitia* Wiebes, 1981

Recorded from: Wiebes 1981

Host information: *Ficus rubra* Vahl (Moraceae) (Wiebes 1981)

*Watshamiella lucens* Wiebes, 1981

Recorded from: Wiebes 1981

Host information: *Ficus densifolia* Miq. (Moraceae) (Wiebes 1981)

## Family: SIGNIPHORIDAE

**Genus:** *Chartocerus* Motschulsky, 1859

*Chartocerus* sp.

Recorded from: Delvare G. unpublished determination (2013)

Host information: In 2013 *Dendrocerus wollastoni* emerged from a specimen of *Rodolia chermesina* (Coleoptera, Coccinellidae) in Reunion Island (Delvare 2013, unpublished data)

## Family: TORYMIDAE

**Subfamily:** Megastigmatae

**Genus:** *Megastigmus* Dalman, 1820

*Megastigmus transvaalensis* (Hussey, 1956)

Recorded from: Habeck et al. 1989

Host information: Develops on plants in the genera *Rhus* and *Schinus* (Anacardiaceae) (Hussey 1956, Habeck et al. 1989)

## Family: TRICHOGRAMMATIDAE

**Subfamily:** Trichogrammatinae

**Genus:** *Trichogramma* Westwood, 1833

*Trichogramma chilonis* Ishii, 1941

Recorded from: Vayssières et al. 2001

Host information: *Plutella xylostella* (Lepidoptera, Plutellidae) (Vayssières et al. 2001)

**Table 2.** List of the Chalcidoidea recorded from Reunion Island.

Family	Subfamily	Genus / Species	General host information	Recorded from
AGAONIDAE	Agaoninae	<i>Elisabethiella reflexa</i> Wiebes, 1975	<i>Ficus reflexa</i> and <i>Ficus aldabrensis</i> (Moraceae)	Wiebes 1975
		<i>Nigeriella avicola</i> Wiebes, 1975	<i>Ficus rubra</i> (Moraceae)	Wiebes 1975
		<i>Platyscapa etiennei</i> Wiebes, 1977	<i>Ficus salicifolia</i> (Moraceae)	Wiebes 1977
	Kradibiinae	<i>Ceratosolen coecus</i> (Coquerel, 1855)	<i>Ficus mauritiana</i> (Moraceae)	Coquerel 1855
		<i>Kradibia etiennei</i> Wiebes, 1990	<i>Ficus lateriflora</i> (Moraceae)	Wiebes and Gompton 1990
	Sycophaginae	<i>Sycophaga explorator</i> (Coquerel, 1855)	Unknown Moraceae	Coquerel 1855

Family	Subfamily	Genus / Species	General host information	Recorded from
APHELINIDAE	Aphelininae	<i>Aphelinus asychis</i> (Walker, 1839)	Aphidiidae (Hemiptera)	Vayssières et al. 2001
		<i>Aphelinus gosypii</i> Timberlake, 1924	Aphidiidae (Hemiptera)	Quilici et al. 2003
		<i>Aphelinus mariscusae</i> (Risbec, 1957)	Aphidiidae (Hemiptera)	Risbec 1957
		<i>Aphelinus varipes</i> (Förster, 1841)	Aphidiidae (Hemiptera)	Vayssières et al. 2001
		<i>Aphytis africanus</i> (Quednau, 1964)	<i>Aonidiella aurantii</i> (Hemiptera: Diaspididae)	Quilici et al. 2003
		<i>Aphytis coheni</i> (DeBach, 1960)	<i>Aspidiotus nerii</i> (Hemiptera: Diaspididae)	Quilici et al. 2003
		<i>Aphytis holoxanthus</i> (DeBach, 1960)	Diaspididae (Hemiptera)	Quilici et al. 2003
		<i>Aphytis lepidosaphes</i> (Compere, 1955)	<i>Lepidosaphes beckii</i> (Hemiptera: Diaspididae)	Quilici et al. 2003
		<i>Aphytis lignanensis</i> (Compere, 1955)	<i>Aonidiella aurantii</i> , <i>Pseudaulacaspis pentagona</i> (Hemiptera: Diaspididae)	Quilici et al. 2003
		<i>Aphytis melinus</i> (DeBach, 1959)	<i>Aonidiella aurantii</i> (Hemiptera: Diaspididae)	Quilici et al. 2003
	Mariettinae	<i>Marietta leopardina</i> (Motschulsky, 1863)	Hymenoptera	Quilici et al. 2003
	Calesinae	<i>Cales noacki</i> Howard, 1907	<i>Aleurotrachelus atratus</i> , <i>Aleurotrixus flocosus</i> (Hemiptera: Aleyrodidae)	Etienne 1977
	Coccophaginae	<i>Coccophagus ceroplastae</i> (Howard, 1985)	Coccoidae, Diaspididae or Pseudococcidae (Hemiptera)	Quilici et al. 2003
		<i>Coccophagus couperi</i> (Girault, 1917)	<i>Saissetia</i> (Hemiptera: Coccidae)	Quilici et al. 2003
		<i>Coccophagus rusti</i> (Compere, 1928)	<i>Saissetia oleae</i> (Hemiptera: Coccidae)	Quilici et al. 2003
		<i>Encarsia acaudaleyrodis</i> Hayat, 1976	Aleyrodidae (Hemiptera)	Vayssières et al. 2001
		<i>Encarsia brasiliensis</i> (Hempel, 1904)	Aleyrodidae (Hemiptera)	Vayssières et al. 2001
		<i>Encarsia citrina</i> (Craw, 1891)	Coccoidae (Hemiptera)	Vayssières et al. 2001
		<i>Encarsia diaspidicola</i> (Silvestri, 1909)	<i>Pseudaulacaspis pentagona</i> (Hemiptera: Diaspididae)	Quilici et al. 2003
		<i>Encarsia formosa</i> Gahan, 1924	Aleyrodidae (Hemiptera)	Vayssières et al. 2001
		<i>Encarsia lounsburyi</i> (Berlese & Paoli, 1916)	Coccoidae (Hemiptera)	Quilici et al. 2003
		<i>Encarsia luteola</i> Howard, 1895	<i>Bemisia</i> (Hemiptera: Aleyrodidae)	Vayssières et al. 2001
		<i>Encarsia nigriceps</i> Dozier, 1937	<i>Trialeurodes</i> (Hemiptera: Aleyrodidae)	Vayssières et al. 2001
		<i>Encarsia perniciosi</i> (Tower, 1913)	<i>Quadrastriotus perniciosus</i>	Quilici et al. 2003
		<i>Encarsia sophia</i> (Girault & Dodd, 1915)	<i>Bemisia tabaci</i> , <i>Trialeurodes vaporarium</i> (Hemiptera: Aleyrodidae)	Vayssières et al. 2001

Family	Subfamily	Genus / Species	General host information	Recorded from
APHELINIDAE	Coccophaginae	<i>Encarsia tabacivora</i> Viggiani, 1985	Aleyrodidae (Hemiptera)	Vayssières et al. 2001
	Eretmocerinae	<i>Eretmocerus hayati</i> (Zolnerowich & Rose, 1998)	<i>Bemisia tabaci</i> , <i>Trialeurodes vaporarium</i> (Hemiptera: Aleyrodidae)	Vayssières et al. 2001
		<i>Eretmocerus mundus</i> (Mercet, 1931)	<i>Bemisia argentifolii</i> , <i>Bemisia tabaci</i> , <i>Trialeurodes vaporarium</i> (Hemiptera: Aleyrodidae)	Vayssières et al. 2001
CHALCIDIDAE	Chalcidinae	<i>Brachymeria nephantidis</i> Gahan, 1930	(Lepidoptera: Autostichidae), <i>Corcyra cephalonica</i> (Lepidoptera: Pyralidae)	Ramage et al. 2011
		<i>Brachymeria podagrifica</i> (Fabricius, 1787)	Lepidoptera and Diptera	Ramage et al. 2011
		<i>Dirhinus galesuaeformis</i> (Risbec, 1957)	Unknown	Risbec 1957
		<i>Dirhinus giffardii</i> (Silvestri, 1913)	Tephritidae (Diptera)	Vayssières et al. 2001
		<i>Dirhinus himalayanus</i> Westwood, 1836	Some Diptera in: Tephritidae, Muscidae and Sarcophagidae	Ramage et al. 2011
	Epitraninae	<i>Epitrurus erythrogaster</i> Cameron, 1888	<i>Corcyra cephalonica</i> (Lepidoptera: Pyralidae)	Ramage et al. 2011
		<i>Epitrurus evanioides</i> (Westwood, 1835)	Unknown	Ramage et al. 2011
	Halticellinae	<i>Anthrocephalus crassipes</i> (Masi, 1940)	Unknown	Ramage et al. 2011
		<i>Anthrocephalus dividens</i> (Walker, 1860)	Unknown	Ramage et al. 2011
		<i>Hockeria fluvipes</i> Masi, 1917	Unknown	Ramage et al. 2011
		<i>Proconura eublemmae</i> (Steffan, 1951)	<i>Eublemma gayneri</i> (Lepidoptera: Erebidae)	Ramage et al. 2011
ENCYRTIDAE	Encyrtinae	<i>Ageniaspis citricola</i> Logvinovskaya, 1983	<i>Phyllocnistis citrella</i> (Lepidoptera: Gracillariidae)	Quilici et al. 2003
		<i>Ageniaspis fuscicallis</i> (Dalman, 1920)	<i>Yponomeuta malinellus</i> (Lepidoptera: Yponomeutidae), <i>Acrolepia assectella</i> (lepidoptera: Acrolepididae)	Quilici et al. 2003
		<i>Aloencyrtus obscuratus</i> (Waterston, 1917)	Coccidae (Hemiptera)	Quilici et al. 2003
		<i>Arrhenophagus chionaspidis</i> (Aurivillius, 1888)	<i>Pseudaulacaspis pentagona</i> (Hemiptera: Diaspididae)	Quilici et al. 2003
		<i>Cheiloneurus cyanonotus</i> (Waterston, 1917)	<i>Phenacoccus manihoti</i> (Hemiptera: Pseudococcidae)	Risbec 1957
		<i>Comperiella bifasciata</i> (Howard, 1906)	Diaspididae (Hemiptera)	Quilici et al. 2003
		<i>Copidosoma koelheri</i> (Blanchard, 1940)	<i>Phitorimea operculella</i>	Vayssières et al. 2001
		<i>Diaphorencyrtus aligarhensis</i> (Shafee, Alam & Agarwal, 1975)	<i>Diaphorina citri</i> (Hemiptera: Psyllidae)	Quilici et al. 2003

Family	Subfamily	Genus / Species	General host information	Recorded from
ENCYRTIDAE	Encyrtinae	<i>Habrolepis rouxi</i> (Compere, 1936)	<i>Aonidiella aurantii</i> (Hemiptera, Diaspididae)	Quilici et al. 2003
		<i>Homalotylus eytelweinii</i> (Ratzeburg, 1844)	Coccinellidae (Coleoptera)	Delpoux et al. 2013
		<i>Metaphycus galbus</i> (Annecke, 1964)	<i>Protopulvinaria pyriformis</i> (Hemiptera, Coccidae)	Quilici et al. 2003
		<i>Microterys nietneri</i> (Motschulsky, 1859)	Coccidae (Hemiptera)	Quilici et al. 2003
		<i>Psyllaephagus pulvinatus</i> (Waterson, 1922)	Psyllidae (Hemiptera)	Aubert 1975
		<i>Syrphophagus africanus</i> (Gahan, 1932)	Hyperparasitoid of aphid parasitoid	Vayssières et al. 2001
	Tetracneminae	<i>Coccidoxenoides permixtus</i> (Girault, 1915)	<i>Planococcus ficus</i> (Hemiptera: Pseudococcidae)	Quilici et al. 2003
	Entedoninae	<i>Chrysocharis bedius</i> (Walker, 1842)	<i>Liriomyza</i> spp. (Diptera: Agromyzidae)	Vayssières et al. 2001
		<i>Chrysocharis</i> sp.	<i>Liriomyza</i> spp. (Diptera: Agromyzidae)	Vayssières et al. 2001
		<i>Chrysonotomyia pulcherrima</i> (Kerrich, 1970)	<i>Procontarinia matteiana</i> (Diptera: Cecidomyiidae)	Quilici et al. 2003
		<i>Neochrysocharis formosus</i> (Westwood, 1833)	<i>Liriomyza</i> spp. (Diptera: Agromyzidae)	Vayssières et al. 2001
		<i>Neochrysocharis</i> sp.	<i>Liriomyza</i> spp. (Diptera: Agromyzidae)	Vayssières et al. 2001
		<i>Platocharis coffeae</i> (Ferrière, 1936)	<i>Leucoptera</i> spp. (Lepidoptera: Lyonetiidae)	Ferrière 1936
EUOPHIDAE	Eulophinae	<i>Cirrospilus cinctiventris</i> (Ferrière, 1936)	<i>Leucoptera</i> spp. (Lepidoptera: Lyonetiidae)	Quilici et al. 2003
		<i>Cirrospilus crowei</i> (Kerrich, 1969)	<i>Phyllocnistis citrella</i> (Lepidoptera: Gracillariidae)	Quilici et al. 2003
		<i>Elachertus insularis</i> (Risbec, 1957)	Unknown	Risbec 1957
		<i>Elasmus masii</i> Ferrière, 1929	(Hyper)Parasitoid of Lepidoptera	Risbec 1957
		<i>Euplectrus bebourensis</i> Risbec, 1957	Lepidoptera	Risbec 1957
		<i>Hamonia reunionensis</i> (Risbec, 1957)	Unknown	Risbec 1957
		<i>Hamonia sexdentata</i> (Risbec, 1957)	Unknown	Risbec 1957
		<i>Hamonia sylvatica</i> (Risbec, 1957)	Unknown	Risbec 1957
		<i>Hemiptarsenus varicornis</i> Girault, 1913	<i>Liriomyza</i> spp. (Diptera: Agromyzidae)	Vayssières et al. 2001
		<i>Notanisomorphella borborica</i> (Giard, 1903)	<i>Leucoptera</i> spp. (Lepidoptera: Lyonetiidae)	Quilici et al. 2003
	Tetrastichinae	<i>Stenomesius belouvi</i> (Risbec, 1957)	Unknown	Risbec 1957
		<i>Stenomesius masii</i> (Risbec, 1957)	Unknown	Risbec 1957
		<i>Aprostocetus ceroplastae</i> (Girault, 1916)	<i>Ceroplastes destructor</i> (Hemiptera, Coccidae)	Quilici et al. 2003
		<i>Aprostocetus toddaliae</i> (Risbec, 1958)	<i>Ceroplastes rusci</i> (Hemiptera, Coccidae)	Quilici et al. 2003
		<i>Gyrolasia hellburgi</i> (Risbec, 1957)	Unknown	Risbec 1957

*Nesolynx phaeosoma* (Waterston, 1915)      *Epischnia beharella* (Lepidoptera: Pyralidae)      Quilici et al. 2003

Family	Subfamily	Genus / Species	General host information	Recorded from
EULOPHIDAE	Tetrastichinae	<i>Oomyzus sokolowskii</i> (Kurdjumov, 1912)	<i>Plutella xylostella</i> (Lepidoptera: Plutellidae)	Vayssières et al. 2001
		<i>Quadrastichus erythrinae</i> (Kim, 2004)	<i>Erythrina</i> (Fabales: Fabaceae)	Kim et al. 2004
		<i>Tamaraxia dryi</i> (Waterston, 1922)	Psyllidae (Hemiptera)	Etienne and Aubert 1980
		<i>Tamaraxia radiata</i> (Waterston, 1922)	Psyllidae (Hemiptera)	Aubert et al. 1979
		<i>Tetrastichus giffardianus</i> (Silvestri, 1915)	Tephritidae (Diptera)	Vayssières et al. 2001
		<i>Tetrastichus gyrolasiaeformis</i> (Risbec, 1957)	Unknown	Risbec 1957
		<i>Tetrastichus sesamiae</i> (Risbec, 1951)	Lepidoptera	Risbec 1957
EUPELMIDAE	Eupelminae	<i>Eupelmus</i> sp.	Extremely polyphagous	Vayssières et al. 2001
EURYTOMIDAE	Eurytominae	<i>Eurytoma ivohibei</i> (Risbec, 1957)	Unknown	Risbec 1957
		<i>Eurytoma reunionensis</i> (Risbec, 1957)	Unknown	Risbec 1957
ORMYRIDAE	Eurytominae	<i>Ormyrus australis</i> Westwood, 1832	Unknown	Risbec 1957
PTEROMALIDAE	Eunotinae	<i>Mesopeltita truncatipennis</i> (Waterston, 1917)	Coccidae (Hemiptera)	Quilici et al. 2003
		<i>Moranila californica</i> (Howard, 1881)	<i>Saissetia oleae</i> , <i>Ceroplastes</i> <i>floridensis</i> (Hemiptera, Coccidae)	Quilici et al. 2003
	Miscogasterinae	<i>Halticoptera</i> sp.	<i>Melanagromyza phaseoli</i> , <i>Liriomyza</i> spp. (Diptera: Agromyzidae)	Vayssières et al. 2001
	Pteromalinae	<i>Muscidifurax raptor</i> (Girault & Sanders, 1910)	Muscidae (Diptera)	Quilici et al. 2003
		<i>Muscidifurax uniraptor</i> (Kogan & Legner, 1970)	Muscidae (Diptera)	Quilici et al. 2003
		<i>Pachyneuron</i> sp.	Extremely polyphagous	Vayssières et al. 2001
		<i>Pachyneuron longiradius</i> (Silvestri, 1915)	Coccinellidae (Coleoptera)	Delvare unpublished
		<i>Ploskana tenuis</i> (Boucek, 1976)	Tephritidae (Diptera)	Vayssières et al. 2001

Family	Subfamily	Genus / Species	General host information	Recorded from
PTEROMALIDAE	Pteromalinae	<i>Pteromalus</i> sp.	Extremely polyphagous	Vayssières et al. 2001
		<i>Spodophagus lepidopterae</i> (Risbec, 1952)	Noctuidae (Lepidoptera)	van Noort 2013
		<i>Trichomalopsis</i> sp.	Muscidae (Diptera)	Vayssières et al. 2001
	Spalangiinae	<i>Spalangia endius</i> (Walker, 1839)	<i>Musca domestica</i> (Diptera: Muscidae), <i>Dacus ciliatus</i> (Diptera: Tephritidae)	Vayssières et al. 2001
		<i>Spalangia gemina</i> Boucek, 1963	Muscidae, Tephritidae (Diptera)	Vayssières et al. 2001
		<i>Spalangia syrigi</i> (Risbec, 1952)	<i>Dacus ciliatus</i> (Diptera: Tephritidae)	Vayssières et al. 2001
	Sycoecinae	<i>Seres bouceki</i> (Wiebes, 1981)	<i>Ficus reflexa reflexa</i> (Moraceae)	Wiebes 1981
	Sycoryctinae	<i>Apocrypta perplexa</i> Coquerel, 1855	<i>Ficus mauritiana</i> (Moraceae)	Coquerel 1855
		<i>Sycoryctes anceps</i> Wiebes, 1981	<i>Ficus densifolia</i> (Moraceae)	Wiebes 1981
		<i>Sycoryctes caelebs</i> Wiebes, 1975	<i>Ficus densifolia</i> (Moraceae)	Wiebes 1975
		<i>Sycoryctes comparabilis</i> Wiebes, 1981	<i>Ficus densifolia</i> (Moraceae)	Wiebes 1981
		<i>Sycoryctes remus</i> Wiebes, 1981	<i>Ficus reflexa reflexa</i> (Moraceae)	Bouček et al. 1981
		<i>Sycoscapter gibbus</i> Saunders, 1883	<i>Ficus politoria</i> and <i>Ficus lateriflora</i> (Moraceae)	Saunders 1883
		<i>Sycoscapter tibialis</i> Wiebes, 1981	<i>Ficus rubra</i> (Moraceae)	Wiebes 1981
		<i>Philotrypesis cnephaea</i> Wiebes, 1981	<i>Ficus reflexa reflexa</i> (Moraceae)	Wiebes 1981
		<i>Watshamiella fictitia</i> Wiebes, 1981	<i>Ficus rubra</i> (Moraceae)	Wiebes 1981
		<i>Watshamiella lucens</i> Wiebes, 1981	<i>Ficus densifolia</i> (Moraceae)	Wiebes 1981
SIGNIPHORIDAE	—	<i>Chartocerus</i> sp.	Coccinellidae (Coleoptera)	Delvare unpublished
TORYMIDAE	Megastigminae	<i>Megastigmus transvaalensis</i> (Hussey, 1956)	Anacardiaceae (Sapindales)	Habeck et al. 1989
TRICHOGRAMMATIDAE	Trichogrammatinae	<i>Trichogramma chilonis</i> (Ishii, 1941)	<i>Plutella xylostella</i> (Lepidoptera: Plutellidae)	Vayssières et al. 2001

