

A Revision of *Danalia* Giard, 1887, *Faba* Nierstrasz & Brender à Brandis, 1930 and *Zeuxokoma* Grygier, 1993 (Crustacea: Isopoda: Epicaridea: Cryptoniscoidea: Cryptoniscidae) with Description of a New Genus and Four New Species

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Abstract. Species belonging to the genera *Danalia* Giard, 1887, *Faba* Nierstrasz & Brender à Brandis, 1930, and *Zeuxokoma* Grygier, 1993 are reviewed. *Danalia* contains species that have mature females that are strongly recurved in shape, cryptoniscus larvae that have reduced and modified pereopods 6 and 7, and that are hyperparasitic on rhizocephalans or directly parasitic on crab hosts. Most species of *Danalia* are in need of recollection and redescription. The generic placement of *Danalia caulleryi* Nierstrasz & Brender à Brandis, 1923 is questioned on the basis of female morphology. *Faba* contains species with females that are linear in shape and are all parasites directly on shrimp hosts. *Faba* is a junior synonym of *Zeuxo* Kossmann, 1880, a preoccupied name previously replaced by *Zeuxokoma*, which is the correct name for the genus. Two new species are described in *Zeuxokoma*, *Z. musaeiformis*, n. sp. and *Z. elongata*, n. sp., representing the first species described in the genus from both the eastern and western Atlantic, respectively. A new genus, *Avada*, n. gen., is erected for those species distinguished from *Danalia* by having females with a compact, weakly recurved shape and cryptoniscus larvae with more modified and more reduced pereopods 6 and 7 than those seen in *Danalia* spp. Two new species are described in *Avada*: *A. kedavra*, n. sp. and *A. eldredgei*, n. sp. Keys to the genera are provided based on female and cryptoniscus characters.

Introduction

The genus *Danalia* was erected by Giard (1887) for isopod parasites of rhizocephalans that differed from those found on *Peltogaster* (e.g., *Cryptoniscus paguri* Fraisse, 1878) and for two species of *Zeuxo* Kossmann, 1872 that parasitized decapods. Giard (1887) erected *Danalia* because the “appendices terminaux sont de dimension inégales au lieu de former quatre lobes égaux comme chez les types étudiés par Kossmann” [terminal appendages are of unequal size instead of forming four equal lobes as in the types studied by Kossmann]. Although this appears to only differentiate the genus from *Zeuxo*, it also differentiates it from *Cryptoniscus sensu stricto*, as the type species, *C. paguri*, does not have 4 elongate lobes on the attachment structure—it has only 2 rounded ones. Giard’s (1887) logic in erecting *Danalia* is hard to follow because he used only the inequality in attachment lobe size as seen in specimens of *Danalia pellucida* Giard, 1887 to distinguish this species from those of *Zeuxo*, but he placed four additional species in *Danalia* without comment as to the shapes of their attachment lobes: *Cryptoniscus larvaeformis* Giard, 1874, *Cryptoniscus curvatus* Fraisse, 1878, *Danalia dohrnii* Giard, 1887, and *Zeuxo longicollis* Kossmann, 1880. Giard (1887) also did not comment on the fact that the shape of the attachment lobes was quite variable, especially during development (see Fraisse 1878a, Caullery 1908).

Currently, there are a dozen species of cryptoniscoids either originally or later placed in *Danalia*, excluding *D. lobiancoi* Giard & Bonnier, 1890, which is a *nomen nudum* (see Grygier 1993, and herein). The species were erected based on the form of the females and, in most cases, the selection of host, with no consideration of the larval characters of the cryptoniscus. Taxonomy based on host identity was in line with the now-discredited concept of Giard & Bonnier (e.g., Giard & Bonnier 1890) that each host bears its own unique parasite fauna and each species of parasite will

be found on only a single host species. Cryptoniscus larvae and neotenous males, which are very useful as sources for specific and generic characters, are unknown in all species except *D. curvata* (type species), *D. hapalocarcini*, and “*Danalia 2*” of Shiino (1952).