**Superfamily: CYNIPOIDEA****Family: FIGITIDAE****Subfamily: Charipinae****Genus: *Phaenoglyphis* Förster, 1869***Phaenoglyphis villosa* (Hartig, 1841)

Recorded from: Evenhuis and Barbotin 1977

Host information: *Aphis nerii* (Hemiptera, Aphididae) (Evenhuis and Barbotin 1977), Hyperparasitoid of Aphididae (Hemiptera) via Aphidiinae (Hymenoptera, Braconidae) (Pujade-villar et al. 2007)**Subfamily: Eucoilinae****Genus: *Aganaspis* Lin, 1987***Aganaspis daci* (Weld, 1951)

Recorded from: Etienne 1975

Host information: *Bactrocera dorsalis* (Clausen et al. 1965), *Anastrepha suspensa* (Nuñez-Bueno 1982), *Ceratitis capitata* and *Ceratitis rosa* (Diptera, Tephritidae) (Etienne 1975)**Genus: *Leptopilina* Förster, 1869***Leptopilina freyae* Allemand & Nordlander, 2003

Recorded from: Allemand et al. 2003

Host information: *Drosophila* ssp. (Diptera, Drosophilidae) (Allemand et al. 2003)*Leptopilina guineanensis* Allemand & Nordlander, 2003

Recorded from: Allemand et al. 2003

Host information: *Drosophila* ssp. (Diptera, Drosophilidae) (Allemand et al. 2003)*Leptopilina orientalis* Allemand & Nordlander, 2003

Recorded from: Allemand et al. 2003

Host information: *Drosophila* ssp. (Diptera, Drosophilidae) (Allemand et al. 2003)*Leptopilina victoriae* Nordlander, 1980

Recorded from: Allemand et al. 2003

Host information: *Drosophila* ssp. (Diptera, Drosophilidae) (Allemand et al. 2003)**Genus: *Rhoptromeris* Förster, 1869***Rhoptromeris bupalus* Quinlan, 1986

Recorded from: Quinlan 1986

Host information: Parasitoid of Chloropidae (Diptera) on grass and fungi (van Noort et al. 2015)

*Rhopstromeris crito* Quinlan, 1986

Recorded from: Quinlan 1986, Madl and van Achterberg 2014

Host information: Parasitoid of Chloropidae (Diptera) on grass and fungi (van Noort et al. 2015)

**Superfamily: CHRYSIDOIDEA**

**Family: BETHYLIDAE**

**Subfamily: Bethylinae**

**Genus: *Goniozus*** Förster, 1856

*Goniozus indicus* (Ashmead, 1903)

Recorded from: Polaszek et al. 1994

Host information: *Maliarpha separatiella* (Lepidoptera, Pyralidae), *Cryptophlebia leucotreta*, *Cryptophlebia peltastica*, *Cryptophlebia semilunana*, *Eccopsis praecedens*, *Strepsicrates rhothia* (Lepidoptera, Olethreutidae) (Azevedo et al. 2010)

**Family: CRHYSIDIDAE**

**Subfamily: Amiseginae**

**Genus: *Senesega*** Kimsey, 2005

*Senesega attiei* Kimsey, 2005

Recorded from: Kimsey 2005

Host information: Probably parasitoid of Phasmatodea (Kimsey 2005)

**Subfamily: Chrysidinae**

**Genus: *Chrysis*** Linnaeus, 1761

*Chrysis gheudei* Guérin-Méneville, 1842

Recorded from: Azevedo et al. 2010. The record from Reunion is probably a misidentification of *Chrysis lincea* Fabricius 1775 (Azevedo et al. 2010)

Host information: *Delta reginum* (Hymenoptera, Vespidae, Eumeninae) and *Sceliphron fuscum* (Hymenoptera, Sphecidae) (Azevedo et al. 2010)

**Genus: *Praestochrysis*** Linsenmaier, 1959

*Praestochrysis lusca* (Fabricius, 1804)

Recorded from: Bordage 1912

Host information: *Chalybion madecassum*, *Sceliphron fuscum* (Hymenoptera, Sphecidae) (Azevedo et al. 2010)

**Family: DRYINIDAE****Subfamily: Anteoninae****Genus: *Anteon*** Jurine, 1807*Anteon reunionense* Olmi, 1987

Recorded from: Olmi 1987

Host information: Unknown. But Dryinidae (including *Anteon*) are parasitoids of Homoptera auchenorrhyncha and commonly called “Cicada wasps” (Azevedo et al. 2010)**Subfamily: Gonatopodinae****Genus: *Gonatopus*** Ljungh, 1810*Gonatopus similis* Brues, 1906

Recorded from: Olmi 1987a

Host information: *Dicranotropis muiri*, *Perkinsiella saccharicida* (Hemiptera, Delphacidae) (Azevedo et al. 2010)**Superfamily: PLATYGASTROIDEA****Family: PLATYGASTRIDAE****Subfamily: Platygastrinae****Genus: *Leptacis*** Förster, 1856*Leptacis risbeci* Masner, 1960

Recorded from: Masner 1960, Madl 2016

Host information: Parasitoids of Cecidomyiidae (Diptera) (Buhl 2011)

**Genus: *Synopeas*** Förster, 1856*Synopeas pauliani* (Risbec, 1957)

Recorded from: Risbec 1957, Masner 1960

Host information: Parasitoids of Cecidomyiidae (Diptera) (Buhl 2011)

**Family: SCELIONIDAE****Subfamily: Scelioninae****Genus: *Macroteleia*** Westwood, 1935*Macroteleia insularis* (Risbec, 1957)

Recorded from: Risbec 1957

Host information: Unknown

**Genus: *Styloteleia*** Kieffer, 1916

*Styloteleia gibbosa* Risbec, 1957

Recorded from: Risbec 1957

Host information: Unknown

**Subfamily: Telenominae**

**Genus: *Telenomus*** Haliday, 1833

*Telenomus busseolae* Gahan, 1922

Recorded from: Rao and Nagaraja 1969

Host information: Parasitizes eggs of *Busseola fusca*, *Sesamia calamistis* and *Sesamia cretica* (Lepidoptera, Pyralidae) (Samin and Asgari 2012)

**Superfamily: DIAPRIOIDEA**

**Family: DIAPRIIDAE**

**Subfamily: Diapriinae**

**Genus: *Trichopria*** Ashmead, 1893

*Trichopria belouvi* (Risbec, 1957)

Recorded from: Risbec 1957, Notton 2004, Madl 2015

Host information: Unknown. But *Trichopria* are parasitoids of Tachinidae (Diptera) (Rajmohana 2006) and Tephritidae (Diptera) (Vayssières et al. 2001)

*Trichopria inconspicua* (Kieffer, 1905)

Recorded from: Huggert 1977, Madl 2015

Host information: Unknown. But *Trichopria* are parasitoids of Tachinidae (Diptera) (Rajmohana 2006) and Tephritidae (Diptera) (Vayssières et al. 2001)

*Trichopria jeanneli* Notton, 2004

Recorded from: Risbec 1957, Madl 2015

Host information: Unknown. But *Trichopria* are parasitoids of Tachinidae (Diptera) (Rajmohana 2006) and Tephritidae (Diptera) (Vayssières et al. 2001)

*Trichopria scotti* (Kieffer, 1912)

Recorded from: Risbec 1957

Host information: Unknown. But *Trichopria* are parasitoids of Tachinidae (Diptera) (Rajmohana 2006) and Tephritidae (Diptera) (Vayssières et al. 2001)

*Trichopria variabilis* (Risbec, 1950)

Recorded from: Risbec 1957, Madl 2015

Host information: Unknown. But *Trichopria* are parasitoids of Tachinidae (Diptera) (Rajmohana 2006) and Tephritidae (Diptera) (Vayssières et al. 2001)

## Superfamily: CERAPHRONOIDEA

### Family: CERAPHRONIDAE

**Genus:** *Aphanogmus* Thomson, 1858

*Aphanogmus fijiensis* (Ferrière, 1933)

Recorded from: Polaszek and LaSalle 1995, Madl 2015

Host information: *Cotesia sesamiae* (Hymenoptera, Braconidae) (Polaszek and LaSalle 1995)

**Genus:** *Ceraphron* Jurine, 1807

*Ceraphron amphimelas* Dessart, 1989

Recorded from: Dessart 1989, Madl 2015

Host information: Hemiptera, Diaspididae (Dessart 1989)

### Family: MEGASPILIDAE

#### Subfamily: Megaspilinae

**Genus:** *Dendrocerus* Ratzeburg, 1852

*Dendrocerus wollastoni* (Dodd, 1920)

Recorded from: Dessart 1984, Madl 2015

Host information: Neuroptera, Chrysopidae (Dessart 1984). In 2013 *Dendrocerus wollastoni* emerged from a specimen of *Rodolia chermesina* (Coleoptera, Coccinellidae) in Reunion Island (Delvare 2013, unpublished data)

*Dendrocerus* sp.

Recorded from: Delvare G. unpublished determination (2013)

Host information: Cf. *Dendrocerus wollastoni*.

**Superfamily: EVANIOIDEA****Family: EVANIIDAE****Genus: *Evania* Fabricius, 1775***Evania appendigaster* (Linnaeus, 1758)

Recorded from: Madl and Ganeshan 2008

Host information: Oviposits within the oothecae of *Periplaneta americana* and possibly that of *Periplaneta australasiae* and *Rhynparobia maderae* (Dictyoptera, Blattidae) (Madl and Ganeshan 2008)**Genus: *Prosevania* Kieffer, 1911***Prosevania erythrosoma* (Schletterer, 1886)

Recorded from: Recorded from Rodrigues and Mauritius, but not yet from Reunion Island (Madl and Ganeshan 2008)

Host information: Oviposits within the oothecae of *Blatta orientalis* (Dictyoptera, Blattidae) (Madl and Ganeshan 2008)

**Table 3.** List of the Cynipoidea, Chrysidoidea, Platygastroidea, Diaprioidea, Ceraphronoidea and Evanioidea recorded from Reunion Island.

Superfamily	Family	Subfamily	Genus / Species	General host information	Recorded from
CYNPOIDEA	FIGITIDAE	Eucoilinae	<i>Aganaspis daci</i> (Weld, 1951)	Tephritidae (Diptera)	Etienne 1975
			<i>Leptopilina freyae</i> Allemand & Nordlander, 2003	<i>Drosophila</i> ssp.	Allemand et al. 2003
			<i>Leptopilina guineanensis</i> Allemand & Nordlander, 2003	<i>Drosophila</i> ssp.	Allemand et al. 2003
			<i>Leptopilina orientalis</i> Allemand & Nordlander, 2003	<i>Drosophila</i> ssp.	Allemand et al. 2003
			<i>Leptopilina victoriae</i> Nordlander, 1980	<i>Drosophila</i> ssp.	Allemand et al. 2003
			<i>Rhoptromeris bupalus</i> Quinlan, 1986	Chloropidae (Diptera)	Quinlan 1986
			<i>Rhoptromeris crito</i> Quinlan, 1986	Chloropidae (Diptera)	Quinlan 1986; Madl and Achterberg 2014
CHRYSIDOIDEA	BETHYLIDAE	Bethylinae	<i>Goniozus indicus</i> (Ashmead, 1903)	Pyralidae, Olethreutidae (Lepidoptera)	Polaszek et al. 1994
	CHRYSIDIDAE	Amiseginae	<i>Senesega attiei</i> (Kimsey, 2005)	Phasmatodea	Kimsey 2005
		Chrysidinae	<i>Chrysis gheudei</i> [1] Guérin-Méneville, 1842	Vespidae and Sphecidae (Hymenoptera)	Azevedo et al. 2010

Superfamilly	Familly	Subfamilly	Genus / Species	General host information	Recorded from
CHRYSIDOIDEA	CHRYSIDIDAE	Chrysidinae	<i>Praestochrysis lusca</i> (Fabricius, 1804)	<i>Chalybion madecassum</i> <i>Sceliphron fuscum</i> (Hymenoptera: Apoidea: Sphecidae)	Bordage 1912
		Anteoninae	<i>Anteon reunionense</i> (Olmi, 1987)	Cicadellidae (Hemiptera)	Olmi 1987
	DRYINIDAE		<i>Gonatopus similis</i> Brues, 1906	<i>Dicranotropis muiri</i> , <i>Perkinsiella saccharicida</i> (Hemiptera: Delphacidae)	Olmi 1987a
	Gonato-podinae				
PLATYGASTROIDEA	PLATYGASTRIDAE	Platyga-strinae	<i>Leptacis risbeci</i> (Masner, 1960)	Cecidomyiidae (Diptera)	van Noort 2013
			<i>Synopeas pauliani</i> (Risbec, 1957)	Cecidomyiidae (Diptera)	Risbec 1957
	SCELIONIDAE	Scelioninae	<i>Macrolelia insularis</i> (Risbec, 1957)	Unknown	Risbec 1957
			<i>Styloteleia gibbosa</i> (Risbec, 1957)	Unknown	Risbec 1957
		Telenominae	<i>Telenomus busseolae</i> Gahan, 1922	Pyralidae (Lepidoptera)	Rao and Nagaraja 1969
DIAPROIODEA	DIAPRIIDAE	Diapriinae	<i>Trichopria belouvi</i> (Risbec, 1957)	Tachinidae, Tephritidae (Diptera)	Risbec 1957; Notton 2004; Madl 2015
			<i>Trichopria inconspicua</i> (Kieffer, 1905)	Tachinidae, Tephritidae (Diptera)	Huggert 1977; Madl 2015
			<i>Trichopria jeanneli</i> Notton, 2004	Tachinidae, Tephritidae (Diptera)	Risbec 1957; Madl 2015
			<i>Trichopria scotti</i> (Kieffer, 1912)	Tachinidae, Tephritidae (Diptera)	Risbec 1957
			<i>Trichopria variabilis</i> (Risbec, 1950)	Tachinidae, Tephritidae (Diptera)	Risbec 1957
CERAPHRONOIDEA	CERAPHONIDAE	-	<i>Aphanogmus fijensis</i> (Ferrière, 1933)	<i>Cotesia sesamiae</i> (Braconidae)	Polaszek and LaSalle 1995; Madl 2015
			<i>Ceraphron amphimelas</i> (Dessart 1989)	Hemiptera: Diaspididae	Dessart 1984; Madl 2015
	MEGASPILIDAE	-	<i>Dendrocerus wollastonii</i> (Dodd, 1920)	Coccinellidae (Coleoptera)	Delvare unpublished
			<i>Dendrocerus</i> sp.	Coccinellidae (Coleoptera)	Delvare unpublished
EVANIOIDEA	EVANIIDAE	-	<i>Evania appengaster</i> (Linnaeus, 1758)	Blattidae (Blattodea)	Madl and Ganeshan 2008
			<i>Prosevania erythrosoma</i> [2] (Schletterer, 1886)	<i>Blatta orientalis</i> (Blattodea: Blattidae)	Madl and Ganeshan 2008

[1] Probably a misidentification of *Chrysis lincea* (Azevedo et al. 2010)

[2] Recorded from Rodrigues and Mauritius, not (yet) from Reunion Island

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# Marine biodiversity baseline for Área de Conservación Guanacaste, Costa Rica: published records

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## Abstract

The diversity of tropical marine organisms has not been studied as intensively as the terrestrial biota worldwide. Additionally, marine biodiversity research in the tropics lags behind other regions. The 43,000 ha Sector Marino of Área de Conservación Guanacaste (ACG, Marine Sector of Guanacaste Conservation Area), on the North Pacific coast of Costa Rica is no exception. For more than four decades, the terrestrial flora and fauna has been studied continuously. The ACG marine biodiversity was studied in the 1930's by expeditions that passed through the area, but not much until the 1990's, except for the marine turtles. In the mid 1990's the Center for Research in Marine Science and Limnology (CIMAR) of the Universidad de Costa Rica (UCR) initiated the exploration of the marine environments and organisms of ACG. In 2015, ACG, in collaboration with CIMAR, started the BioMar project whose goal is to inventory the species of the marine sector of ACG (BioMar ACG project). As a baseline, here I have compiled the published records of marine ACG species, and found that 594 marine species have been reported, representing 15.5% of the known species of the Pacific coast of Costa Rica. The most diverse groups were the crustaceans, mollusks and cnidarians comprising 71.7% of the ACG species. Some taxa, such as mangroves and fish parasites are well represented in ACG when compared to the rest of the Costa Rican coast but others appear to be greatly underrepresented, for example, red algae, polychaetes, copepods, equinoderms, and marine fishes and birds, which could be due to sampling bias. Thirty species have been originally described with specimens from ACG, and 89 species are not known from other localities on the Pacific coast of Costa Rica except ACG. Most of the sampling has been concentrated in a few localities in Sector Marino, Playa Blanca and Islas Murciélagos, and in the nearby waters of Bahía Santa Elena. In an effort to fill this gap, CIMAR is collaborating with ACG and a private foundation to start an inventory of the marine

organisms of the conservation area. The project will be assisted by two marine parataxonomists, and all samples will be catalogued, photographed, bar coded and voucher specimens deposited at the Museo de Zoología, UCR. All the information will be available through Internet. It is anticipated that the BioMar project will fill many of the knowledge gaps and significantly more marine species will be encountered. This project could become a viable model for marine biodiversity inventories in other Costa Rican Conservation Areas (Áreas de Conservación) and in other countries.

### Keywords

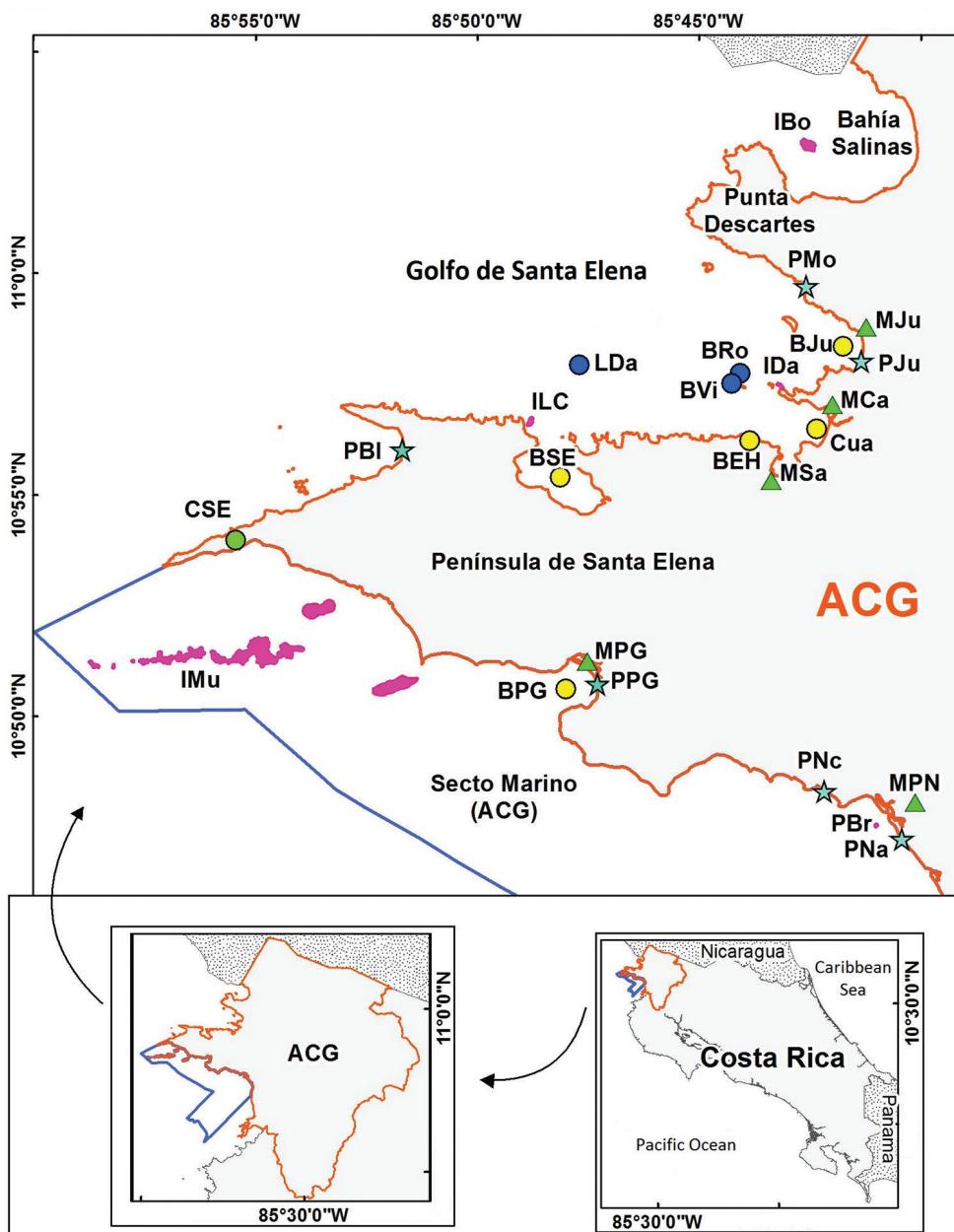
Marine organisms, marine ecosystems, marine biodiversity, conservation areas, Central America, compilation

## Introduction

Marine biodiversity studies have lagged behind terrestrial research, especially in the tropics, with a few exceptions such as Australia (Chapman 2009). Some studies in the Neotropics regarding marine biodiversity have been published, most focused on coral reef areas (Cortés et al. 2017). Several taxonomic groups are fairly well known, such as mollusks and fishes, with monographs, many papers and guides, while others are poorly known, to mention a few, microorganisms and smaller phyla. The same occurs geographically: some countries in the tropics have been relatively well studied, for example, Costa Rica (Wehrtmann and Cortés 2009), while in other countries (such as Nicaragua) research and publications on marine biodiversity are scarce.

Costa Rica comprises 11 Conservation Areas (Áreas de Conservación), one of which is Área de Conservación Guanacaste (ACG) on the northwest Pacific coast of Costa Rica (Fig. 1). The ACG contains much of the last remnants of Costa Rican tropical dry forest and its terrestrial biodiversity has been and still is the subject of intensive research and restoration (Janzen and Hallwachs 2016). The ACG covers an area of 163000 hectares, 43000 of them marine, and 150 km of protected coastline (<http://www.acguanacaste.ac.cr/acg/que-es-el-acg>). It was declared a UNESCO World Heritage Natural Site in 1999. Compared to the terrestrial area, the marine sector (officially Sector Marino) has not been studied intensively. A new initiative, BioMar ACG (Marine Biodiversity of ACG), was started in 2015 to inventory the marine organisms of the area, and then make all the information publicly available, mainly through the Internet, but also with scientific and popular publications. This project is a 5-year collaboration between the conservation area, a private foundation and academia; all samples are being catalogued, photographed, bar coded, and vouchers deposited at the Museo de Zoología (Museum of Zoology) at the Universidad de Costa Rica (UCR).

The marine sector of ACG has a high diversity of habitats, with high species richness worthy of more study (Beebe 1942, Cortés 1996–1997b). There is a well-represented suite of coastal and marine ecosystems, such as mangrove forest of variable sizes, beaches of different composition and size, bays and coves, rocky intertidal zones with several wave regimens, mud flats, rocky subtidal sites, coral reefs, rhodolith beds and deep areas – more than 50 m, plus an archipelago (Isla Murciélagos), shoals, and several more isolated islands (Cortés and Wehrtmann 2009, Cortés 2016). The main



**Figure 1.** Map of the Área de Conservación Guanacaste (ACG) in the northern Pacific coast of Costa Rica with indication of the sites mentioned in the text. See Table 2 for the codes of the sites. Stars = beaches, triangle = mangrove forests, circle = bays; green = protected area; blue circles = shoals.

nesting site in the country of the frigate bird, *Fregata magnificens*, is on one of the nearby islands, Isla Bolaños, in Bahía Salinas (Alvarado-Quesada 2006). An outstanding oceanographic feature of the region is the seasonal upwelling (the Papagayo Up-

**Table 1.** Historical account of marine studies at the Área de Conservación Guanacaste, Pacific coast of Costa Rica.

Years	Expedition/Project/Institutions/ Individual	Taxon/System	References
1932	The Templeton Crocker Expedition of the California Academy of Sciences, aboard the SY <i>Zaca</i>	Algae and mollusks	93, 104, 184
1935	The Allan Hancock Pacific Expeditions, aboard the MY <i>Velero III</i>	Foraminifera, corals, hydroids, mollusks, crustaceans and echinoderms	5, 28, 50, 51, 52, 53, 54, 62, 63, 68, 76, 77, 78, 79, 90, 94, 95, 96, 119, 127, 148, 152, 156, 157, 158, 180, 186, 188, 203
1937–1938	Eastern Pacific Expeditions of the New York Zoological Society, aboard the SY <i>Zaca</i>	Mollusks, crustaceans and echinoderms	44, 45, 46, 47, 61, 80, 81, 82, 91, 105, 106, 107, 108, 109, 110, 111, 112, 113, 114, 136, 189
1959	Eastern Pacific cruise, aboard the MY <i>Stella Polaris</i>	Algae	56, 57, 58
1970 –present	Many individuals, for example, SE Cornelius, LG Fonseca, DA Hughes, JD Richard, DC Robinson, JR Spotila and RA Valverde	Turtle studies	1, 10, 25, 33, 34, 35, 36, 37, 48, 49, 65, 66, 67, 70, 71, 74, 84, 89, 115, 120, 121, 122, 123, 147, 150, 153, 155, 164, 165, 166, 167, 168, 169, 175, 183, 190, 192, 193, 202
1972	Central American Expedition/Janss Foundation, aboard the RV <i>Searcher</i>	Crustacean and fish	21
1973 –present	Several individuals and groups, e.g. DJ Pool, FE Putz and CIMAR, UCR	Mangroves	128, 170, 172, 208
1978	Caribbean-Pacific Expedition Phase VI/ Scripps Institution of Oceanography, aboard the RV <i>Alpha Helix</i>	Mollusks and crustaceans	27, 129, 130
1984 –present	CIMAR, UCR	Coral reefs	7, 39, 42, 124
1984 –present	CIMAR, UCR	Octocorals, corals, anemones, crustaceans, fishes, marine mammals,	11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 38, 41, 59, 60, 64, 72, 141, 142, 143, 144, 145, 151, 160, 187
1991, 2013, present	Museo de Zoología, UCR	Crustaceans	102, 194, 195, 196, 197, 199, 201
1996, 1998	Fish parasite studies	Platyhelminths and acathocephalans	24, 138, 149, 159
1996, 2002	Instituto Nacional de Biodiversidad	Mollusks	22, 23, 133, 191
2005	Benthic survey of northern and central Costa Rica/Smithsonian Tropical Research Institute, aboard the RV <i>Urnacá</i>	Crustaceans	198
2005	Museo Nacional de Costa Rica	Birds	2
2006, 2011	Universidad Nacional, Heredia	Ascidians and cetaceans	139, 154
2014 –present	CIMAR, UCR	Beaches and rocky shores	185

welling) that brings deep cold, nutrient-rich and CO<sub>2</sub>-rich waters to the surface during the trade winds season (December to April-May) (McCreary et al. 1989, Alfaro and Cortés 2012, Rixen et al. 2012). Micro- and macroalgal growth increases significantly as a consequence of the upwelling (Cortés et al. 2014).

What is now ACG's Sector Marino (Fig. 1) was first explored, samples collected, and papers published by several marine expeditions from the United States starting in the 1930's (Cortés 2009a, Table 1). The first expedition was the Templeton Crocker Expedition of the California Academy of Sciences in 1932 aboard the SY *Zaca*, when they visited Bahía Murciélagos and Bahía de Santa Elena (previously known as Port Parker) (Crocker 1933). In 1935, as part of the Allan Hancock Pacific Expeditions aboard the MY *Velero III*, biologists visited Bahía Santa Elena and Bahía Salinas (Fraser 1943a, b). The SY *Zaca* was again in the region in 1937–1938, but this time in an expedition of the New York Zoological Society; they collected in Bahía Santa Elena, around Islas Murciélagos and around Playa Potrero Grande (Beebe 1938, 1942). These three expeditions generated a significant number of publications on ACG marine organisms (Table 1). There were no additional expeditions until 1959, when the MY *Stella Polaris* visited the country (Dawson and Beaudette 1959). In 1972, the RV *Searcher* collected samples in the region and new species of fish were described (Bussing and Lavenberg 2003). The next expedition that visited the area was the Eastern Pacific RV *Alpha Helix* Expedition, in 1978 organized by the Scripps Institution of Oceanography (SIO). They collected samples that are deposited at SIO, but few papers were published (Luke 1995). Chan et al. (2016) recently published on some of the barnacles collected during that expedition. The most recent expedition was the Smithsonian Tropical Research Institute RV *Urracá* to the northern and central Pacific coast of Costa Rica in 2005 (Vargas-Castillo 2008).

Many individuals, groups of researchers or institutions have contributed to the knowledge of ACG marine biodiversity (Table 1). Elmer Y. Dawson published several papers on macroalgae of Costa Rica, including the ACG (Dawson 1960, 1961). Richard and Hughes (1972) and Cornelius (1975) published on marine turtles of the ACG, with the first observations in 1970–1971. In 1996, Marques et al. (1997) and Monks et al. (1997) collected and later described several fish parasites. Between 1996 and 2002, the Instituto Nacional de Biodiversidad collected mollusks in the ACG, and generated several papers on the opistobranchs (Valdés and Camacho-García 2004, Camacho-García et al. 2005, Camacho-García and Gosliner 2008). The CIMAR of the UCR has published papers on marine organisms and environments of Costa Rica that include the ACG: e.g., Cutler et al. (1992) on sipunculids, Moran and Dittel (1993) - crustaceans, Cortés and Guzmán (1998) - corals, Dean (2001, 2004) - polychaetes, Suárez-Morales and Morales-Ramírez (2001) - copepods, and Heard et al. (2009) - tanaidaceans. Also, new species have been described from the ACG: a crustacean (Vargas 2000), two octocorals (Breedy and Guzman 2003) and a fish (Del Moral-Flores et al. 2015). Cortés and Jiménez (2003) provided a description of the coral reefs of the ACG, while Loría-Naranjo et al. (2014) evaluated the main mangrove forests and Sibaja-Cordero et al. (2014) the beach fauna. Even so, our knowledge about the species diversity of the ACG is far from complete.

The objective of this contribution is to generate a baseline of the marine biodiversity of ACG's Sector Marino and adjacent unprotected areas, some of which are in the process of being officially protected. This will serve as a starting point for the recently initiated BioMar ACG project (Marine Biodiversity of the Guanacaste Conservation Area). This five-year project (2015–2019), funded by the Guanacaste Dry Forest Conservation Fund, and with support from the Ministry of the Environment and Energy of the Costa Rican government and the UCR, will collect, identify and provide publicly accessible information about most of ACG's species of marine macroorganisms and as many of the microorganisms as feasible.

## Materials and methods

The study area is Sector Marino of the ACG and adjacent areas, located on the North Pacific of Costa Rica (Fig. 1, Table 2). Publications about ACG marine organisms were compiled and analyzed. A list of recorded species was created based on those publications. Later all scientific names were updated using WoRMS (World Register of Marine Species, <http://www.marinespecies.org/>), AlgaeBase, <http://www.algaebase.org> (Guiry and Guiry 2016), Encyclopedia of Life (<http://eol.org/>), Bryozone (<http://bryozone.myspecies.info/>), Integrated Digitized Biocollections (<https://www.idigbio.org/>), Worldwide Mollusc Species Data Base ([http://www.bagniliggia.it/WMSD/Lindex\\_aaa.htm](http://www.bagniliggia.it/WMSD/Lindex_aaa.htm)), SeaLifeBase (<http://www.sealifebase.org/>) and ZipcodeZoo ([http://zipcodezoo.com/index.php/Main\\_Page](http://zipcodezoo.com/index.php/Main_Page)).

The resulting list of species was compared to the remainder of the Pacific coast of Costa Rica and to available species lists from other countries in the Eastern Tropical Pacific. Knowledge gaps were identified and potential areas of future research suggested.

## Results

Five hundred ninety four marine species have been reported so far for the ACG (Table 3, Appendix 1), which represents 15.5% of the known species of the Pacific coast of Costa Rica. The most diverse groups were crustaceans (193 spp.), mollusks (187 spp.) and cnidarians (46 spp.), comprising together 71.7% of the ACG's marine species. These three groups represent 23.9%, 18.2% and 26.7%, respectively of the known species of the Pacific coast of the country (Table 3). Some groups are well represented in the ACG when compared to the rest of the coast (e.g., species of mangroves and fish parasites), while others are greatly underrepresented. For example, red algae, polychaetes, copepods, equinoderms, and marine fishes and birds are poorly represented in the published reports (Table 3). Other groups of organisms have been observed and identified (e.g., various species of sponges, flat worms, ophiuroids, and ascidian) but there are no published records of these species (Table 4). Other taxa (such as diatoms, nemerteans and appendicularians) undoubtedly inhabit the study area but have not been observed or collected yet (Table 4).

**Table 2.** Localities of the samples reported in the Appendix. # spp. = number of species reported from that site. a = Protected area, b = area in the process of being officially protected, c = marine area not protected, and d = private reserve (protected area).

Code	Locality / area	Notes	# spp.
ACG <sup>a</sup>	Área de Conservación Guanacaste	Entire Conservation Area	13
BEH <sup>c</sup>	Bahía El Hachal	Bay	6
BJu <sup>c</sup>	Bahía Junquillal	Bay	5
BPG <sup>a</sup>	Bahía Potrero Grande	Bay	18
BRo <sup>c</sup>	Bajo Rojo	Shoal	2
BSF <sup>b</sup>	Bahía Santa Elena	Bay	371
BVi <sup>c</sup>	Bajo Viejón	Shoal	5
CSE <sup>a</sup>	Cabo Santa Elena	Tip of PSE	23
Cua <sup>c</sup>	Cuajiniquil	Off Cuajiniquil	6
IBo <sup>c</sup>	Isla Bolaños	Island	1
IDa <sup>c</sup>	Isla David	Island	7
ILC <sup>b</sup>	Isla Los Cabros	Island	1
IMU <sup>a</sup>	Islas Murciélagos	Archipelago	103
Jun <sup>a</sup>	Junquillal	Off Junquillal	21
LDA <sup>c</sup>	La Danta	Shoal	1
MCA <sup>a</sup>	Manglar de Cuajiniquil	Mangrove forest	14
MJu <sup>a</sup>	Manglar de Junquillal	Mangrove forest	6
MPG <sup>a</sup>	Manglar de Potrero Grande	Mangrove forest	14
MPN <sup>a</sup>	Manglar de Playa Naranjo	Mangrove forest	19
MSa <sup>a</sup>	Manglar Salinita	Mangrove forest	14
PBl <sup>a</sup>	Playa Blanca	Beach	104
PBr <sup>a</sup>	Peña Bruja	Islet off PNa	2
PPG <sup>a</sup>	Playa de Potrero Grande	Beach	4
PJu <sup>a</sup>	Playa Junquillal	Beach	2
PMo <sup>d</sup>	Playa Mostrencal	Beach	3
PNa <sup>a</sup>	Playa Naranjo	Beach	10
PNC <sup>c</sup>	Playa Nancite	Beach	16
PSE <sup>a</sup>	Península de Santa Elena	Peninsula	12
SMa <sup>a</sup>	Sector Marino ACG	Marine Sector of ACG	4

Over 85% of the species reported are also found in other areas of the coast of Costa Rica and in the Eastern Tropical Pacific; however, most areas, including the ACG, have not been intensively collected, and the same common species are found repeatedly by collecting expeditions. Thirty new species have been described from specimens collected in the ACG: one foraminiferan, one echinoderm, two octocorals, three parasitic flatworms, four fishes, eight crustaceans and 11 mollusks (Appendix 1). Eighty-nine species are currently known only from the ACG along the Pacific coast of Costa Rica (Table 3, Appendix 1).

Most of the sampling has been concentrated in a few localities of the marine area of the ACG and those sites therefore have the highest number of reported species. For example, Bahía Santa Elena (371 spp.), Playa Blanca (104 spp.) and in some of the

**Table 3.** Number of marine species reported from Área de Conservación Guanacaste (complete list of species in the Appendix), Pacific coast of Costa Rica (see Cortés 2012, plus references indicated as superindex) (species reported only for Isla del Coco were excluded); percentage of the species of the Pacific reported from ACG, and species only found in ACG. n.k. = not known.

TAXA	Species from ACG	Species from Pacific Costa Rica	% of species of the Pacific	Species only at ACG
Bacteria	15	>17 <sup>103, 183</sup>	88.2	15
Cyanobacteria	4	28	14.3	2
Chlorophyta	4	44 <sup>73</sup>	9.1	2
Phaeophyceae	6	26 <sup>73</sup>	23.1	1
Rhodophyta	15	146 <sup>73</sup>	10.3	9
Mangroves	7	8	87.5	0
Foraminifera	24	76	31.6	12
Cnidaria	46	172	26.7	2
Anthozoa	35	59	59.3	2
Hydrozoa	11	108	10.2	0
Platyhelminthes	7	38 <sup>40, 178</sup>	18.4	7
Trematoda	4	20 <sup>40, 178, 182</sup>	20.0	4
Cestoda	3	12 <sup>40, 178</sup>	25.0	3
Acanthocephala	1	1 <sup>149</sup>	100	0
Mollusca	187	1025	18.2	0
Gastropoda	85	631	13.5	0
Bivalvia	102	362	28.2	0
Sipuncula	3	15	20.0	0
Annelida	24	313	7.7	11
Nemertea	1	Several species	n.k.	n.k.
Crustacea	193	807	23.9	13
Amphipoda	13	106	12.3	8
Cumacea	1	19 <sup>161</sup>	5.3	1
Decapoda	162	409	39.6	1
Mysida	1	5	20.0	0
Stomatopoda	10	27	37.0	0
Tanaidacea	1	5	20.0	1
Copepoda	1	163	0.61	1
Cirripedia	4	36	11.1	1
Bryozoa	9	39	23.1	8
Echinodermata	15	105	14.3	7
Astroidea	1	12	8.3	0
Echinoidea	1	28	3.6	0
Holothuroidea	13	28	46.4	7
Chordata	33	961	3.4	0
Asciidiacea	5	14	35.7	0
Cephalochordata	1	2	50	0
Elasmobranchii	3	68	4.4	0
Actinopterygii	11	774	1.4	0
Reptilia	4	5	80.0	0
Aves	2	76	2.6	0
Mammalia	7	22	31.8	0
<b>TOTAL</b>	<b>594</b>	<b>3821+</b>	<b>15.5</b>	<b>89</b>

**Table 4.** Taxa reported from other sites of Pacific Costa Rica (see Cortés 2012, plus references indicated as superindex), but not from Área de Conservación Guanacaste. n.k. = not known; Present = have been observed or collected but there are no publications; Probably = there is a high probability that they are present but have not been observed yet.

Taxonomic group	Number of species reported	ACG
Diatoms	174 <sup>131,132,200</sup>	Present
Dinoflagellates	102	Present
Marine fungi	5 genera	n.k.
Seagrasses	2	n.k.
Porifera	62	Present
Pennatulaceans	4	Present
Scyphozoans	10	Present
Polyplacophorans	24	Present
Cephalopods	20	Present
Echiurians	1	Present
Monogeneans	10 <sup>40</sup>	Probably
Nemerteans	Several species	Probably
Kinorhynchans	2	n.k.
Euphausiids	20	Present
Isopods	37	Present
Branchiopods	1	n.k.
Ostracods	2	Probably
Pycnogonids	10	Probably
Marine insects	9	Probably
Chaetognaths	27	Present
Brachiopods	8	n.k.
Phoronids	1	n.k.
Crinoids	2	n.k.
Ophiuroids	54	Present
Appendicularians	10	Probably
Thaliaceans	4	Probably
Turtle parasites	34	Present

Islas Murciélagos (103 spp.) seem very species-rich (Table 2, Appendix 1). Other areas within ACG have not been sampled at all, for example the northern shore of the Santa Elena Peninsula or some of the Islas Murciélagos. The soft bottom substrate has not been sampled thoroughly nor most of the rocky intertidal zones.