As noted by Grygier (1993), about half of the species of *Danalia* (*caulleryi*, *dohrnii*, *gregaria*, *larvaeformis*, *longicollis*, *pellucida*) are extremely poorly known. Only *D. caulleryi*, a parasite of the decapod *Galathea australiensis* Stimpson, 1858, was illustrated (but may not be a *Danalia* species, see below), and all suffer from very brief, and in some cases nearly non-existent, descriptions. None of the others can be recognized as separate species based on the original descriptions unless they are again collected from the type host (all are from rhizocephalans parasitizing decapods). Grygier (1993) did not include *D. porcellanae* in his list of species, but this was clearly an oversight, as the species was mentioned elsewhere in the paper as previously having been placed in *Danalia* by Altes (1982).

Of the described species in *Danalia*, females of both *Danalia caulleryi* and *D. porcellanae* differ in many respects from the other species. In the case of *D. caulleryi*, its short, thick lobes and development of external segmented plates contrast with the narrow, extending lobes and lack of such plates seen in other species of *Danalia*. This suggests that *D. caulleryi* may belong to another genus. Superficially, it resembles a *Cabirops* (Cryptoniscoidea: Cabiropidae, see Boyko 2013) but appears to have an attachment process that *Cabirops* species lack. Females of several species of *Cabirops* and *Danalia* exhibit an amazing degree of convergence in gross morphology that has led to considerable taxonomic confusion (Boyko 2013, and herein).

The proposal of *Danalia* by Giard (1887) left two species remaining in *Zeuxo*: *Zeuxo porcellanae* Kossmann, 1872 and *Z. alpehi* Kossmann, 1872. Giard (1887) wrote: “Je suis bien convaincu qu’une étude plus complete montrera que ce dernier [*Z. alpehi*] diffère aussi génériquement du *Zeuxo porcellanae*” [I am convinced that a more complete study will show that the [*Z. alpehi*] also differs generically from *Zeuxo porcellanae*]. This has indeed proved to be the case. Currently, *Zeuxo porcellanae* is considered a species of *Danalia* (since its transfer there by Caullery 1908), while *Z. alpehi* remains in this monotypic genus, now known as *Zeuxokoma* Grygier, 1993 because *Zeuxo* Kossmann, 1872 is preoccupied (see Grygier 1993, and below). Due to *Zeuxo* being preoccupied, *Faba* Nierstrasz & Brender à Brandis, 1930 would become the next available name for the genus but *Faba* itself is preoccupied by *Faba* Fischer, 1883 (Mollusca), so the correct name for the genus must be *Zeuxokoma* Grygier, 1993.

Danalia and *Zeuxokoma* (= *Zeuxo* Kossmann non Templeton) were, before 1930, the only two genera of Cryptoniscidae known where the female isopods possessed 4-lobed attachment structures. In 1930, Nierstrasz & Brender à Brandis erected *Faba*, a third genus of Cryptoniscidae with 4-lobed attachment structures, despite their concern that the similarity of the attachment structures in *Faba* and *Danalia* was convergent and not necessarily indicative of a close relationship. Females of cryptoniscid isopods present few morphological characters useful in elucidating relationships so, in the absence of information about the potentially more informative cryptoniscid stage of any *Faba* species, the presence of the 4-lobed attachment structure does suggest a close relationship between *Faba*, *Danalia*, and *Zeuxokoma*.

Faba is distinct from *Danalia* as females of *Faba* are mature (bearing eggs or embryos) with a linear sac-like morphology without the bilobate U-shape as seen in species of *Danalia*. However, there is no obvious distinction between *Faba* and *Zeuxokoma* and, based on host and insertion method, they appear synonymous. *Zeuxokoma alpehi* is poorly known, based only on Kossmann’s (1872) brief description regarding its “viel geringere Krümmung, den mehr endständigen Mund, und die weniger massenhaft verzweigten Canäle des Lacunensystems” [much lower curvature, more terminal mouth and less massive branched canal of the lacunae system] and single illustration of the female sac on the alpheid host (type specimens now lost). Although subsequent discovery of parasites on alpheid hosts (see below) indicates that *Faba* is a junior synonym of *Zeuxokoma*, the type species of *Zeuxokoma* is so poorly known that it would be premature to identify any known specimens as *Z. alpehi*.

As surmised by Giard (1887), *Zeuxo porcellanae* is not a species of *Danalia* despite its superficial resemblance to species in that genus (see below under *Avada*, n. gen.). This was also suggested when Shiino (1952) described but did not name three species that he ascribed to *Danalia*. Three

decapod hosts were reported [*Pachygrapsus crassipes* Randall, 1840, *Pugettia quadridens* (De Haan, 1839), and *Petrolisthes japonicus* (De Haan 1849)], each with a different species of *Danalia*.

The differences in pereopod 6 and 7 morphology of the cryptoniscus larvae (pereopod 6 with only 3 segments and a hyperextended terminal segment; pereopod 7 with bifurcated terminal segment) are sufficient to establish a new genus, *Avada*, for “*Danalia 2*” of Shino (1952) which also must be described as a new species. The morphology of the terminal segment of pereopod 6 in *Avada*, n. gen. is similar to that seen in species of *Danalia* (larvae of *Zeuxokoma* unknown), albeit much longer and much more distally recurved. This structure appears apomorphic and is considered a synapomorphy of *Danalia* and *Avada*, n. gen. The female of “*Danalia 2*” is also quite different from those of typical *Danalia* species in its lack of 2 clear elongate lobes with a spatial separation between them and with irregular dorsal lobes present. Therefore, a new genus for “*Danalia 2*” is erected based on both female and cryptoniscus characters. It would be preferable to have a larger character set as the basis for separation of the genera, but this will have to wait until detailed descriptions and redescriptions of further species can be accomplished.

Avada, n. gen. contains Shiino’s “*Danalia 2*” (described herein as *Avada kedavra*, n. sp.), “*Danalia 1*” (not described), and “*Danalia 3*” (not described). *Danalia porcellanae* (Kossmann, 1872) is likewise transferred to this new genus as it has the same basic morphology as Shiino’s “*Danalia 3*.” In fact, as mentioned by Shiino (1952), “*Danalia 3*” is likely the same species as *Avada porcellanae* and is included in synonymy with it here. “*Danalia 1*” of Shiino (1952), is also likely to be a member of *Avada*, but the original description is so limited that it is not advisable to describe it at this time. A new species from Hawai‘i, *A. eldredgei*, is also described. As with *Danalia*, some species of *Avada* parasitize rhizocephalans on decapods (e.g., *Danalia 1*), while some parasitize crab hosts (*A. kedavra*, n. sp., *A. porcellanae*, *A. eldredgei* n. sp.).

The present paper summarizes all species that are or have been placed in *Danalia*, *Zeuxo*, *Zeuxokoma*, or *Faba*, with description of a new genus, *Avada*, to include *Zeuxo porcellanae* and related taxa, and four new species: Two in *Zeuxokoma* and two in *Avada*.

Material and Methods

Specimens were borrowed from or are deposited in the following institutions: Bernice P. Bishop Museum, Honolulu, Hawai‘i (BPBM), Florida Museum of Natural History (UF), Museum and Art Gallery of the Northern Territory, Darwin, Australia (NTM), Naturalis Biodiversity Center, Leiden (RMNH), National Science Museum of Tokyo (NSMT), University Museum of Bergen Zoological Museum (UBZM), Department of Invertebrate Zoology, Smithsonian National Museum of Natural History (USNM), and Zoological Museum of Amsterdam (ZMA, now in RMNH). Length of the isopods is given as total length (TL), the maximum distance from the attachment end to the opposite end of the specimen (including if U-shaped, as in *Danalia* species), whereas that of the host is given as carapace length (CL, inclusive of rostrum).

Systematics

Cryptoniscidae Kossmann, 1880

Danalia Giard, 1887

Danalia Giard, 1887: 47–50. Type species. *Cryptoniscus curvatus* Fraisse, 1878, by subsequent designation of Grygier (1993).