## Discussion

Compared to other areas on the Pacific of Costa Rica, the ACG has fewer known marine species (594 spp.) than does Golfo Dulce (1028 spp.: Morales-Ramírez 2011) or Isla del Coco (1688 spp.: Cortés 2012), but about the same as what is currently known for Bahía Culebra (577 spp: Cortés et al. 2012). But that number will defi-

nitely increase as more taxa, other sites and environments within the ACG are inventoried.

Cortés et al. (2017) synthesized the knowledge of marine biodiversity of the Eastern Tropical Pacific, mainly from coral reefs, where most studies have been done. For example, 857 marine species have been reported for Clipperton Atoll, France, (Charpy 2009, Payri et al. 2009, Fourrière et al. 2014), 968 spp. for El Salvador (Barraza 2000, 2014a, b), 2157 spp. for the coast of Oaxaca, México (Bastida-Zavala et al. 2013), 3536 spp. for the Galápagos Islands (Bustamante et al. 2002, Hickman 2009), 3838 spp. for the Pacific coast of Costa Rica (Table 3, this paper), and 5740 spp. for the entire Gulf of California, México (Aburto-Oropeza and Balart 2001, Reyes-Bonilla et al. 2012). In other countries, for example, Panamá and Colombia, there are detailed inventories of some higher taxa, but not a compilation of all macrotaxa (Cortés et al. 2017). None of these inventories attempted to include the microorganisms.

There are large differences in the numbers of species among different sites in the Eastern Tropical Pacific and these differences could be due to several causes. First, the number, diversity and depth of research efforts influence the extent of the knowledge of the marine biodiversity of a region. Second, the extent of each region will also have an effect on species diversity, because larger areas will probably include more habitats and environments, and thus species. The ACG marine area comprises 430 km<sup>2</sup>, while the Gulf of California has about 160000 km<sup>2</sup>. Third, some sites may differ in species richness and diversity because of differences in geomorphology, oceanography, geological history and biogeography. Fourth, natural disturbances such as warming or cooling events can have a long-term impact on local biodiversity.

Knowing and documenting which species occurs where is a critical first step in understanding and conserving the biodiversity of a particular area. As outlined in Tables 3 and 4, there are important gaps in our knowledge in taxonomy and geographic distribution of marine organisms in the ACG. Much more work is needed to have an even approximately complete inventory, understand the ecological role of the species, their habitats, population structure, and distribution. Researchers of the BioMar-ACG project will fill many of these gaps, and together with other researchers from Costa Rica and elsewhere, the understanding of the marine biodiversity of the ACG will increase greatly. The BioMar project incorporates several innovative aspects, including marine parataxonomists, DNA barcoding of all organisms and fast accessibility of the information. This project could serve as a viable model for marine biodiversity inventory in other Costa Rican conservation areas and in other countries.

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**Note: Only the references used in the Tables and Appendix 1 are numbered.**

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## Appendix

Marine species reported from Área de Conservación Guanacaste (ACG). Species in bold type reported only for the ACG in Costa Rica (in the case of bacteria some have been reported in people but not in marine organisms). Localities as in Figure 1 and Table 1. Localities in bold type = <sup>a)</sup> Type locality, <sup>b)</sup> Paratype locality and <sup>c)</sup> Neotype specimen. References numbered as in the reference list.

	Species	Locality	References
Phylum ACTINOBACTERIA, Class Actinobacteria, Order Actinomycetales, Family Corynebacteriaceae	<b><i>Corynebacterium</i> spp.</b>	PNC	183
Phylum FIRMICUTES, Class Bacilli, Order Bacillales, Family Bacillaceae	<b><i>Bacillus</i> spp.</b>	PNC	183
Order Lactobacillales, Family Enterococcaceae	<b><i>Enterococcus faecalis</i> (Orla-Jensen 1919) Schleifer &amp; Kilpper-Bälz 1984</b>	PNC	183
Order Lactobacillales, Family Lactobacillaceae	<b><i>Lactobacillus</i> spp.</b>	PNC	183
Order Bacillales, Family Staphylococcaceae	<b><i>Staphylococcus aureus</i> Rosenbach, 1884</b>	PNC	183
Phylum PROTEOBACTERIA, Class Betaproteobacteria, Order Burkholderiales, Familia Alcaligenaceae	<b><i>Alcaligenes faecalis</i> Castellani &amp; Chalmers, 1919</b>	PNC	183
Class Gammaproteobacteria, Order Aeromonadales, Family Aeromonadaceae	<b><i>Aeromonas</i> spp.</b>	PNC	183
Order Enterobacteriales, Family Enterobacteriaceae	<b><i>Citrobacter freundii</i> (Braak 1928) Werkman &amp; Gillen, 1932</b>	PNC	183
	<b><i>Pantoea agglomerans</i> (Ewing &amp; Fife, 1972) as <i>Enterobacter agglomerans</i></b>	PNC	183
	<b><i>Escherichia coli</i> Castellani &amp; Chalmers, 1919</b>	PNC	183
	<b><i>Proteus mirabilis</i> Hauser, 1885</b>	PNC	183
	<b><i>Salmonella</i> spp.</b>	PNC	183
Order Pseudomonadales, Family Moraxellaceae	<b><i>Acinetobacter</i> spp.</b>	PNC	183
Order Pseudomonadales, Family Pseudomonadaceae	<b><i>Pseudomonas aeruginosa</i> (Schroeter, 1872) Migula, 1900</b>	PNC	183
	<b><i>Pseudomonas</i> spp.</b>	PNC	183
Phylum CYANOBACTERIA, Class Cyanophyceae, Order Chroococcales, Family Dermocarpaceae	<b><i>Cyanocystis violacea</i> (P.L. Crouan &amp; H.M. Crouan) Komárek &amp; Anagnostidis, 1986 as <i>Dermocarpa violacea</i></b>	BSE	188
Order Chroococcales, Family Entophysalidaceae	<b><i>Entophysalis granulosa</i> Kützing, 1843</b>	BSE	188
Order Oscillatoriales, Family Oscillatoriaceae	<b><i>Lyngbya semiplena</i> J. Agardh ex Gomont, 1892</b>	BSE	188
Class Cyanophyceae	One species	BEH	185
Phylum CHLOROPHYTA, Class Ulvophyceae, Order Cladophorales, Family Cladophoraceae	<b><i>Cladophora lemanniana</i> (Lindenberg) Kützing, 1843 as <i>Cladophora utriculosa</i></b>	BPG	56, 57
	<b><i>Cladophora</i> sp.</b>	BSE	128

	Species	Locality	References
Order Ulvales, Family Ulvaceae	<i>Ulva flexuosa</i> Wulfen, 1803 as <i>Enteromorpha flexuosa</i> and as <i>Enteromorpha lingulata</i>	BSE	57, 188
	<i>Ulva lactuca</i> Linnaeus, 1753	BSE	188
	<i>Ulva prolifera</i> O.F. Müller 1778 as <i>Enteromorpha prolifera</i> var. <i>flexuosa</i>	BSE	57, 128
	<i>Ulva</i> sp.	Jun	185
Phylum OCHROPHYTA, Class Phaeophyceae Order Dictyotales, Family Dictyotaceae	<i>Padina</i> sp.	BPG	58
Order Ectocarpales, Family Scytoniphonaceae	<i>Colpomenia durvillei</i> (Bory de Saint-Vincent) M.E. Ramírez, 1991 as <i>Colpomenia phaeodactyla</i>	BSE	207
	<i>Colpomenia ramosa</i> W.R. Taylor, 1945	BSE	57, 188
	<i>Colpomenia sinuosa</i> (Mertens ex Roth) Derbès & Solier, 1851	BSE	57
	<i>Rosenvingea orientalis</i> (J. Agardh) Børgesen, 1914	BPG	56, 57
Order Fucales, Family Sargassaceae	<i>Sargassum liebmannii</i> J. Agardh 1847	BSE	184
	<i>Sargassum</i> sp.	BPG	58
Phylum RHODOPHYTA, Class Bangiophyceae, Order Bangiales, Family Bangiaceae	<i>Bangia fuscopurpurea</i> (Dillwyn) Lyngbye, 1819 <i>Pyropia thuretii</i> (Setchell & E.Y. Dawson) J.E. Sutherland, L.E. Aguilar Rosas & R. Aguilar Rosas, 2011	BSE	188
Class Compsopogonophyceae, Order Erythrolleptidales, Family Erythrotrichiaceae	<i>Smithora naiadum</i> (C.L. Anderson) Hollenberg, 1959 as <i>Porphyra naiadum</i>	BSE	188
Class Florideophyceae, Order Acrochaetiaceae, Family Acrochaetiaceae	<i>Acrochaetium arcuatum</i> (K.M. Drew) C.K. Tseng, 1945 as <i>Acrochaetium penetrale</i>	BSE	57, 188
Order Ceramiales, Family Rhodomelaceae	<i>Bostrychia</i> sp.	Jun	185
	<i>Chondria dangeardii</i> E.Y. Dawson, 1954 as <i>Chondria platyclada</i>	BPG	58
Order Ceramiales, Family Ceramiaceae	<i>Ceramium avalonae</i> E.Y. Dawson, 1949	BPG	57
	<i>Ceramium personatum</i> Setchell & N.L. Gardner, 1930	BSE	57, 188
Order Ceramiales, Family Rhodomelaceae	<i>Neosiphonia beaudettei</i> (Hollenberg) M.-S. Kim & I.A. Abbott, 2006 as <i>Polysiphonia beaudettei</i>	BPG	57
	<i>Polysiphonia bifurcata</i> Hollenberg in W.R. Taylor, 1945	PBI	57
Order Gigartinales, Family Dicranemataceae	<i>Dicranema rosaliae</i> Setchell & Gardner, 1924	BSE	57
Order Gracilariales, Family Gracilariaeae	<i>Gracilaria symmetrica</i> Dawson, 1949	BPG	58
	<i>Gracilaria</i> sp.	BSE	57
	<i>Gracilariaopsis</i> sp.	BPG	58
Order Hildebrandiales, Family Hildebrandiaceae	<i>Hildenbrandia rubra</i> (Sommerfelt) Meneghini, 1841 as <i>Hildenbrandia prototypus</i>	BSE	188
Order Rhodymeniales, Family Rhodymeniaceae	<i>Botryocephalia beaudettei</i> E.Y. Dawson, 1960	BPG	57
Division MAGNOLIOPHYTA, Class Magnoliopsida, Order Ericales, Family Tetrameristaceae	<i>Pelliciera rhizophorae</i> Triana & Planchon, 1862	BSE	128
	<i>Pelliciera rhizophorae</i> Triana & Planchon, 1862	MPG	32, 128, 208
	<i>Pelliciera rhizophorae</i> Triana & Planchon, 1862	MPN	176

	<b>Species</b>	<b>Locality</b>	<b>References</b>
Order Lamiales, Family Acanthaceae	<i>Avicennia bicolor</i> Standley, 1923	MJu	32
	<i>Avicennia bicolor</i> Standley, 1923	MCa	32
	<i>Avicennia bicolor</i> Standley, 1923	MSa	32
	<i>Avicennia bicolor</i> Standley, 1923	BSE	128
	<i>Avicennia bicolor</i> Standley, 1923	MPG	32, 208
	<i>Avicennia bicolor</i> Standley, 1923	MPN	32, 208
	<i>Avicennia germinans</i> Linnaeus, 1764	MJu	32
	<i>Avicennia germinans</i> Linnaeus, 1764	MCa	32
	<i>Avicennia germinans</i> Linnaeus, 1764	MSa	32
	<i>Avicennia germinans</i> Linnaeus, 1764	BSE	128
Order Myrtales, Family Combretaceae	<i>Avicennia germinans</i> Linnaeus, 1764	MPG	32, 128, 208
	<i>Avicennia germinans</i> Linnaeus, 1764 as <i>Avicennia tonduzii</i> in reference 172	MPN	32, 116, 172, 206
	<i>Avicennia</i> spp.	MPN	176
	<i>Conocarpus erectus</i> Linnaeus, 1753	MJu	32
	<i>Conocarpus erectus</i> Linnaeus, 1753	MCa	32
	<i>Conocarpus erectus</i> Linnaeus, 1753	MSa	32
	<i>Conocarpus erectus</i> Linnaeus, 1753 as <i>Conocarpus erecta</i> in reference 176	MPN	172, 176, 206
	<i>Laguncularia racemosa</i> (L.) Gärtner, 1807	MJu	32
	<i>Laguncularia racemosa</i> (L.) Gärtner, 1807	MSa	32
	<i>Laguncularia racemosa</i> (L.) Gärtner, 1807	BSE	128
Order Rhizophorales, Family Rhizophoraceae	<i>Laguncularia racemosa</i> (L.) Gärtner, 1807	MPG	128, 208
	<i>Laguncularia racemosa</i> (L.) Gärtner, 1807	MPN	172, 176, 206
	<i>Rhizophora mangle</i> Linnaeus, 1753	MJu	32
	<i>Rhizophora mangle</i> Linnaeus, 1753	MCa	32
	<i>Rhizophora mangle</i> Linnaeus, 1753	MSa	32
	<i>Rhizophora mangle</i> Linnaeus, 1753	BSE	128
	<i>Rhizophora mangle</i> Linnaeus, 1753	MPG	32, 128
	<i>Rhizophora mangle</i> Linnaeus, 1753	MPN	32, 170, 208
	<i>Rhizophora racemosa</i> Meyer, 1818	MJu	32
	<i>Rhizophora racemosa</i> Meyer, 1818	MCa	32
Phylum FORAMINIFERA, Class Globothalamea, Order Lituolida, Family Discamminidae	<i>Rhizophora racemosa</i> Meyer, 1818	MSa	32
	<i>Rhizophora racemosa</i> Meyer, 1818	BSE	128
	<i>Rhizophora racemosa</i> Meyer, 1818	MPG	32, 128, 208
	<i>Rhizophora racemosa</i> Meyer, 1818	MPN	32, 206, 208
	<i>Rhizophora</i> spp.	MPN	176
	<i>Ammoscalaria compressa</i> (Cushman & McCulloch, 1939) as <i>Ammofrondicularia compressa</i>	PBl	50
	<i>Haplophragmoides planissima</i> Cushman, 1927 as <i>Haplophragmoides planissimum</i>	BSE	50
	<i>Labospira columbiensis</i> (Cushman, 1925) as <i>Haplophragmoides columbiense</i>	PBl	50
	<i>Labospira columbiensis</i> (Cushman, 1925) as <i>Haplophragmoides columbiense</i>	BSE	50
Order Lituolida, Family Haplophragmoididae			

	Species	Locality	References
Order Lituolida, Family Lituolidae	<i>Eratidus foliaceus</i> (Brady, 1881) as <i>Ammobaculites foliaceus</i>	PBl	50
Order Lituolida, Family Reophacidae	<i>Reophax curitus</i> Cushman, 1920	PBl	50
	<i>Reophax scorpiurus</i> de Montfort, 1808	BSE	50
Order Lituolida, Family Nouriidae	<i>Nouria polymorphinoides</i> Heron-Allen & Earland, 1914	BSE	50
	<i>Nouria polymorphinoides</i> Heron-Allen & Earland, 1914	PBl	50
Order Lituolida, Family Remaneicidae	<i>Remaneica kelletiae</i> (Thalmann, 1932) as <i>Trochammina kelletiae</i>	BSE	50
Order Lituolida, Family Trochamminidae	<i>Portatrochammina pacifica</i> (Cushman, 1925) as <i>Trochammina pacifica</i>	BSE	50
	<i>Portatrochammina pacifica</i> (Cushman, 1925) as <i>Trochammina pacifica</i>	PBl	50
Order Rotaliida, Family Bolivinitidae	<i>Bolivina pygmaea</i> (Brady, 1881)	PBl	52
	<i>Loxostomina limbata</i> (Brady, 1881) as <i>Loxostoma limbatum</i>	BSE	52
Order Rotaliida, Family Buliminellidae	<i>Buliminella elegantissima</i> (d'Orbigny, 1839)	PBl	53
Order Rotaliida, Family Elphidiidae	<i>Elphidium seymourense</i> McCulloch, 1977 as <i>Elphidium crispum</i> var. <i>subcrispum</i>	PBL	51
Order Rotaliida, Family Heterohelicidae	<i>Bifarina pacifica</i> Cushman & McCulloch, 1942	BSE <sup>a</sup>	52
Order Textulariida, Family Textulariidae	<i>Sabulia conica</i> (d'Orbigny, 1839) as <i>Textularia conica</i>	BSE	127
	<i>Textularia calva</i> Lalicker, 1940	BSE	127
	<i>Textularia candeiana</i> d'Orbigny, 1839	BSE	127
	<i>Textularia candeiana</i> d'Orbigny, 1839	PBl	127
	<i>Textularia corrugata</i> Herron-Allen & Earland, 1915	PBl	127
	<i>Textularia foliacea</i> Heron-Allen & Earland, 1915	PBl	127
	<i>Textularia panamensis</i> Cushman, 1918	PBl	127
	<i>Textularia secasensis</i> Lalicker & McCulloch, 1940	BSE	127
	<i>Textularia secasensis</i> Lalicker & McCulloch, 1940	PBl	127
Class Tubothalamea, Order Spirillinida, Family Ammodiscidae	<i>Glomospira gordialis</i> (Jones & Parker, 1860)	BSE	50
Class <i>incerta sedis</i> , Order Lagenida, Family Lagenidae	<i>Lagena amphora</i> Reuss, 1863	PBl	54
	<i>Lagena striata</i> (d'Orbigny, 1839)	PBl	54
Phylum CNIDARIA, Class Anthozoa, Orden Antipatharia, Family Antipathidae	<i>Antipathes</i> sp.	IMu	7
Order Alcyonacea, Family Gorgoniidae	<i>Eugorgia aurantiaca</i> (Horn, 1860)	IMu	38
	<i>Eugorgia daniana</i> Verrill, 1868	BSE	11
	<i>Eugorgia rubens</i> Verrill, 1868	IMu	11, 18
	<i>Leptogorgia alba</i> (Duchassaing & Michelotti, 1864)	IBo	11, 15, 38
	<i>Leptogorgia alba</i> (Duchassaing & Michelotti, 1864)	BSE	11, 15, 38
	<i>Leptogorgia alba</i> (Duchassaing & Michelotti, 1864)	PBl	7
	<i>Leptogorgia alba</i> (Duchassaing & Michelotti, 1864)	IMu	7, 11, 15, 38
	<i>Leptogorgia cofrini</i> Breedy & Guzman, 2005	IMu <sup>b</sup>	14

	<b>Species</b>	<b>Locality</b>	<b>References</b>
Order Alcyonacea, Family Gorgoniidae	<i>Leptogorgia cuspidata</i> Verrill, 1865	IMu	15
	<i>Leptogorgia regis</i> Hickson, 1928	BSE	11, 15
	<i>Leptogorgia regis</i> Hickson, 1928	IMu	11, 15
	<i>Pacifigorgia firma</i> Breedy & Guzman, 2003	BSE	11
	<i>Pacifigorgia irene</i> Bayer, 1951	IMu	7, 11, 12, 13
	<i>Pacifigorgia rubicunda</i> Breedy & Guzman, 2003	IMu <sup>b</sup>	11, 13
	<i>Pacifigorgia senta</i> Breedy & Guzman, 2003	Cua <sup>a</sup>	11, 13
	<i>Pacifigorgia senta</i> Breedy & Guzman, 2003	PBl	7
	<i>Pacifigorgia senta</i> Breedy & Guzman, 2003	IMu <sup>b</sup>	7, 11, 13
	<i>Pacifigorgia stenobrochis</i> (Valenciennes, 1846)	IMu	11, 13
Order Alcyonacea, Family Plexauridae	<i>Pacifigorgia tupperi</i> Breedy & Guzman, 2003	IMu <sup>a</sup>	11, 13
	<i>Muricea austera</i> Verrill, 1869	PBr	17
	<i>Muricea plantaginea</i> (Valenciennes, 1846)	BSE	17
	<i>Muricea squarrosa</i> Verrill, 1869	LDa	16
	<i>Muricea</i> sp.	ACG	38
Order Actiniaria, Family Nemanthidae	<b><i>Nemanthus californicus</i> Carlgren, 1940</b>	IMu	72
Order Scleractinia, Family Agariciidae	<i>Gardineroseris planulata</i> (Dana, 1846)	IMu	7, 42, 124
	<i>Pavona clavus</i> (Dana, 1846)	PSE	38, 39
	<i>Pavona clavus</i> (Dana, 1846)	PBl	7
	<i>Pavona clavus</i> (Dana, 1846)	IMu	7, 41, 42, 124
	<i>Pavona clavus</i> (Dana, 1846)	ACG	39, 42
	<i>Pavona gigantea</i> Verrill, 1869	PSE	38, 39, 43
	<i>Pavona gigantea</i> Verrill, 1869	PBl	7
	<i>Pavona gigantea</i> Verrill, 1869	IMu	7, 42, 124
	<i>Pavona gigantea</i> Verrill, 1869	ACG	39, 41, 42
	<i>Pavona maldivensis</i> (Gardiner, 1905)	ACG	41
Order Scleractinia, Family Dendrophylliidae	<i>Pavona varians</i> Verrill, 1864	IMu	7, 41
	<i>Pavona varians</i> Verrill, 1864	ACG	41
	<i>Cladopsammia eguchii</i> (Wells, 1982)	IMu	38
	<i>Tubastraea coccinea</i> Lesson, 1829 as <i>Tubastrea tenuilamellosa</i>	PBl	68
	<i>Tubastraea coccinea</i> Lesson, 1829	IDa	154
	<i>Tubastraea coccinea</i> Lesson, 1829 as <i>Tubastrea coccinea</i>	BVi	154
	<i>Tubastraea coccinea</i> Lesson, 1829 as <i>Tubastrea coccinea</i>	PSE	38
	<i>Tubastraea coccinea</i> Lesson, 1829 as <i>Tubastrea coccinea</i>	IMu	7, 42, 124
	<i>Tubastraea coccinea</i> Lesson, 1829 as <i>Tubastrea coccinea</i>	ACG	39, 42
	<i>Pocillopora damicornis</i> (Linnaeus, 1758)	PSE	43
Order Scleractinia, Family Pocilloporidae	<i>Pocillopora damicornis</i> (Linnaeus, 1758)	IMu	7, 41, 42, 124
	<i>Pocillopora damicornis</i> (Linnaeus, 1758)	ACG	39, 41
	<i>Pocillopora elegans</i> Dana, 1846	BSE	7
	<i>Pocillopora elegans</i> Dana, 1846	PBl	7
	<i>Pocillopora elegans</i> Dana, 1846	IMu	41, 42, 124
	<i>Pocillopora elegans</i> Dana, 1846	ACG	39

	Species	Locality	References
Order Scleractinia, Family Pocilloporidae	<i>Pocillopora eydouxi</i> Milne Edwards & Haime, 1860	ILC	7, 39
	<i>Pocillopora eydouxi</i> Milne Edwards & Haime, 1860	PSE	41, 43
	<i>Pocillopora eydouxi</i> Milne Edwards & Haime, 1860	IMu	7, 41, 42, 124
	<i>Pocillopora eydouxi</i> Milne Edwards & Haime, 1860	ACG	39
	<i>Pocillopora inflata</i> Glynn, 1999, but see Paz-García et al. 2015	BSE	7
	<i>Pocillopora inflata</i> Glynn, 1999	IMu	42, 86
	<i>Pocillopora meandrina</i> Dana, 1846	BSE	38
	<i>Pocillopora meandrina</i> Dana, 1846	PSE	41
	<i>Pocillopora meandrina</i> Dana, 1846	IMu	7, 41
	<i>Pocillopora meandrina</i> Dana, 1846	ACG	39
Order Scleractinia, Family Poritidae	<i>Porites lobata</i> Dana, 1846	PBl	7
	<i>Porites lobata</i> Dana, 1846	IMu	7, 42, 124
	<i>Porites lobata</i> Dana, 1846	ACG	39
	<i>Porites panamensis</i> Verrill, 1866	IMu	42, 124
	<i>Porites panamensis</i> Verrill, 1866	ACG	39, 41, 42
Order Scleractinia, Family Rhizangiidae	<i>Oulangia bradleyi</i> Verrill, 1866	ACG	39
Order Scleractinia, Family Siderastreidae	<i>Psammocora stellata</i> (Verrill, 1866)	BSE	7
	<i>Psammocora stellata</i> (Verrill, 1866)	PSE	43
	<i>Psammocora stellata</i> (Verrill, 1866)	IMu	7, 41, 42
	<i>Psammocora profundacella</i> Gardiner, 1898 as <i>Psammocora superficialis</i>	BSE	7
Class Hydrozoa, Order Anthoathecata Family Bougainvilliidae	<i>Garveia gracilis</i> (Clark, 1876) as <i>Bimeria gracilis</i>	BSE	38, 76, 77
Order Leptothecata, Family Aglaopheniidae	<i>Aglaophenia trifida</i> Agassiz, 1862 as <i>Aglaophenia rigida</i>	PBl	38, 76
Order Leptothecata, Family Campanulariidae	<i>Clytia fascicularis</i> Fraser, 1938	PBl	38, 77
	<i>Clytia gracilis</i> (Sars, 1850) as <i>Clytia cylindrica</i> and as <i>Gonothyraea gracilis</i>	BSE	38, 77
	<i>Clytia universitatis</i> Torrey, 1904	BSE	38, 77
Order Leptothecata, Family Haleciidae	<i>Halecium washingtoni</i> Nutting, 1901	BSE	38, 77
Order Leptothecata, Family Plumulariidae	<i>Plumularia micronema</i> Fraser, 1938 as <i>Plummularia micronema</i>	BSE	38, 76
	<i>Plumularia micronema</i> Fraser, 1938 as <i>Plummularia micronema</i>	PBl	38, 76
	<i>Amphisbetia furcata</i> (Trask, 1857) as <i>Sertularia furcata</i>	CSE	76
Order Leptothecata, Family Sertulariidae	<i>Dynamena crisioides</i> Lamouroux, 1824 as <i>Thuiaria tubuliformis</i>	BSE	38, 76, 77
	<i>Dynamena crisioides</i> Lamouroux, 1824 as <i>Thuiaria tubuliformis</i>	PBl	38, 77
	<i>Sertularia distans</i> (Lamouroux, 1816) as <i>Sertularia stokeyi</i>	CSE	76
	<i>Physalia physalis</i> (Linnaeus, 1758) as <i>Physalia physalia</i>	IMu	38
Orden Siphonophorae, Familia Physaliidae			
Phylum PLATYHELMINTHES, Class Trematoda Order Plagiorchiida, Family Acanthocolpidae	<i>Stephanostomum casum</i> (Linton, 1910)	Jun	40, 159

	Species	Locality	References
Order Plagiorchiida, Family Lecithasteridae	<i>Trifoliovarium</i> sp. Yamaguti, 1940 as <i>Pseudolecithaster</i>	Cua	159, 178
Order Plagiorchiida, Family Hemiuridae	<i>Theletrum lamothei</i> Pérez-Ponce de León, León-Règagnon & Monks, 1998	Cua <sup>a</sup>	159, 178
Order Plagiorchiida, Family Lepocreadiidae	<i>Hypocreadium myobelicatum</i> Bravo-Hollis & Manter, 1957	Jun	159
Class Cestoda, Order Onchoproteocephalidea, Family Onchobothriidae	<i>Acanthobothrium franus</i> Marques, Centritto & Stewart, 1997	Cua <sup>a</sup>	138, 178
	<i>Acanthobothrium inbiorium</i> Marques, Centritto & Stewart, 1997	Jun <sup>a</sup>	138, 178
Order Trypanorhyncha, Family Pterobothriidae	<i>Pterobothrioides carvajali</i> Campbell & Beveridge, 1997	Cua <sup>b</sup>	24, 178
Phylum ACANTHOCEPHALA, Class Palaeacanthocephala, Order Echinorhynchida Family Illiosentidae	<i>Koronacatha pectinaria</i> (Van Cleave, 1940)	Jun	149, 178
Phylum MOLLUSCA, Class Gastropoda, Subclass Heterobranchia, Order Unassigned, Family Acteonidae	<i>Acteon traskii</i> Stearns, 1897	BSE	191
	<i>Acteocina carinata</i> (Carpenter, 1857)	IDa	191
	<i>Acteocina carinata</i> (Carpenter, 1857)	IDa	191
	<i>Acteocina carinata</i> (Carpenter, 1857)	BSE	191
	<i>Acteocina carinata</i> (Carpenter, 1857)	PBl	191
	<i>Acteocina carinata</i> (Carpenter, 1857)	BPG	191
	<i>Acteocina infrequens</i> (C. B. Adams, 1852)	BJu	191
	<i>Acteocina infrequens</i> (C. B. Adams, 1852)	IDa	191
	<i>Acteocina infrequens</i> (C. B. Adams, 1852)	BSE	191
	<i>Acteocina infrequens</i> (C. B. Adams, 1852)	BPG	191
	<i>Acteocina</i> sp.	BEH	191
Order Cephalaspidea, Family Aglajidae	<i>Navanax aenigmaticus</i> (Bergh, 1894)	BJu	191
Order Cephalaspidea, Family Bullidae	<i>Bulla punctulata</i> A. Adams in Sowerby, 1850 <i>Cylichna atahualpa</i> (Dall, 1908)	Jun BSE	134 191
Order Cephalaspidea, Family Cylichnidae	<i>Cylichnella tabogaensis</i> (Strong & Hertlein, 1939) <i>Cylichnella tabogaensis</i> (Strong & Hertlein, 1939) <i>Cylichnella tabogaensis</i> (Strong & Hertlein, 1939) <i>Cylichnella tabogaensis</i> (Strong & Hertlein, 1939)	BJu IDa BSE PBl	191 191 191 191
Order Cephalaspidea, Family Haminoeidae	<i>Atys defuncta</i> (Baker & Hanna, 1927) <i>Atys exaratus</i> (Carpenter, 1857) as <i>Atys exarata</i> <i>Atys exaratus</i> (Carpenter, 1857) as <i>Atys exarata</i> <i>Atys exaratus</i> (Carpenter, 1857) as <i>Atys exarata</i> <i>Atys exaratus</i> (Carpenter, 1857) as <i>Atys exarata</i>	IDa BSE IMu CSE BPG BJu IDA PBl IMu	191 191 191 191 191 191 191 191 191
Order Cephalaspidea, Family Retusidae	<i>Retusa paziana</i> Dall, 1919 <i>Retusa paziana</i> Dall, 1919 <i>Retusa</i> sp.	IDa BSE PNa	191 191 191

	<b>Species</b>	<b>Locality</b>	<b>References</b>
Order Cephalaspidea, Family Rhizoridae	<i>Volvulella cylindrica</i> (Carpenter, 1864)	PJu	191
	<i>Volvulella cylindrica</i> (Carpenter, 1864)	BSE	191
	<i>Volvulella cylindrica</i> (Carpenter, 1864)	PBl	191
	<i>Volvulella cylindrica</i> (Carpenter, 1864)	IMu	191
	<i>Volvulella cylindrica</i> (Carpenter, 1864)	BPG	191
	<i>Volvulella cylindrica</i> (Carpenter, 1864)	PNa	191
Order Nudibranchia, Family Discodorididae	<i>Atagema notacristata</i> Camacho-García & Gosliner 2008	IMu	22
Orden Nudibranchia, Family Fionidae	<i>Fiona pinnata</i> (Eschscholtz, 1831)	BSE	130
Orden Nudibranchia, Family Polyceridae	<i>Limacia janssi</i> (Bertsch & Ferreira, 1974) as <i>Laila janssi</i>	BSE <sup>a,b</sup>	8
Order Sacoglossa, Family Plakobranchiidae	<i>Elysia</i> sp.	IMu	23
Infraclass Pulmonata, Order Unassigned, Family Siphonariidae	<i>Siphonaria gigas</i> Sowerby, 1825	CSE	130
	<i>Siphonaria gigas</i> Sowerby, 1825	Jun	185
Infraclass Unassigned, Family Pyramidellidae	<i>Eulimastoma dotella</i> (Dall & Bartsch, 1909) as <i>Odostomia (Telloida) subdotella</i>	BSE	114
	<i>Odostomia costaricensis</i> Hertlein & Strong, 1951 as <i>Odostomia (Chrysallida) costaricensis</i>	BSE	114
	<i>Odostomia nicoyana</i> Hertlein & Strong, 1951 as <i>Odostomia (Menestho) nicoyana</i>	BSE	114
	<i>Odostomia woodbridgei</i> Hertlein & Strong, 1951 as <i>Odostomia (Chrysallida) woodbridgei</i>	BSE	114
	<i>Odostomia (Besla) caneloensis</i> Hertlein & Strong, 1951	BSE <sup>a</sup>	114
	<i>Turbanilla amiriana</i> Hertlein & Strong, 1951 as <i>Turbanilla (Pyrgiscus) amiriana</i>	BSE	114
	<i>Turbanilla ayamana</i> Hertlein & Strong, 1951 as <i>Turbanilla (Pyrgiscus) ayamana</i>	BSE	114
	<i>Turbanilla bolleyi</i> Hertlein & Strong, 1951 as <i>Turbanilla (Pyrgiscus) bolleyi</i>	BSE	114
	<i>Turbanilla ekidana</i> Hertlein & Strong, 1951 as <i>Turbanilla (Pyrgiscus) ekidana</i>	BSE	114
	<i>Turbanilla guanacastensis</i> Hertlein & Strong, 1951 as <i>Turbanilla (Pyrgiscus) guanacastensis</i>	BSE	114
	<i>Turbanilla nicoyana</i> Hertlein & Strong, 1951 as <i>Turbanilla (Pyrgiscus) nicoyana</i>	BSE	114
	<i>Turbanilla portoparkerensis</i> Hertlein & Strong, 1951 as <i>Turbanilla (Ptycheulimella) portoparkensis</i>	BSE	114
	<i>Turbanilla sulacana</i> Hertlein & Strong, 1951 as <i>Turbanilla (Pyrgiscus) sulacana</i>	BSE	114
	<i>Turbanilla templetonis</i> Hertlein & Strong, 1951 as <i>Turbanilla (Pyrgiscus) templetonis</i>	BSE	114
	<i>Turbanilla utuana</i> Hertlein & Strong, 1951 as <i>Turbanilla (Pyrgisculus) utuana</i>	BSE	114
	<i>Turbanilla zacae</i> Hertlein & Strong, 1951 as <i>Turbanilla (Pyrgiscus) zacae</i>	BSE	114
Subclass Caenogastropoda, Order Littorinimorpha, Family Cypracidae	<i>Pseudozonaria arabicula</i> (Lamarck, 1810) as <i>Zonaria (Zonaria) arabicula</i>	IMu	26
Order Littorinimorpha, Family Ficidae	<i>Ficus ventricosa</i> (G. B. Sowerby I, 1825)	IMu	130

	Species	Locality	References
Order Littorinimorpha, Family Littorinidae	<i>Echinolittorina atrata</i> (C. B. Adams, 1852) as <i>Nodilittorina atrata</i>	PSE	174
	<i>Echinolittorina fuscolineata</i> (Reid, 2002) as <i>Nodilittorina fuscolineata</i>	IMu	174
	<i>Echinolittorina modesta</i> (Philippi, 1846) as <i>Littorina modesta</i>	IMu	130
	<i>Echinolittorina peruviana</i> (Lamarck, 1822) as <i>Littoraria zebra</i>	MCa	32
	<i>Echinolittorina peruviana</i> (Lamarck, 1822) as <i>Littoraria zebra</i>	MSa	32
	<i>Echinolittorina peruviana</i> (Lamarck, 1822) as <i>Littoraria (Littoraria) zebra</i>	BSE	173
	<i>Echinolittorina peruviana</i> (Lamarck, 1822) as <i>Littoraria zebra</i>	PPG	32, 208
	<i>Echinolittorina peruviana</i> (Lamarck, 1822) as <i>Littoraria zebra</i>	MPN	32, 208
Order Littorinimorpha, Family Personidae	<i>Distorsio decussata</i> (Valenciennes, 1832)	IMu	130
Order Littorinimorpha, Family Rissoinidae	<i>Zebinella alarconi</i> (Hertlein & Strong, 1951) as <i>Rissoina alarconi</i>	BSE	114
Order Littorinimorpha, Family Strombidae	<i>Persististrombus granulatus</i> (Swainson, 1822) as <i>Strombus granulatus</i> Swainson, 1822	IMu	130
Order Littorinimorpha, Family Tornidae	<i>Anticlimax willetti</i> Hertlein & Strong, 1951 as <i>Anticlimax (Subclimax) willetti</i>	BSE <sup>a</sup>	114
	<i>Aorotrema humboldti</i> (Hertlein & Strong, 1951) as <i>Cyclostremiscus humboldti</i>	BSE	114
	<i>Teinostoma herbertianum</i> Hertlein & Strong, 1951 as <i>Teinostoma herbertiana</i>	BSE	114
	<i>Teinostoma zacae</i> Hertlein & Strong, 1951	BSE	114
	<i>Anachis fluctuata</i> (G. B. Sowerby I, 1832) as <i>Anachis (Parvanachis) fluctuata</i>	IMu	130
Order Neogastropoda, Family Columbellidae	<i>Anachis pardalis</i> (Hinds, 1843) as <i>Anachis (Parvanachis) carmen</i>	IMu	130
	<i>Clavistrombina clavulus</i> (G. B. Sowerby I, 1834)	BSE	125
	<i>Cosmioconcha rebderi</i> (Hertlein & Strong, 1951) as <i>Anachis rebderi</i>	BSE <sup>a</sup>	114
	<i>Cotonopsis hirundo</i> (Gaskoin, 1852) as <i>Cotonopsis (Turrina) hirundo</i>	BSE	125
	<i>Mazatlania fulgurata</i> (Philippi, 1846) as <i>Terebra moolenbeeki</i>	PNa <sup>a</sup>	4, 9
	<i>Sincola dorsata</i> (G. B. Sowerby I, 1832) as <i>Sincola (Dorsina) dorsata</i>	BSE	125
	<i>Strombina elegans</i> (G. B. Sowerby I, 1832) as <i>Strombina (Spiralta) elegans</i>	BSE	125
	<i>Sincola gibberula</i> (G. B. Sowerby I, 1832) as <i>Sincola (Dorsina) gibberula</i>	BSE	125
	<i>Strombina elegans</i> (G. B. Sowerby I, 1832) as <i>Strombina (Spiralta) elegans</i>	PBl	125
	<i>Strombina elegans</i> (G. B. Sowerby I, 1832) as <i>Strombina (Spiralta) elegans</i>	IMu	125
	<i>Strombina maculosa</i> (G. B. Sowerby I, 1832) as <i>Strombina (Spiralta) maculosa</i>	BSE	125
	<i>Strombina maculosa</i> (G. B. Sowerby I, 1832) as <i>Strombina (Spiralta) maculosa</i>	IMu	125

	Species	Locality	References
Order Neogastropoda, Family Columbellidae	<i>Strombina pulcherrima</i> (G. B. Sowerby I, 1832) as <i>Strombina (Linastrombina) pulcherrima</i>	BSE	125
	<i>Strombina pulcherrima</i> (G. B. Sowerby I, 1832) as <i>Strombina (Linastrombina) pulcherrima</i>	IMu	125
	<i>Strombina recurva</i> (G. B. Sowerby I, 1832) as <i>Strombina (Recurvina) recurva</i>	BSE	125
	<i>Strombina recurva</i> (G. B. Sowerby I, 1832) as <i>Strombina (Recurvina) recurva</i>	PBl	125
	<i>Strombina recurva</i> (G. B. Sowerby I, 1832) as <i>Strombina (Recurvina) recurva</i>	BPG	125
	<i>Strombina solidula</i> (Reeve, 1859) as <i>Strombina (Linastrombina) solidula</i> – doubtful record	BSE	125
	<i>Conasprella lucida</i> (W. Wood, 1828) as <i>Conus lucidus</i> Wood, 1828	BSE	93
Order Neogastropoda, Family Conidae	<i>Conasprella perplexa</i> (G. B. Sowerby II, 1857) as <i>Conus perplexus</i>	BSE	93
	<i>Conasprella tornata</i> (G. B. Sowerby I, 1833) as <i>Conus tornatus</i>	BSE	93
	<i>Conus brunneus</i> Wood, 1828	BSE	93
	<i>Conus brunneus</i> Wood, 1828	IMu	93
	<i>Conus dalli</i> Stearns, 1873	BSE	93
	<i>Conus fergusoni</i> G. B. Sowerby II, 1873	BSE	93
	<i>Conus gladiator</i> Broderip, 1833	BSE	93
Order Neogastropoda, Family Fasciolariidae	<i>Conus recurvus</i> Broderip, 1833	BSE	93
	<i>Conus vittatus</i> Hwase in Bruguière, 1792	BSE	93
	<i>Fusinus dupetithouarsi</i> (Kiener, 1840)	IMu	130
	<i>Opeatostoma pseudodon</i> (Burrow, 1815)	IMu	130
	<i>Pustularius hemphilli</i> (Hertlein & Strong, 1951) as <i>Latirus hemphilli</i>	BSE <sup>a</sup>	114
	<i>Pustularius mediamericanus</i> (Hertlein & Strong, 1951) as <i>Latirus mediamericanus</i>	BSE	114
	<i>Dentimargo zetetes</i> Roth, 1978	BSE <sup>a</sup>	181
Order Neogastropoda, Family Marginellidae	<i>Prunum aletes</i> Roth, 1978 as <i>Prunum (microspira) aletes</i>	BSE	181
	<i>Prunum aletes</i> Roth, 1978 as <i>Prunum (microspira) aletes</i>	CSE	181
	<i>Prunum aletes</i> Roth, 1978 as <i>Prunum (microspira) aletes</i>	IMu <sup>a</sup>	181
	<i>Prunum lizanoi</i> Magaña, Espinosa & Ortea, 2003	BJu <sup>a</sup>	133, 199
	<i>Acanthina</i> sp.	CSE	130
Order Neogastropoda, Family Muricidae	<i>Murexul zeteki</i> (Hertlein & Strong, 1951) as <i>Muricopsis zeteki</i>	BSE	114
	<i>Plicopurpura columellaris</i> (Lamarck, 1816) as <i>Purpura pansa</i>	CSE	130
	<i>Vasula melones</i> (Duclos, 1832)	BEH	185
	<i>Crassispira xanti</i> Hertlein & Strong, 1951	BSE	114
Order Unassigned, Family Cerithiopsidae	<i>Cerithiopsis guanacastensis</i> Hertlein & Strong, 1951	BSE <sup>a</sup>	114
	<i>Seila kanoni</i> (de Folin, 1867)	BSE	69
	<i>Seila montereyensis</i> Bartsch, 1907	CSE	69
Order Unassigned, Family Potamididae	<i>Cerithideopsis californica</i> (Haldeman, 1840) as <i>Cerithidea valida</i>	MCa	32