Other described species. *D. larvaeformis* (Giard, 1874), *D. longicollis* (Kossmann, 1880), *D. dohrnii* Giard, 1887, *D. pellucida* Giard, 1887, *D. ypsilon* Smith, 1906, *D. gregaria* Caullery, 1908, *D. caulleryi* Nierstrasz & Brender à Brandis, 1923, *D. inopinata* Harant, 1925, *D. hapalocarcini* Fize, 1955.

Diagnosis. Mature female: elongate and strongly recurved. Strongly convex dorsal margin with weakly to moderately pronounced lobes (6–10), ventral side strongly concave, with large median gap between lobes. Attachment trunk variable in length with four short to elongate flexible and fragile attachment lobes. Thickened antero-ventral shield area small to moderate in size. Hyperparasitic on sacculinid rhizocephalans or parasitizing crab hosts.

Cryptoniscus (described only for *D. curvata* and *D. hapalocarcini*): Body tear-drop shaped, cuticular surface smooth. Eyes with irregular pigment most prominent around medially directed edge. Antennule of 3 articles, first (basal) article smooth, anterior margin smooth, posterior margin and surface smooth, article 2 triangular, article 3 with 2 flagella and bundle of aesthetascs. Antennae of 9 articles (4 peduncular and 5 flagellar), flagellar articles much narrower than peduncular articles. Pereomeres with entire (not toothed) quadrangular coxal plates 1–7. Pereopods 1 and 2 subequal in size, gnathopodal with dactyli entire (non-bifid). Pereopods 3–5 ambulatory, smooth. Pereopod 6 of 4 segments; basis elongate, broadening distally, ischium quadrangular, approximately 1/3 length of basis, merus about 1/4 size of ischium, fourth segment (fused dactylus and propodus?) long and slender, tapering toward tip, approximately as long as ischium and basis combined. Pereopod 7 of 4 segments, basis similar in shape to that of pereopod 6 but smaller; ischium short, subquadrate; carpus small and cylindrical; terminal segment elongate, undivided, tapering to distal tip, recurved at tip.

Remarks. The species are listed in chronological order of description and the list contains all taxa currently or formerly placed in *Danalia*, with reference to their current status. Females of *Danalia* spp. differ from those of *Zeuxokoma* in being strongly recurved whereas those of *Zeuxokoma* are linear. Females of *Danalia* spp. can be distinguished from those of *Avada* n. gen. in that those of *Danalia* present two elongate lobes with a large gap between them on the ventral side whereas those of *Avada* n. gen. have short irregular lobes with little to no gap between them. Females of *Danalia* have very soft, flexible attachment hooks that are easily broken while those of *Zeuxokoma* and *Avada* n. gen. have strongly sclerotized hooks. The cryptoniscus larvae of *Danalia* spp. have a smooth antennular segment 1, a 4-segmented pereopod 6 with the terminal segment being approximately as long as the basis and ischium combined and pereopod 7 with the terminal segment entire. This contrasts with the cryptoniscus larvae of *Avada* spp. that have a toothed antennular segment 1, a 3-segmented pereopod 6 with the terminal segment being much longer than the basis and ischium combined and pereopod 7 with the terminal segment bifid.

Danalia porcellanae (Kossmann, 1872)

Remarks: See *Avada porcellanae* n. comb., below.

Danalia larvaeformis (Giard, 1874)

Cryptoniscus larvaeformis Giard, 1874: 243; Delage, 1884: 665; Giard, 1887: 48–49; Stebbing, 1893: 403; Grygier, 1993: 187, 190, 192.

Danalia larvaeformis:—Giard, 1887: 50–51; Bonnier, 1900: 197, 384; Richard, 1900: 73; Caullery, 1908: 589; Wimpenny, 1927: 6; Bourdon, 1963: 423; Altes, 1982: 27; Grygier, 1993: 188.

Danalia larvae-formis (sic) Fize, 1956: 27.

Type host and locality:—Unknown number of female and cryptoniscus syntypes from *Sacculina carcini* Thompson, 1836 (Sacculinidae) infesting *Carcinus maenas* (Linnaeus, 1758) (originally as *Cancer maenas*) (Portunidae) from the coast of Bretagne, France (Atlantic).

Other hosts and localities. Same host rhizocephalan and crab from Roscoff, France (Bourdon, 1963; Øksnebjerg, 2000).

Forms known. Female and cryptoniscus.

Material examined. None.

Remarks. The original description leaves much to be desired in terms of characters that would distinguish this species from any other in *Danalia*. Although subsequent collections have been made (Bourdon 1963), no specimen has ever been illustrated or described in detail.

Danalia curvata (Fraisse, 1878)

Fig. 1

Cryptoniscus curvatus Fraisse, 1878a: 257–269, 287, 291, pl. 12, figs. 4, 9, pl. 14, pl. 15, figs. 55, 56; Fraisse, 1878b: 434; Giard, 1887: 48–49; Grygier, 1993: 187, 190, 192.

Zeuxo curvata:—Kossmann, 1880: 125.

Danalia curvata:—Giard, 1887: 51; Stebbing, 1893: 403; Bonnier, 1900: 168, 197, 384; Giard, 1900: 73; Smith, 1906: 99–104, pl. 1, fig. 4, pl. 7, figs. 22–30; Caullery, 1908: 583, 589, 591, 596, 597, figs. A1–6, B1–7, C1–4, D1–4, E1–7, pl. 26, figs. 1–20; Lo Biaco, 1909: 593, 609; Wimpenny, 1927: 6; Fize, 1956: 27; Snodgrass, 1956: 50–52, fig. 19; Nielsen & Strömberg, 1965: 54; Altes, 1982: 28–29, fig. 3; Grygier, 1993: 188; Øksnebjerg, 2000: 72, fig. 3A.