	Species	Locality	References
Order Unassigned, Family Potamididae	<i>Cerithideopsis californica</i> (Haldeman, 1840) as <i>Cerithidea valida</i>	MSa	32
	<i>Cerithideopsis californica</i> (Haldeman, 1840) as <i>Cerithidea valida</i>	PPG	32, 203
	<i>Cerithideopsis californica</i> (Haldeman, 1840) as <i>Cerithidea valida</i>	MPN	30, 208
Subclass Neritimorpha, Order Cycloneritimorpha, Family Neritidae	<i>Nerita costata</i> Gmelin, 1791 as <i>Nerita scabricosta</i>	BSE	128
	<i>Nerita costata</i> Gmelin, 1791 as <i>Nerita scabricosta</i>	IMu	130
Subclass Vertebrata, Order Unassigned, Family Scissurellidae	<i>Scissurella kaiserae</i> Geiger, 2006	CSE	85
Class Bivalvia, Subclass Heterodontia, Order Cardiida, Family Cardiidae	<i>Americardia biangulata</i> (Broderip & G. B. Sowerby I, 1829) as <i>Cardium biangulatum</i>	BSE	109
	<i>Laevicardium substriatum</i> (Conrad, 1837) as <i>Cardium alenense</i>	BSE	109
	<i>Lophocardium annettiae</i> (Dall, 1889) as <i>Cardium annettiae</i>	BSE	109
	<i>Microcardium pazianum</i> (Dall, 1916) as <i>Cardium pazianum</i>	BSE	109
	<i>Trachycardium consors</i> (G. B. Sowerby I, 1833) as <i>Cardium consors</i>	BSE	109
	<i>Trachycardium procerum</i> (G. B. Sowerby I, 1833) as <i>Cardium procerum</i>	BSE	109
	<i>Trigoniocardia granifera</i> (Broderip & G. B. Sowerby I, 1829) as <i>Cardium graniferum</i>	BSE	109
	<i>Heterodonax bimaculatus</i> (Linnaeus, 1758) as <i>Heterodonax bimaculata</i>	BSE	113
	<i>Cumingia lamellosa</i> G. B. Sowerby I, 1833	BSE	112
Order Cardiida, Family Semelidae	<i>Semele jovis</i> (Reeve, 1853)	BSE	112
	<i>Semele pallida</i> (G. B. Sowerby I, 1833) as <i>Semele simplicissima</i>	BSE	112
	<i>Semele verrucosa</i> Mörch, 1860 as <i>Semele pacifica</i>	BSE	112
	<i>Tagelus affinis</i> (C. B. Adams, 1852) as <i>Tagelus (Tagelus) affinis</i>	BSE	113
Order Cardiida, Family Solecurtidae	<i>Tagelus politus</i> (Carpenter, 1857) as <i>Tagelus (Mesopleura) politus</i>	BSE	113
Order Cardiida, Family Tellinidae	<i>Cymatoica undulata</i> (Hanley, 1844) as <i>Macoma (Cymatoica) undulata</i>	BSE	111
	<i>Macoma panamensis</i> Dall, 1900 as <i>Macoma (Psammacoma) panamensis</i>	BSE	111
	<i>Tellina amianta</i> Dall, 1900 as <i>Tellina (Moerella) amianta</i>	BSE	111
	<i>Tellina inaequistrata</i> Donovan, 1802 as <i>Tellina (Eurytellina) inaequistrata</i>	BSE	111
	<i>Tellina martinicensis</i> d'Orbigny, 1853 as <i>Tellina (Merisca) proclivis</i>	BSE	111
	<i>Tellina pristiphora</i> Dall, 1900 as <i>Tellina (Phyllodina) pristiphora</i>	BSE	111
	<i>Tellina prona</i> Hanley, 1844 as <i>Tellina (Eurytellina) prona</i>	BSE	111
	<i>Tellina rubescens</i> Hanley, 1844 as <i>Tellina (Eurytellina) rubescens</i>	BSE	111
	<i>Tellina tabogensis</i> Salisbury, 1934 as <i>Tellina (Moerella) recurvata</i>	BSE	111

	Species	Locality	References
Order Carditida, Family Carditidae	<i>Carditamera affinis</i> (G. B. Sowerby I, 1833) as <i>Cardita (Carditamera) affinis</i>	BSE	108
	<i>Carditamera radiata</i> (G. B. Sowerby I, 1833) as <i>Cardita (Carditamera) radiate</i>	BSE	108
	<i>Cardites laticostatus</i> (G. B. Sowerby I, 1833) as <i>Cardita tricolor</i>	BSE	108
	<i>Strophocardia megastropha</i> (J.E. Gray, 1825) as <i>Cardita megastropha</i>	BSE	108
Order Carditida, Family Condylocardiidae	<i>Condylocardia sparsa</i> Coan, 2003	CSE	29
Order Carditida, Family Crassatellidae	<i>Crassinella pacifica</i> (C. B. Adams, 1852)	BSE	108
	<i>Eucrassatella antillarum</i> (Reeve, 1842) as <i>Crassatellites (Hybolophus) digueti</i>	BSE	108
	<i>Eucrassatella gibbosa</i> (G. B. Sowerby I, 1832) as <i>Crassatellites (Hybolophus) gibbosus</i>	BSE	108
Order Lucinida, Family Lucinidae	<i>Codakia distinguenda</i> (Tryon, 1872)	BSE	108
	<i>Ctena mexicana</i> (Dall, 1901)	BSE	108
	<i>Livalucina approximata</i> (Dall, 1901) as <i>Lucina (Parvilocina) approximata</i>	BSE	108
	<i>Radiolucina cancellaris</i> (Philippi, 1846) as <i>Lucina (Bellucina) cancellaris</i>	BSE	108
Order Myida, Family Corbulidae	<i>Caryocorbula biradiata</i> (G. B. Sowerby I, 1833) as <i>Aloidis (Caryocorbula) biradiata</i>	BSE	113
	<i>Caryocorbula marmorata</i> (Hinds, 1843) as <i>Aloidis (Caryocorbula) marmorata</i>	BSE	113
	<i>Caryocorbula nasuta</i> (G. B. Sowerby I, 1833) as <i>Aloidis (Caryocorbula) nasuta</i>	BSE	113
Order Myida, Family Pholadidae	<i>Jouannetia pectinata</i> (Conrad, 1849) as <i>Jouannetia (Triomphalia) pectinata</i>	BSE	113
Order Venerida, Family Veneridae	<i>Agriopoma catharium</i> (Dall, 1902) as <i>Pitar (Pitarella) mexicanus</i>	BSE	110
	<i>Anomalocardia subimbricata</i> (Sowerby, 1835)	BSE	110
	<i>Chione compta</i> (Broderip, 1835) as <i>Chione (Chione) compta</i>	BSE	110
	<i>Cyclinella subquadrata</i> (Hanley, 1844)	BSE	110
	<i>Dosinia dunkeri</i> (Philippi, 1844) as <i>Dosinia (Dosiniida) dunkeri</i>	BSE	110
	<i>Dosinia ponderosa</i> (Gray, 1838) as <i>Dosinia (Dosiniida) ponderosa</i>	BSE	110
	<i>Gouldia californica</i> Dall, 1917	BSE	110
	<i>Iliochione subrugosa</i> (W. Wood, 1828) as <i>Anomalocardia subrugosa</i>	BSE	110
	<i>Leukoma asperrima</i> (G. B. Sowerby I, 1835) as <i>Chione (Nioche) asperrima</i>	BSE	110
	<i>Lirophora mariae</i> (d'Orbigny, 1846) as <i>Chione (Lirophora) mariae</i>	BSE	110
	<i>Megapitaria aurantiaca</i> (G. B. Sowerby I, 1831)	BSE	110
	<i>Megapitaria squalida</i> (G. B. Sowerby I, 1835)	BSE	110
	<i>Periglypta multicostata</i> (G. B. Sowerby I, 1835) as <i>Antigona (Periglypta) multicostata</i>	BSE	110
	<i>Pitar consanguineus</i> (C. B. Adams, 1852) as <i>Pitar (Pitar) consanguineous</i>	BSE	110
	<i>Pitar unicolor</i> (Sowerby, 1835)	IMu	130
	<i>Protothaca grata</i> (Say, 1830)	MCa	32

	<b>Species</b>	<b>Locality</b>	<b>References</b>
Order Venerida, Family Veneridae	<i>Protothaca grata</i> (Say, 1830)	MSa	32
	<i>Protothaca grata</i> (Say, 1830) as <i>Protothaca (Callithaca) grata</i>	BSE	110
	<i>Protothaca grata</i> (Say, 1830)	MPG	32
	<i>Protothaca grata</i> (Say, 1830)	MPN	32
Order Unassigned, Family Chamidae	<i>Arcinella californica</i> (Dall, 1903) as <i>Echinochama californica</i>	BSE	108
	<i>Chama echinata</i> Broderip, 1835	Jun	185
Order Unassigned, Family Galeommatidae	<i>Bellascintilla parmaleeana</i> Coney, 1990	PNa	31
Order Unassigned, Family Ungulinidae	<i>Diplodonta semirugosa</i> Dall, 1899 as <i>Taras semirugosus</i>	BSE	109
	<i>Diplodonta subquadrata</i> Carpenter, 1856 as <i>Taras subquadratus</i>	BSE	109
Subclass Protobranchia, Order Nuculanida, Family Nuculanidae	<i>Saccella elenensis</i> (G. B. Sowerby I, 1833) as <i>Nuculana (Saccella) elenensis</i>	BSE	105
	<i>Saccella impar</i> (Pilsbry & Lowe, 1932) as <i>Nuculana (Saccella) impar</i>	BSE	105
	<i>Saccella laeviradius</i> (Pilsbry & Lowe, 1932) as <i>Nuculana (Saccella) laeviradius</i>	BSE	105
Subclass Pteriomorphia, Order Arcida, Family Arcidae	<i>Acar gradata</i> (Broderip & Sowerby, 1829) as <i>Acar (Arca) gradata</i>	BSE	105
	<i>Acar gradata</i> (Broderip & Sowerby, 1829)	PBl	180
	<i>Anadara biangulata</i> (G. B. Sowerby I, 1833) as <i>Acar (Anadara) biangulata</i>	BSE	106
	<i>Anadara nux</i> (G. B. Sowerby I, 1833) as <i>Arca (Cunearca) nux</i>	BSE	106, 180
	<i>Anadara perlabiata</i> (Grant & Gale, 1931) as <i>Arca (Cunearca) perlabiata</i>	BSE	106
	<i>Anadara reinharti</i> (Lowe, 1935) as <i>Arca (Anadara) reinharti</i>	BSE	106
	<i>Anadara reinharti</i> (Lowe, 1935) as <i>Arca (Scapharca) reinharti</i>	BSE	180
	<i>Anadara tuberculosa</i> (G. B. Sowerby I, 1833)	MCa	32
	<i>Anadara tuberculosa</i> (G. B. Sowerby I, 1833)	MSa	32
	<i>Anadara tuberculosa</i> (G. B. Sowerby I, 1833)	PPG	32, 208
	<i>Anadara tuberculosa</i> (G. B. Sowerby I, 1833)	MPN	32
	<i>Arca mutabilis</i> (G. B. Sowerby I, 1833) as <i>Arca (Arca) mutabilis</i>	BSE	106, 180
	<i>Arca mutabilis</i> (G. B. Sowerby I, 1833) as <i>Arca (Arca) mutabilis</i>	PBl	180
	<i>Barbatia illota</i> (G. B. Sowerby I, 1833) <i>Barbatia (Fugleria) illota</i>	PBl	180
	<i>Barbatia reeveana</i> (d'Orbigny, 1846) as <i>Barbatia (Cucullaearpa) reeveana</i>	PBl	180
	<i>Calloarca alternata</i> (G. B. Sowerby I, 1833) as <i>Arca (Calloarca) alternata</i>	BSE	106
	<i>Larkinia grandis</i> (Broderip & G. B. Sowerby I, 1829) as <i>Grandiarca grandis</i>	MCa	32
	<i>Larkinia grandis</i> (Broderip & G. B. Sowerby I, 1829) as <i>Arca (Lakinia) grandis</i>	BSE	106
	<i>Larkinia grandis</i> (Broderip & G. B. Sowerby I, 1829) as <i>Grandiarca grandis</i>	MPG	32, 208
	<i>Larkinia grandis</i> (Broderip & G. B. Sowerby I, 1829) as <i>Grandiarca grandis</i>	MPN	32

	<b>Species</b>	<b>Locality</b>	<b>References</b>
Subclass Pteriomorphia, Order Arcida, Family Arcidae	<i>Larkinia multicostata</i> (G. B. Sowerby I, 1833) as <i>Anadara multicostata</i>	MCA	32
	<i>Larkinia multicostata</i> (G. B. Sowerby I, 1833) as <i>Anadara multicostata</i>	MSA	32
	<i>Larkinia multicostata</i> (G. B. Sowerby I, 1833) as <i>Arca (Larkinia) multicostata</i>	BSE	106
	<i>Larkinia multicostata</i> (G. B. Sowerby I, 1833) as <i>Anadara multicostata</i>	MPG	32, 204
	<i>Larkinia multicostata</i> (G. B. Sowerby I, 1833) as <i>Anadara multicostata</i>	MPN	32
Order Arcida, Family Glycymerididae	<i>Tucetona strigilata</i> (G. B. Sowerby I, 1833) as <i>Glycymeris (Tuceta) tessellata strigilata</i> and as <i>Glycymeris (Tuceta) tessellata</i>	BSE	106
Order Arcida, Family Noetiidae	<i>Arcopsis solida</i> (G. B. Sowerby I, 1833) as <i>Arca (Arcopsis) solida</i>	BSE	106
	<i>Arcopsis solida</i> (G. B. Sowerby I, 1833)	PBI	180
Order Arcida, Family Philobryidae	<i>Philobrya setosa</i> (Carpenter, 1864)	CSE	30
Order Limida, Family Limidae	<i>Limaria orbignyi</i> (Lamy, 1930) as <i>Lima (Limaria) orbignyi</i>	BSE	107
Order Mytilida, Family Mytilidae	<i>Amygdalum americanum</i> Soot-Ryen, 1955	PBI	186
	<i>Brachidontes adamsianus</i> (Dunker, 1856) as <i>Hormomyia adamsiana</i>	BSE	186
	<i>Brachidontes puntarenensis</i> (Pilsbry & Lowe, 1932)	BSE	186
	<i>Brachidontes</i> sp.	Jun	185
	<i>Crenella divaricata</i> (Orbigny, 1853)	BSE	107, 186
	<i>Leiosolenus aristatus</i> (Dillwyn, 1817) as <i>Lithophaga (Myoforceps) aristata</i>	BSE	107, 186
	<i>Leiosolenus aristatus</i> (Dillwyn, 1817) as <i>Lithophaga (Myoforceps) aristata</i>	PBI	186
	<i>Leiosolenus attenuatus</i> (Deshayes, 1836) as <i>Lithophaga (Labis) attenuata</i>	BSE	107, 186
	<i>Leiosolenus attenuatus</i> (Deshayes, 1836) as <i>Lithophaga (Labis) attenuata</i>	PBI	186
	<i>Leiosolenus plumula</i> (Hanley, 1843) as <i>Lithophaga (Diberus) plumula</i>	BSE	107, 186
	<i>Leiosolenus plumula</i> (Hanley, 1843) as <i>Lithophaga (Diberus) plumula</i>	PBI	186
	<i>Modiolus capax</i> (Conrad, 1837) as <i>Volsella (Volsella) capax</i> in reference 107	BSE	107, 186
	<i>Modiolus capax</i> (Conrad, 1837)	PBI	186
	<i>Mytilus</i> sp.	MCA	32
	<i>Mytilus</i> sp.	MSA	32
	<i>Mytilus</i> sp.	MPG	32
	<i>Mytilus</i> sp.	MPN	32
Order Ostreida, Family Ostreidae	<i>Septifer zeteki</i> Hertlein & Strong, 1946	BSE	186
	<i>Crassostrea corteziensis</i> (Hertlein, 1951)	MPG	208
	<i>Saccostrea palmula</i> (Carpenter, 1857)	Jun	185
Order Ostreida, Family Pinnidae	<i>Saccostrea palmula</i> (Carpenter, 1857)	BSE	107
Order Ostreida, Family Pteriidae	<i>Pinna rugosa</i> G. B. Sowerby I, 1835	BSE	106
	<i>Pinctada mazatlanica</i> (Hanley, 1856)	BSE	106
	<i>Pinctada mazatlanica</i> (Hanley, 1856)	IMu	7
	<i>Pteria sterna</i> (Gould, 1851)	IMu	7

	Species	Locality	References
Order Pectinida, Family Anomiidae	<i>Placunanomia cumingii</i> Broderip, 1832	BSE	107
	<i>Argopecten irradians concentricus</i> (Say, 1822) as <i>Pecten (Plagioctenium) circularis</i>	BSE	107
	<i>Euvola vogdesi</i> (Arnold, 1906) as <i>Pecten (Pecten) vogdesi</i>	BSE	107
Order Pectinida, Family Pectinidae	<i>Leopecten sericeus</i> (Hinds, 1845) as <i>Pecten (Pecten) sericeus</i>	BSE	107
	<i>Leptopecten biolleyi</i> (Hertlein & Strong, 1946) as <i>Pecten (Leptopecten) velero biolleyi</i>	BSE <sup>a</sup>	107
	<i>Nodipecten subnodosus</i> (G. B. Sowerby I, 1835) as <i>Pecten (Lyropecten) subnodosus</i>	BSE	104, 107
Order Pectinida, Family Propeamussiidae	<i>Cyclopecten pernomus</i> (Hertlein, 1935)	BSE	107
Order Pectinida, Family Spondylidae	<i>Spondylus</i> sp.	IMu	7
Phylum SIPUNCULA, Class Phascolosomatidea, Order Phascolosomatida, Family Phascolosomatidae	<i>Antillesoma antillarum</i> (Grube & Oersted 1858)	Jun	185
	<i>Antillesoma antillarum</i> (Grube & Oersted 1858)	IMu	55, 59
	<i>Phascolosoma (Phascolosoma) perlucens</i> Baird, 1868	IMu	59
	<i>Phascolosoma</i> sp.	Jun	185
	<i>Sipunculus (Sipunculus) nudus</i> Linnaeus, 1766	Jun	185
Phylum ANNELIDA, Class Polychaeta, Subclass Errantia, Order Amphinomida, Family Amphinomidae	<i>Eurythoe complanata</i> (Pallas, 1776) as <i>Eurythoë complanata</i> in reference 95	BSE	60, 95, 189
	<i>Eurythoe complanata</i> (Pallas, 1776) as <i>Eurythoë complanata</i> in reference 95	PBl	60, 95
	<i>Hermodice carunculata</i> (Pallas, 1766) doubtful record	BSE	60, 189
	<i>Notopygus ornata</i> Grube, 1856	BSE	189
	<i>Notopygus ornata</i> Grube, 1856	PBl	60, 95
Order Eunicida, Family Eunicidae	<i>Nicidion mutilata</i> (Webster, 1884) as <i>Eunice mutilata</i>	BSE	60, 96
	<i>Palola siciliensis</i> (Grube, 1840)	BSE	60, 96
Order Eunicida, Family Lumbrineridae	One species	PJu	185
	<i>Scoletoma tetraura</i> (Schmarda, 1861) as <i>Lumbrineris tetraura</i>	BSE	60, 96
Order Eunicida, Family Oenonidae	<i>Oenone fulgida</i> (Savigny in Lamarck, 1818) as <i>Aglaurides fulgida</i> in reference 96	BSE	60, 96
	<i>Oenone fulgida</i> (Savigny in Lamarck, 1818) as <i>Aglaurides fulgida</i> in reference 96	PBl	60, 96
Order Eunicida, Family Onuphidae	<i>Diopatra tridentata</i> Hartman, 1944	BSE	60, 96
	<i>Hyalinoecia juvenalis</i> Moore, 1911	BSE	60, 96, 189
	<i>Hyalinoecia juvenalis</i> Moore, 1911	PBl	60
Order Phyllodocida, Family Glyceridae	One species	PJu	185
	<i>Glycera tesselata</i> Grube, 1840	PBl	95
Order Phyllodocida, Family Iphionidae	<i>Iphione ovata</i> Kinberg, 1855	BSE	60, 94
Order Phyllodocida, Family Nereididae	One species	PJu	185
Order Phyllodocida, Family Polynoidae	<i>Lepidasthenia varius</i> Treadwell, 1917 as <i>Lepidasthenia picta</i> in reference 189	BSE	60, 189
Order Phyllodocida, Family Sigalionidae	<i>Pelogenia antipoda</i> Schmarda, 1861 as <i>Psammolyce antipoda</i> (Schmarda) <i>anoculata</i>	PBl	60, 94
	<i>Sigalion lewisi</i> Berkeley & Berkeley, 1939 as <i>Thalenessa lewisi</i>	BSE	94
	<i>Sthenelais fusca</i> Johnson 1897 as <i>Stenelais variabilis colorata</i>	BSE	94

	Species	Locality	References
Subclass Sedentaria, Order Spionida, Family Magelonidae	<i>Magelona</i> sp.	PJu	185
	One species	PJu	185
Order Terebellida, Family Terebellidae	<i>Lanicola guillermoi</i> Capa & Hutchings, 2006	BEH	185
	<i>Terebella gorgonae</i> Monro, 1933	BSE	60, 189
Order Unassigned, Family Chaetopteridae	One species	PJu	185
Order Unassigned, Family Opheliidae	<i>Armandia maculata</i> (Webster, 1884) as <i>Ammotrypane bermudensis</i>	BSE	60, 189
Phylum NEMERTEA	One species	PJu	185
	<i>Ampelisca brevisimulata</i> Barnard, 1954	BSE	5
	<i>Ampelisca cristata</i> Holmes, 1908	BSE	5
	<i>Ampelisca hancocki</i> Barnard, 1954	<b>BSE<sup>a</sup></b>	5
	<i>Ampelisca lobata</i> Holmes, 1908	BSE	5
	<i>Ampelisca milleri</i> Barnard, 1954	BSE	5
	<i>Ampelisca milleri</i> Barnard, 1954 as <i>Ampelisca pugicta</i> Stimpson, 1864 as <i>Ampelisca pugicta</i> forma <i>macrodentata</i>	PBl	5
	<i>Ampelisca romigi</i> Barnard, 1954 as <i>Ampelisca isocornea</i>	BSE	5
	<i>Ampelisca schellenbergi</i> Shoemaker, 1933	PBl	5
	<i>Ampelisca venetiensis</i> Shoemaker, 1916	BSE	5
Phylum ARTHROPODA, Subphylum Crustacea			
Class Malacostraca, Order Amphipoda, Family Ampeliscidae			
Order Amphipoda, Family Aoridae	<i>Paramicrodeutopus schmitti</i> (Shoemaker, 1942) as <i>Microdeutopus schmitti</i>	PBl	152
Order Amphipoda, Family Neomolgophopidae	<i>Neomegamphopus roosevelti</i> Shoemaker, 1942	PBl	152
Order Amphipoda, Family Phoxocephalidae	<i>Micropboxus minimus</i> Barnard, 1954	<b>PBl<sup>a</sup></b>	5, 6
Order Amphipoda, Family Unciolidae	<i>Acuminodeutopus periculosus</i> Barnard, 1969 as <i>Acuminodetopus heteroporus</i>	PBl	152
Order Amphipoda	Several unidentified species	IMu	75
Order Cumacea, Family Bodotriidae	<i>Cyclaspis vargasae</i> Petrescu & Heard, 2004	<b>IMu<sup>a</sup></b>	161, 162
Order Decapoda, Family Albuneidae			
Order Decapoda, Family Alpheidae	<i>Lepidopa mearnsi</i> Benedict, 1904	PNa	197
	<i>Alpheus aequus</i> Kim & Abele, 1988	<b>PBl<sup>a</sup></b>	126, 204
	<i>Alpheus cylindricus</i> Kingsley, 1878	BSE	126
	<i>Alpheus galapagensis</i> Sivertsen, 1933 as <i>Alpheus canalis</i> Kim & Abele, 1988	BSE	126
	<i>Alpheus galapagensis</i> Sivertsen, 1933 as <i>Alpheus canalis</i> Kim & Abele, 1988	PBl	126
	<i>Alpheus hebes</i> Kim & Abele, 1988	BSE	126
	<i>Alpheus hebes</i> Kim & Abele, 1988	PBl	126
	<i>Alpheus longinquus</i> Kim & Abele, 1988	BSE	126
	<i>Alpheus longinquus</i> Kim & Abele, 1988	PBl	126
	<i>Alpheus normanni</i> Kingsley, 1878	BSE	126
	<i>Alpheus panamensis</i> Kingsley, 1878	CSE	196
	<i>Alpheus paracrinitus</i> Miers, 1881	PBl	126
	<i>Alpheus rostratus</i> Kim & Abele, 1988	BSE	126, 204
	<i>Alpheus sulcatus</i> Kingsley, 1870	CSE	196
	<i>Alpheus umbo</i> Kim & Abele, 1988	BSE	126
	<i>Alpheus</i> sp.	BEH	185
	<i>Pomagnathus corallinus</i> Chace, 1962	BSE	196
	<i>Pomagnathus corallinus</i> Chace, 1962	PBl	202
	<i>Synalpheus digueti</i> Coutière, 1909	BSE	202

	Species	Locality	References
Order Decapoda, Family Axiidae	<i>Axiopsis serratifrons</i> (H. Milne-Edwards, 1873)	IMu	196
	<i>Calappa convexa</i> Saussure, 1853	BSE	81
	<i>Calappula saussurei</i> (Rathbun, 1898) as <i>Calappa saussurei</i>	BSE	198
	<i>Cryptosoma bairdii</i> (Stimpson, 1860) as <i>Cycloes bairdii</i>	BSE	82
Order Decapoda, Family Calappidae	<i>Cryptosoma bairdii</i> (Stimpson, 1860) as <i>Cycloes bairdii</i>	IMu	82
	<i>Platymera gaudichaudii</i> H. Milne-Edwards, 1837 as <i>Mursia gaudichaudii</i>	CSE	129
	<i>Platymera gaudichaudii</i> H. Milne Edwards, 1837	IMu	198
Order Decapoda, Family Callianideidae	<i>Callianidea mariamartae</i> Hernández & Vargas, 2013	IMu <sup>a</sup>	102
	<i>Paracallianidea laevicauda</i> (Gill, 1859) as <i>Callianidea laevicauda</i>	PBl	196
Order Decapoda, Family Coenobitidae	<i>Coenobita compressus</i> H. Milne Edwards, 1837	IMu	197
Order Decapoda, Family Dairidae	<i>Daira americana</i> Stimpson, 1860	BSE	47
	<i>Daldorfia trigona</i> (A. Milne-Edwards, 1869) as <i>Daldorfia garthi</i>	BSE	47
Order Decapoda, Family Daldorfidae	<i>Daldorfia trigona</i> (A. Milne-Edwards, 1869) as <i>Daldorfia garthi</i>	PBl	78
Order Decapoda, Family Diogenidae	<i>Aniculus elegans</i> Stimpson, 1858	IMu	197
	<i>Trizopagurus magnificus</i> (Bouvier, 1898)	IMu	197
Order Decapoda, Family Domeciidae	<i>Cheriusius triunguiculatus</i> (Borradaile, 1902) as <i>Maldivia galapagensis</i>	BSE	83
Order Decapoda, Family Dromiidae	<i>Hypoconcha panamensis</i> Smith, 1869	BSE	82
	<i>Moreiradromia sarraburei</i> (Rathbun, 1910)	BSE	198
Order Decapoda, Family Dynomenidae	<i>Hirsutodynemene ursula</i> (Stimpson, 1860) as <i>Dynomene ursula</i> Stimpson, 1860	IMu	151
	<i>Herbstia pubescens</i> Stimpson, 1871	BSE	80
	<i>Herbstia pubescens</i> Stimpson, 1871	PBl	79
	<i>Macrocoeloma maccullochae</i> Garth, 1940	BSE	79, 80
	<i>Macrocoeloma maccullochae</i> Garth, 1940	PBl	78
Order Decapoda, Family Epialtidae	<i>Microlissa aurivilliasi</i> (Rathbun, 1898) as <i>Lissa aurivilliasi</i>	BSE	80
	<i>Microlissa aurivilliasi</i> (Rathbun, 1898) as <i>Lissa aurivilliasi</i>	PBl	79
	<i>Pelia tumida</i> (Lockington, 1877)	PBl	79
	<i>Stenocionops ovatus</i> (Bell, 1835) as <i>Stenocionops ovata</i>	IMu	198
Order Decapoda, Family Eriphiidae	<i>Eriphia squamata</i> Stimpson, 1859	BSE	47
	<i>Eriphides hispida</i> (Stimpson, 1860)	BSE	47
	<i>Ethusa lata</i> Rathbun, 1893	BSE	81
Order Decapoda, Family Ethusidae	<i>Ethusa lata</i> Rathbun, 1893	IMu	198
	<i>Ethusa panamensis</i> Finnegan, 1931 as <i>Ethusa mascarpone panamensis</i>	IMu	82
Order Decapoda, Family Gecarcinidae	<i>Johngarthia planata</i> (Stimpson, 1860)	IMu	160
	<i>Geograpsus lividus</i> (Milne Edwards, 1837)	BSE	47
Order Decapoda, Family Grapsidae	<i>Grapsus grapsus</i> (Linnaeus, 1758)	BSE	47
	<i>Grapsus grapsus</i> (Linnaeus, 1758)	PPG	47
	<i>Pachygrapsus transversus</i> (Gibbes, 1850)	BSE	47

	Species	Locality	References
Order Decapoda, Family Hippidae	<i>Emerita rathbunae</i> Schmitt, 1935	Jun	197
	<i>Hippolyte williamsi</i> Schmitt, 1924	IMu	201
Order Decapoda, Family Hippolytidae	<i>Lysmata argentopunctata</i> Wicksten, 2000	IMu	201, 204
	<i>Trachycaris restricta</i> (Milne-Edwards, 1878)	BSE	196
	<i>Ericerodes angulatus</i> (Finnegan, 1931) as <i>Podochela angulata</i>	BSE	79
	<i>Ericerodes angulatus</i> (Finnegan, 1931) as <i>Podochela angulata</i>	BSE	80
Order Decapoda, Family Inachidae	<i>Ericerodes veleronis</i> (Garth, 1948) as <i>Podochela veleronis</i>	PBl	79
	<i>Eucinetops panamensis</i> Rathbun, 1923	BSE	47
	<i>Eucinetops panamensis</i> Rathbun, 1923	PBl	79
	<i>Podochela ziesenhennei</i> Garth, 1940	PBl	79
	<i>Collodes tenuirostris</i> Rathbun, 1894	IMu	198
	<i>Euprognatha bifida</i> Rathbun, 1893	BSE	80
	<i>Inachoides laevis</i> Stimpson, 1860	BSE	79
	<i>Inachoides laevis</i> Stimpson, 1860	BSE	80
Order Decapoda, Family Inachoididae	<i>Paradasyggius depressus</i> (Bell, 1835)	BSE	79
	<i>Pyromaia tuberculata</i> (Lockington, 1877)	IMu	198
	<i>Stenorhynchus debilis</i> (Smith, 1871)	BSE	79
	<i>Stenorhynchus debilis</i> (Smith, 1871)	PBl	79
	<i>Stenorhynchus debilis</i> (Smith, 1871)	BSE	80
	<i>Ebalia magdalensis</i> Rathbun, 1933	BSE	82
	<i>Leucosilia jurinii</i> (Saussure, 1853)	BSE	82
Order Decapoda, Family Leucosiidae	<i>Lithadia cumingii</i> Bell, 1855	BSE	82
	<i>Persephona subovata</i> (Rathbun, 1894) as <i>Iliacantha hancocki</i>	BSE	82
	<i>Randallia agariciae</i> Rathbun, 1898	BSE	82
Order Decapoda, Family Majidae	<i>Maiopsis panamensis</i> Faxon, 1893	IMu	198
	<i>Ala cornuta</i> (Stimpson, 1860) as <i>Anaptychus cornutus</i>	BSE	47
	<i>Ala cornuta</i> (Stimpson, 1860)	BSE	79, 80
	<i>Ala cornuta</i> (Stimpson, 1860)	PBl	79
	<i>Hemus finneganae</i> Garth, 1958	BSE	80
	<i>Microphysys branchialis</i> Rathbun, 1898	BSE	79
	<i>Microphysys platysoma</i> (Stimpson, 1860)	BSE	47
	<i>Mithraculus denticulatus</i> (Bell, 1835) as <i>Mithrax denticulatus</i>	BSE	47
	<i>Mithraculus denticulatus</i> (Bell, 1835) as <i>Mithrax denticulatus</i>	PBl	79
Order Decapoda, Family Mithracidae	<i>Mithrax tuberculatus</i> Stimpson, 1860	PBl	79
	<i>Petramithrax pygmaeus</i> Bell, (1836) as <i>Mithrax pygmaeus</i>	BSE	47, 80
	<i>Pitho picteti</i> (Saussure, 1853)	PBl	79
	<i>Pitho picteti</i> (Saussure, 1853)	BSE	80
	<i>Pitho quinquedentata</i> Bell, 1835	BSE	80
	<i>Pitho sexdentata</i> Bell, 1835	BSE	47
	<i>Teleophrys cristulipes</i> Stimpson, 1860	BSE	47, 79
	<i>Teleophrys cristulipes</i> Stimpson, 1860	PBl	79
	<i>Thoe erosa</i> Bell, 1835 as <i>Thoe sulcata panamensis</i>	BSE	47, 79
	<i>Thoe erosa</i> Bell, 1835 as <i>Thoe sulcata panamensis</i>	PBl	79

	<b>Species</b>	<b>Locality</b>	<b>References</b>
Order Decapoda, Family Munididae	<i>Pleuroncodes planipes</i> Stimpson, 1860	CSE	129
	<i>Ocypode gaudichaudii</i> Milne Edwards & Lucas, 1843	BPG	44, 46
	<i>Uca (Leptuca) deichmanni</i> Rathbun, 1935 as <i>Uca deichmanni</i>	BSE	45
	<i>Uca (Leptuca) latimanus</i> (Rathbun, 1894) as <i>Uca latimanus</i>	BSE	45
	<i>Uca (Leptuca) panamensis</i> (Stimpson, 1859) as <i>Uca panamensis</i>	BSE	45
	<i>Uca (Leptuca) stenodactylus</i> (H. Milne Edwards & Lucas, 1843) as <i>Uca stenodactyla</i>	BSE	45
	<i>Uca (Leptuca) terpsichores</i> Crane, 1941 as <i>Uca terpsichores</i>	BSE	45
	<i>Uca (Minuca) brevifrons</i> (Stimpson, 1860) as <i>Uca brevifrons</i>	BSE	45
	<i>Uca</i> sp.	MCA	32
	<i>Uca</i> sp.	MSA	32
	<i>Uca</i> sp.	MPG	32, 208
	<i>Uca</i> sp.	MPN	32
Orden Decapoda, Family Ocypodidae	<i>Epixanthus tenuidactylus</i> (Lockington, 1877) as <i>Ozius tenuidactylus</i>	BSE	47
	<i>Ozius verreauxii</i> Saussure, 1853	BSE	47
Order Decapoda, Family Oziidae	<i>Pagurus vetaultae</i> Harvey & McLaughlin, 1991	BSE <sup>b</sup>	97
Order Decapoda, Family Paguridae	<i>Pagurus virgulatus</i> Haig & Harvey, 1991	BSE <sup>a</sup>	92, 197
	<i>Ancylomenes lucasi</i> (Chace, 1937) as <i>Periclimenes lucasi</i>	PBl	118
	<i>Brachycarpus biunguiculatus</i> (Lucas, 1846)	BSE	119
	<i>Brachycarpus biunguiculatus</i> (Lucas, 1846)	PBl	119
	<i>Brachycarpus biunguiculatus</i> (Lucas, 1846)	IMu	196
	<i>Fennera chacei</i> Holthuis, 1951	BSE	118
Order Decapoda, Family Palaemonidae	<i>Periclimenes infraspinis</i> (Rathbun, 1902) as <i>Periclimenaeus infrispinus</i>	BSE	118, 202, 204
	<i>Periclimenes murcielagensis</i> Vargas, 2000	IMu <sup>a</sup>	194, 204
	<i>Pontonia margarita</i> Smith, 1869	BSE	118
	<i>Pontonia margarita</i> Smith, 1869	PBl	118
	<i>Pontonia margarita</i> Smith, 1869	IMu	196
	<i>Pontonia simplex</i> Holthuis, 1951	BSE	196
	<i>Waldola schmitti</i> Holthuis, 1951	IMu	196
Order Decapoda, Family Panopeidae	<i>Eurypanopeus planus</i> (Smith, 1869)	BSE	47
	<i>Eurypanopeus transversus</i> (Stimpson, 1860)	BSE	47
	<i>Hexapanopeus costaricensis</i> Garth, 1940	BSE <sup>a</sup>	78, 81
	<i>Hexapanopeus orcutti</i> Rathbun, 1930	BSE	81
	<i>Hexapanopeus sinaloensis</i> Rathbun, 1930	BSE	81
	<i>Malacoplax californiensis</i> (Lockington, 1877) as <i>Speocarcinus californiensis</i>	BSE	81