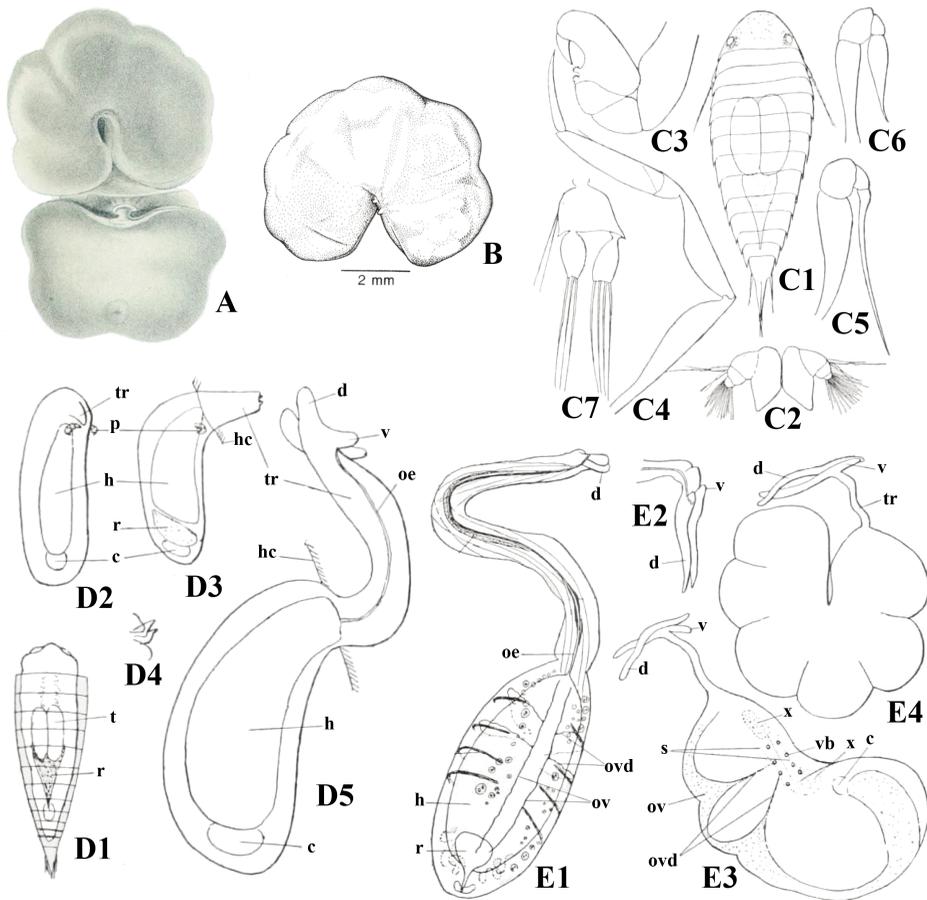


Figure 1. *Danalia curvata* Fraisse, 1878. **A**, female (upper) on host rhizocephalan (lower). **B**, female (hook and trunk lacking). **C**, cryptoniscus larva: C1, dorsal view, C2, antennules, C3, pereopod 2, C4, pereopod 4, C5, pereopod 6, C6, pereopod 7, C7, pleopod 5. **D**, metamorphosis of female from cryptoniscus: D1, molting of cryptoniscus to juvenile female, D2, D3, young females, D4, close up of trunk denticles (precursor to hooks), D5, more advanced female with trunk and hook development. **E**, anatomy of female: E1, dorsal view, E2, end of trunk with hooks, E3, nearly adult female but not yet recurved, E4, adult female in U-shape. c, heart; d, dorsal hooks of proboscis; h, liver; hc, host carapace; oe, esophagus; ov, ovary; ovd, oviducts; p, second pereopod; r, rectal bladder; s, longitudinal grooves of brood cavity; t, testes; tr, trunk; v, ventral hooks of proboscis; vb, ventral buds; x, holes in brood chamber. A from Fraisse, 1878; B from Øksnebjerg, 2000; C–E from Caullery, 1908. Not to scale.

Type host and locality. 20+ female and cryptoniscus syntypes from *Drepanorchis neglecta* (Fraisie, 1878) (originally as *Sacculina neglecta*) (Sacculinidae) infesting *Inachus communissimus* Rizza, 1839 (originally as *Inachus scorpio* Fabricius, 1798) (Inachidae) from Naples, Italy.

Other hosts and localities. Same rhizocephalan and decapod host, Naples and Sicily, Italy (Smith 1906, Caullery 1908, Øksnebjerg 2000).

Forms known. Female and cryptoniscus.

Material examined. 1 mature syntype female, 7.6 mm (RMNH CRUS.I.1389), infesting syntype of *Drepanorchis neglecta* (8.5 mm), Naples, Italy, date unknown, coll. P. Fraisse.

Remarks. *Danalia curvata* is by far the most completely described and illustrated of the species in the genus, primarily from the works of Fraisse (1878a) and Caullery (1908). Fraisse (1878a) was not exact in the number of specimens examined, but there were at least 20 adult females and numerous cryptonisci. Fraisse (1878a: pl. 14, fig. 32) did not illustrate pereopods 6 or 7 of the cryptoniscus larva (only 5 pairs shown), but Caullery (1908: fig. B5, B6, herein, figs. C5, C6) illustrated both. Grygier (1993) dated Fraisse's taxon from 1877, but that work was a dissertation not published in the sense of the ICZN (Fraisie 1877). *Danalia curvata* was made available from Fraisse (1878a), with a good description as well as illustrations.

The material examined here was originally in the collection of Hugo Frederik Nierstrasz (1872–1937) at the University of Utrecht but was transferred to Leiden in 1946 (*vide* L.B. Holthuis correspondence files in RMNH). The original label does not indicate type status but does identify the specimens as being collected by Fraisse, making their type status likely; later RMNH labels give the status as “?type” and “syntype.” It is likely that several Mediterranean species of *Danalia* are synonymous with *D. curvata*, but larval and molecular characters are needed to make this determination.

Danalia longicollis (Kossmann, 1880)

Fig. 2A

Zeuxo longicollis Kossmann, 1880: 124–125, pl. 11, figs. 8–9; Giard, 1887: 49.

Danalia longicollis:—Giard, 1887: 51; Bonnier, 1900: 198, 384; Richard, 1900: 73; Caullery, 1908: 589; Wimpenny, 1927: 6; Fize, 1956: 27; Altes, 1982: 28; Grygier, 1993: 187–188, 190, 192.