	Species	Locality	References
Order Decapoda, Family Parthenopidae	<i>Celatopesia hassleri</i> (Rathbun, 1925) as <i>Cryptopodia hassleri</i>	BSE	79, 80
	<i>Celatopesia hassleri</i> (Rathbun, 1925) as <i>Cryptopodia hassleri</i>	PBl	79
	<i>Heterocrypta macrobrachia</i> Stimpson, 1871	BSE	79
	<i>Hypolambrus hyponcus</i> (Stimpson, 1871) as <i>Pathenope (Pathenope) hyponca</i>	PBl	79
	<i>Mesorhoea bellii</i> (A. Milne-Edwards, 1878)	BSE	198
	<i>Solenolambrus arcuatus</i> Stimpson, 1871	BSE	79, 80
	<i>Solenolambrus arcuatus</i> Stimpson, 1871	PBl	79
	<i>Spinolambrus exilipes</i> (Rathbun, 1893) as <i>Parthenope exilipes</i>	IMu	198
	<i>Leptocheila (Leptocheila) serratorbita</i> Spence Bate, 1888 as <i>Leptocheila serratorbita</i>	BSE	202, 204
	<i>Metapenaeopsis beebei</i> (Burkenroad, 1938)	BSE	198
Order Decapoda, Family Penaeidae	<i>Penaeus</i> sp. as <i>Pennaeus</i>	MCa	32
	<i>Penaeus</i> sp. as <i>Pennaeus</i>	MSa	32
	<i>Penaeus</i> sp. as <i>Pennaeus</i>	MPG	32, 208
	<i>Penaeus</i> sp. as <i>Pennaeus</i>	MPN	32
	<i>Pilumnus pygmaeus</i> Boone, 1927	BSE	47, 81
Order Decapoda, Family Pilumnidae	<i>Glassella costaricana</i> (Wicksten, 1982)	BEH	185
Order Decapoda, Family Pinnotheridae	<i>Euceramus transversilineatus</i> (Lockington, 1878)	PMo	197
	<i>Euceramus transversilineatus</i> (Lockington, 1878)	BSE	90
	<i>Megalobrachium pacificum</i> Gore & Abele, 1973	BEH	197
	<i>Megalobrachium pacificum</i> Gore & Abele, 1973	PBl	87
	<i>Pachycheles biocellatus</i> (Lockington, 1878)	BSE	90
	<i>Pachycheles vicarius</i> Nobili, 1901	BSE	90
	<i>Petrolisthes agassizii</i> Faxon, 1893	PJu	197
	<i>Petrolisthes agassizii</i> Faxon, 1893	BSE	91
	<i>Petrolisthes armatus</i> (Gibbes, 1850)	Jun	197
	<i>Petrolisthes armatus</i> (Gibbes, 1850)	BSE	91
	<i>Petrolisthes artifrons</i> Haig, 1960	BSE	90
	<i>Petrolisthes edwardsii</i> (de Saussure, 1853)	Jun	197
	<i>Petrolisthes edwardsii</i> (de Saussure, 1853)	BSE	90
	<i>Petrolisthes edwardsii</i> (de Saussure, 1853)	PBl	90
	<i>Petrolisthes glasselli</i> Haig, 1957	BSE	90, 91
	<i>Petrolisthes haigae</i> Chace, 1962	Jun	197
	<i>Petrolisthes haigae</i> Chace, 1962	BSE	91
	<i>Petrolisthes haigae</i> Chace, 1962	PSE	197
	<i>Petrolisthes hiatus</i> Nobili, 1902	BSE	90, 91
	<i>Petrolisthes holotrichus</i> Nobili, 1901	BSE	90
	<i>Petrolisthes lewisi</i> Glassell, 1936 as <i>Petrolisthes lewisi austrinus</i>	BSE	90, 100
	<i>Petrolisthes lewisi</i> Glassell, 1936	PBl	197
	<i>Petrolisthes nobilii</i> Haig, 1960	BSE	90
	<i>Petrolisthes nobilii</i> Haig, 1960	PBl	197
	<i>Petrolisthes ortmanni</i> Nobili, 1901	BSE	90, 91
	<i>Petrolisthes ortmanni</i> Nobili, 1901	PBl	90
	<i>Petrolisthes platymerus</i> Haig, 1960	BSE	90, 101
Order Decapoda, Family Porcellanidae			

	<b>Species</b>	<b>Locality</b>	<b>References</b>
Order Decapoda, Family Porcellanidae	<i>Petrolisthes platymerus</i> Haig, 1960	PBl	197
	<i>Petrolisthes polymitus</i> Glassell, 1937	PBl	90
	<i>Petrolisthes tonsorius</i> Haig, 1960	BSE	90
	<i>Petrolisthes tridentatus</i> Stimpson, 1859	BSE	90, 91
	<i>Pisidia magdalenensis</i> (Glassell, 1936)	Jun	197
	<i>Pisidia magdalenensis</i> (Glassell, 1936)	BSE	90, 91
	<i>Pisidia magdalenensis</i> (Glassell, 1936)	PBl	90
	<i>Polyonyx nitidus</i> Lockington, 1878	BJu	197
	<i>Porcellana cancrisocialis</i> Glassell, 1936	BSE	90, 91
	<i>Porcellana paguriconviva</i> Glassell, 1936	BSE	90, 91
Order Decapoda, Family Portunidae	<i>Achelous asper</i> (A. Milne-Edwards, 1861) as <i>Portunus (Portunus) panamensis</i>	BSE	81
	<i>Achelous tuberculatus</i> Stimpson, 1860 as <i>Portunus (Acheolus) tuberculatus</i>	BSE	81
	<i>Arenaeus mexicanus</i> (Gerstaecker, 1856)	IMu	81
	<i>Arenaeus mexicanus</i> (Gerstaecker, 1856)	BPG	81
	<i>Callinectes arcuatus</i> Ordway, 1863	BSE	81
	<i>Cronius ruber</i> (Lamarck, 1818)	BSE	81
	<i>Portunus (Portunus) acuminatus</i> (Stimpson, 1871)	BSe <sup>c</sup>	78, 81, 198
	<i>Portunus (Portunus) asper</i> (A. Milne-Edwards, 1861)	BSE	81
	<i>Portunus (Portunus) asper</i> (A. Milne-Edwards, 1861)	IMu	81
	<i>Lophoxanthus lamellipes</i> (Stimpson, 1860)	BSE	47
Order Decapoda, Family Pseudorhombidae	<i>Aratus pisonii</i> (H. Milne Edwards, 1837)	BSE	47
Order Decapoda, Family Sesarmidae	<i>Sicyonia disdorsalis</i> (Burkenroad, 1934)	PNa	196
	<i>Sicyonia disedwardsi</i> (Burkenroad, 1934)	PMo	196
	<i>Sicyonia laevigata</i> Stimpson, 1871	BSE	196
	<i>Sicyonia laevigata</i> Stimpson, 1871	IMu	196
	<i>Sicyonia martini</i> Pérez-Farfante & Boothe, 1981	IDa	196
	<i>Sicyonia martini</i> Pérez-Farfante & Boothe, 1981	IMu	198
	<i>Sicyonia martini</i> Pérez-Farfante & Boothe, 1981	PNa	196
	<i>Sicyonia picta</i> Faxon, 1893	PNa	196
Order Decapoda, Family Solenoceridae	<i>Solenocera florea</i> Burkenroad, 1938	PBr	196
Order Decapoda, Family Trapeziidae	<i>Trapezia bidentata</i> (Forskål, 1775) as <i>Trapezia cymodoce ferruginea</i>	BSE	47
Order Decapoda, Family Upogebiidae	<i>Upogebia dawsoni</i> Williams, 1986	BPG	205
	<i>Cataleptodius taboganus</i> (Rathbun, 1912) as <i>Leptodius taboganus</i>	BSE	47
	<i>Cycloanthops vittatus</i> (Stimpson, 1860)	BSE	47
	<i>Edwardsium lobipes</i> (Rathbun, 1898) as <i>Medaeus lobipes</i> in reference 81	BSE	81, 198
	<i>Heteractaea lunata</i> (Lucas, in H. Milne Edwards & Lucas, 1844)	BSE	47
	<i>Liomeria cinctimanus</i> (White, 1847) as <i>Carpilodes cinctimanus</i>	BSE	47
	<i>Microcassiope xantusii</i> (Stimpson, 1871) as <i>Micropanope xantusii</i>	BSE	47
	<i>Paractaea sulcata</i> (Stimpson, 1860) as <i>Actaea sulcata</i>	BSE	47
Order Decapoda, Family Xanthidae			

	Species	Locality	References
Order Decapoda, Family Xanthidae	<i>Platyactaea dovii</i> (Stimpson, 1871) as <i>Actaea dovii</i>	BSE	47, 81
	<i>Williamstimpsonia stimpsoni</i> (Milne Edwards, 1879) as <i>Xanthodius stimpsoni</i>	BSE	47
	<i>Xanthodius sternberghii</i> Stimpson, 1859	BSE	47
Order Mysida, Family Mysidae	<i>Chlamydocephalon banneri</i> (Bacescu, 1968) as <i>Boumaniella banneri</i>	IMu	98
	Several species	IMu	171
Order Stomatopoda, Family Gonodactylidae	<i>Neogonodactylus bahiabondensis</i> (Schmitt, 1940)	PSE	195
	<i>Neogonodactylus bahiabondensis</i> (Schmitt, 1940)	IMu	195
	<i>Neogonodactylus costaricensis</i> (Manning & Reaka, 1979)	BSE	136
	<i>Neogonodactylus festae</i> (Nobili, 1901)	BSE	136
	<i>Neogonodactylus zacae</i> (Manning, 1972)	PMo	195
	<i>Neogonodactylus zacae</i> (Manning, 1972)	BSE	195
Order Stomatopoda, Family Nannosquillidae	<i>Nannosquilla canica</i> Manning & Reaka, 1979	PBl	137
	<i>Nannosquilla decemspinosa</i> (Rathbun, 1910) as <i>Lysiosquilla decemspinosa</i>	PBl	135
Order Stomatopoda, Family Pseudosquillidae	<i>Pseudosquillisma adiastalta</i> Manning, 1964	CSE	195
Order Stomatopoda, Family Squillidae	<i>Crenatosquilla oculinova</i> (Glassell, 1942)	CSE	195
	<i>Squilla bifurca</i> Bigelow, 1891	CSE	129, 195
	<i>Squilla panamensis</i> Bigelow, 1891	CSE	195
Order Tanaidacea, Family Leptocheiliidae	Several species	IMu	99
Order Tanaidacea, Family Parapseudidae	<i>Parapseudes latifrons</i> (Grube, 1864) as <i>Parapseudes pedispinis</i>	BSE	148
	<i>Parapseudes latifrons</i> (Grube, 1864) as <i>Parapseudes pedispinis</i>	PBl	148
	<i>Parapseudes latifrons</i> (Grube, 1864) as <i>Parapseudes pedispinos</i>	IMu	99
Order Tanaidacea, Family Tanaididae as Family Tanaidae	Several species	IMu	99
Class Maxillopoda, Subclass Copepoda, Family Acartiidae	<i>Acartia (Acartia) negligens</i> Dana, 1849 as <i>Acartia (Planktacartia) negligens</i>	IMu	187
Class Maxillopoda, Infraclass Cirripedia, Order Sessilia, Family Balanidae	<i>Amphibalanus inexpectatus</i> (Pilsbry, 1916) as <i>Balanus inexpectatus</i>	Jun	185
Order Sessilia, Family Chthamalidae	<i>Chthamalus panamensis</i> Pilsbry, 1916	Jun	185
	<i>Chthamalus panamensis</i> Pilsbry, 1916	CSE	27, 163
	<i>Microeuraphia imperatrix</i> (Pilsbry, 1916)	CSE	27
Order Sessilia, Family Tetraclitidae	<i>Tetraclita stalactifera</i> (Lamarck, 1818)	Jun	185
Phylum BRYOZOA, Class Gymnolaemata, Order Cheilostomatida, Family Bugulidae	<i>Sessibugula translucens</i> Osburn, 1950	BSE	156
Order Cheilostomatida, Family Exechonellidae	<i>Anexechona ancorata</i> Osburn, 1950	BSE	156
Order Cheilostomatida, Family Phidoloporidae	<i>Rhynchocoelium rostratum</i> (Busk, 1855)	PBl	157
Order Cheilostomatida, Family Schizoporellidae	<i>Schizoporella inarmata</i> Hincks, 1884 as <i>Schizoporella linearis</i> var. <i>inarmata</i>	BSE	157

	Species	Locality	References
Class Stenolaemata, Order Cyclostomatida, Family Crisiidae	<i>Crisia occidentalis</i> Trask, 1857	BSE	158
Order Cyclostomatida, Family Lichenoporidae	<i>Disporella californica</i> (d'Orbigny, 1853)	BSE	158
Order Cyclostomatida, Family Tubuliporidae	<i>Tubulipora pulchra</i> MacGillivray, 1885	BSE	158
Order Cyclostomatida, Family Unassigned	<i>Diaperiforma californica</i> (d'Orbigny, 1853) as <i>Diaperoecia californica</i>	PBl	158
	<i>Petralia japonica</i> (Busk, 1884)	BSE	157
Phylum ECHINODERMATA, Class Asteroidea, Order Valvatida, Family Oreasteridae	<i>Pentaceraster cumingi</i> (Gray, 1840) as <i>Oreaster occidentalis</i>	BSE	28
Class Echinoidea, Order Camarodonta, Family Echinometridae	<i>Echinometra vanbrunti</i> A. Agassiz, 1863	Jun	185
Class Holothuroidea, Order Aspidochirotida, Family Holothuriidae	<i>Holothuria (Cystiphorus) rigida</i> (Selenka, 1867) as <i>Fossothuria rigida</i>	PBl	63
	<i>Holothuria (Halodeima) kefersteinii</i> (Selenka, 1867) as <i>Ludwigothuria kefersteini</i>	PBl	63
	<i>Holothuria (Selenkothuria) lubrica</i> Selenka, 1867	BSE	63
	<i>Holothuria (Semperothuria) languens</i> Selenka, 1867 as <i>Semperothuria languens</i>	PBl	63
	<i>Holothuria (Thymioscyia) arenicola</i> Semper, 1868 as <i>Brandtothuria arenicola</i>	BSE	63
	<i>Holothuria (Thymioscyia) arenicola</i> Semper, 1868 as <i>Brandtothuria arenicola</i>	PBl	63
	<i>Holothuria (Thymioscyia) impatiens</i> (Forskål, 1775) as <i>Brandtothuria impatiens</i>	BSE	63
	<i>Holothuria (Thymioscyia) impatiens</i> (Forskål, 1775) as <i>Brandtothuria impatiens</i>	PBl	63
	<i>Neocucumis veleronis</i> (Deichmann, 1941)	PBl <sup>a</sup>	62
Order Dendrochirotida, Family Cucumariidae	<i>Pseudocnus californicus</i> (Semper, 1868) as <i>Cucumaria californica</i>	BSE	62
	<i>Pseudocnus dubiosus dubiosus</i> (Semper, 1868) as <i>Cucumaria dubiosa</i>	BSE	62
	<i>Pentamera chierchiai</i> (Ludwig, 1887)	BSE	61, 62
Order Dendrochirotida, Family Phyllophoridae	<i>Pentamera chierchiai</i> (Ludwig, 1887)	PBl	62
	<i>Afrocucumis ovulum</i> (Selenka, 1867) as <i>Euthyonidium ovulum</i>	BSE	61
	<i>Neothyonone gibber</i> (Selenka, 1867)	BSE	62
	<i>Neothyonone gibbosa</i> Deichmann, 1941	PBl	62
	<i>Didemnum moseleyi</i> (Herdman, 1886) as <i>Didemnum moseleyi</i>	IDa	154
Order Dendrochirotida, Family Sclerodactylidae	<i>Didemnum moseleyi</i> (Herdman, 1886) as <i>Didemnum moseleyi</i>	BVi	154
	<i>Lissoclinum caulleryi</i> (Ritter & Forsyth, 1917)	IDa	154
	<i>Lissoclinum caulleryi</i> (Ritter & Forsyth, 1917)	BVi	154
	<i>Ascidia ceratodes</i> (Huntsman, 1912)	IDa	154
Order Phlebobranchia, Family Ascidiidae	<i>Ascidia ceratodes</i> (Huntsman, 1912)	BRo	154
	<i>Ascidia ceratodes</i> (Huntsman, 1912)	BVi	154

	Species	Locality	References
Order Aplousobranchia, Family Diazonidae	<i>Rhopalaea birkelandi</i> Tokioka, 1971	IDa	154
	<i>Rhopalaea birkelandi</i> Tokioka, 1971	BRo	154
	<i>Rhopalaea birkelandi</i> Tokioka, 1971	BVi	154
Order Stolidobranchia, Family Styelidae	<i>Eusynstyela tincta</i> (Van Name, 1902) as <i>Polyandrocarpa tincta</i>	IDa	154
	<i>Eusynstyela tincta</i> (Van Name, 1902) as <i>Polyandrocarpa tincta</i>	BVi	154
Subphylum Cephalochordata, Class Leptocardii, Order Unassigned, Family Branchiostomatidae	<i>Branchiostoma californiense</i> Andrews, 1893	PJu	185
Subphylum Vertebrata, Superclass Pisces, Class Elasmobranchii, Order Myliobatiformes, Family Dasyatidae	<i>Dasyatis longa</i> (Garman, 1880) as <i>Dasyatis longus</i>	Cua	24, 178
Order Myliobatiformes, Family Urotrygonidae	<i>Urobatis pardalis</i> Del Moral-Flores, Angulo, López & Bussing, 2015	IMu <sup>b</sup>	64
Order Torpediniformes, Family Narcinidae	<i>Narcine entemedor</i> Jordan & Starks, 1895	Cua	40, 138, 178
Class Actinopteri, Order Anguilliformes, Family Muraenidae	<i>Echidna nocturna</i> (Cope, 1872)	Cua	156, 178
Order Perciformes, Family Cirrhitidae	<i>Oxycirrhitus typus</i> Bleeker, 1857	IMu	7
	<i>Chriolepis cuneata</i> Bussing, 1990	CSE	19
Order Perciformes, Family Gobiidae	<i>Chriolepis cuneata</i> Bussing, 1990	IMu <sup>a</sup>	19
	<i>Elacatinus digueti</i> (Pellegrin, 1901) as <i>Elacatinus iornatus</i> in reference 19	IMu <sup>a</sup>	19, 117
Order Perciformes, Family Haemulidae	<i>Microlepidotus brevipinnis</i> (Steindachner, 1869)	Cua	149
Order Perciformes, Family Labridae	<i>Thalassoma lucasanum</i> (Gill, 1862)	IMu	146
Order Perciformes, Family Labrisomidae	<i>Dialommus fuscus</i> (Gilbert, 1891)	IMu	88
	<i>Paraclinus monoptthalmus</i> (Günther, 1861)	BSE	179
Order Perciformes, Family Opistognathidae	<i>Opistognathus fossoris</i> Bussing & Lavenberg, 2003	IMu <sup>a</sup>	21
Order Perciformes, Family Trpterygiidae	<i>Lepidonectes clarkhubbsi</i> Bussing, 1991	BSE <sup>b</sup>	20
	<i>Lepidonectes clarkhubbsi</i> Bussing, 1991	CSE <sup>b</sup>	20
	<i>Lepidonectes clarkhubbsi</i> Bussing, 1991	IMu <sup>a,b</sup>	20
Orden Syngnathiformes, Family Syngnathidae	<i>Bryx veleronis</i> Herald, 1940	IMu	88
Class Reptilia, Order Crocodylia, Family Crocodylidae	<i>Crocodylus acutus</i> (Cuvier, 1807)	MPG	128
	<i>Crocodylus acutus</i> (Cuvier, 1807)	MPN	140

	Species	Locality	References
Order Testudines, Family Cheloniidae	<i>Chelonia mydas agassizi</i> Bocourt, 1868	PNa	33, 34, 35, 65, 67, 115
	<i>Lepidochelys olivacea</i> (Eschscholtz, 1829)	PNc	1, 10, 25, 33, 35, 36, 37 48, 49, 70, 71, 74, 84, 89, 120, 121, 122, 123, 147, 148, 150, 153, 155, 164, 165, 166, 167, 168, 169, 175, 183, 190, 192, 193, 202
	<i>Lepidochelys olivacea</i> (Eschscholtz, 1829)	PNa	1, 34, 35, 65, 66, 67
Order Testudines, Family Dermochelyidae	<i>Dermochelys coriacea</i> (Vandelli, 1761)	PNa	34, 35, 65
Class Aves, Order Pelecaniformes, Family Fregatidae	<i>Fregata magnificens</i> Mathews, 1914	IBo	2
Order Pelecaniformes, Family Pelecanidae	<i>Pelecanus occidentalis</i> Linnaeus, 1766	PNa	3
Class Mammalia, Order Cetartiodactyla, InfraOrder Cetacea, SuperFamily Mysticeti, Family Balaenopteridae	<i>Megaptera novaeangliae</i> Borowski, 1781	SMa	139
SuperFamily Odontoceti, Family Delphinidae	<i>Globicephala macrorhynchus</i> Gray, 1846	IMu	145
	<i>Orcinus orca</i> Linnaeus, 1758	IMu	145
	<i>Orcinus orca</i> Linnaeus, 1758	SMa	139
	<i>Stenella attenuata graffmani</i> (Lönnberg, 1934)	Cua	145
	<i>Senella attenuata graffmani</i> (Lönnberg, 1934)	IMu	141, 142, 143, 144
	<i>Stenella attenuata</i> (Gray, 1846)	SMa	139
	<i>Tursiops truncatus</i> Montagu, 1821	SMa	139
SuperFamily Odontoceti, Family Kogiidae	<i>Kogia breviceps</i> (de Blainville, 1838)	IMu	145
SuperFamily Odontoceti, Family Physeteridae	<i>Physeter macrocephalus</i> Linnaeus, 1758 as <i>Physeter catodon</i>	PSE	177