Type host and locality. 3 female syntypes from *Sacculina* sp. (probably *S. leptodiae* Guérin-Ganivet, 1911) (Sacculinidae) infesting *Leptodius exaratus* (H. Milne Edwards, 1834) (originally as *Chlorodius (Leptodius) exaratus*) (Xanthidae) from the Red Sea.

Other hosts and localities. None.

Forms known. Female only.

Material examined. None.

Remarks. This species is poorly described and no characters are given that would distinguish it from others in the genus but it is the only *Danalia* known from the Red Sea. Although the host rhizocephalan was not identified to species in Kossmann (1880), it is likely *Sacculina leptodiae* Guérin-Ganivet, 1911, as that is the only rhizocephalan known from *Leptodius exaratus* in the Red Sea (Boschma 1955).

***Danalia dohrnii* Giard, 1887**

Fig. 2B

Cryptoniscus curvatus Fraisse, 1878a: 293, pl. 12, fig. 12 (not *Cryptoniscus curvatus* Fraisse, 1878).*Danalia Dohrnii* Giard, 1887: 54; Caullery, 1908: 589, 593.*Danalia dohrni*:—Giard & Bonnier, 1890: 391; Stebbing, 1893: 403; Bonnier, 1900: 197, 384; Richard, 1900: 73; Altes, 1982: 27; Øksnebjerg, 2000: 59.*Danalia dohrnii*:—Caullery, 1908: 593; Grygier, 1993: 188, 190, 192.*Danalia Dohrnii*:—Wimpenny, 1927: 6; Fize, 1956: 27.

Type host and locality. 3 female syntypes from *Sacculina benedeni* Kossmann, 1872 (a probable synonym of *S. carcini* Thompson, 1836) (Sacculinidae) infesting *Pachygrapsus marmoratus* (Fabricius, 1787) (originally as *Grapsus varius* Latreille, 1803) (Grapsidae) from Naples, Italy.

Other hosts and localities. None.

Forms known. Female only.

Material examined. None.

Remarks. This species was erected by Giard (1887), who made the name available by indication through reference to the figure of Fraisse (1878a) that illustrated three very immature female specimens on a single host rhizocephalan (Fig. 2B, herein). There was no description provided at that time or subsequently. Presumably, Giard (1887) considered this to be a new species on the basis of the different host choice (both rhizocephalan and crab), and perhaps also on the basis of the parasite occurring as multiples individuals on a single rhizocephalan, although this is also known for *D. curvata* (see Smith 1906: pl. 1, fig. 4). The correct original spelling of the species name is *dohrnii*, as given by Giard (1887; see also ICZN Articles 31.1.1 and 33.4).

Giard & Bonnier (1890) listed “*Danalia Dohrnii*” from “*Grapsisaccus Benedeni* Kossmann” (= *Sacculina benedeni* Kossmann, 1872) from the Gulf of Naples but without mentioning the identity of the associated decapod host. Bonnier (1900) listed the species as “*Danalia Dohrnii* Giard” infesting “*Sacculina Benedeni* Kossmann” from “*Pachygrapsus marmoratus* Fabricius” (= *Pachygrapsus marmoratus* (Fabricius, 1787) (Grapsidae) from Naples. The genus name *Grapsisaccus* must take the authorship of Giard & Bonnier (1890) with the type (and sole) species *Sacculina benedeni* Kossmann, 1872. *Grapsisaccus* is a synonym of *Sacculina* and *S. benedeni* is a synonym of *Sacculina carcini* Thompson, 1836.

Danalia pellucida* Giard, 1887Danalia pellucida* Giard, 1887: 51; Bonnier, 1900: 198, 384; Richard, 1900: 73; Caullery, 1908: 589; Wimpenny, 1927: 6; Fize, 1956: 27; Altes, 1982: 27; Grygier, 1993: 188, 190, 192.

Type host and locality. Unspecified number of syntypes from *Sacculina triangularis* Anderson, 1862 (Sacculinidae) from *Cancer pagurus* Linnaeus, 1758 (Cancridae) from Penbrom and Croisic, France (Atlantic).

Other hosts and localities. None.

Forms known. Female only.

Material examined. None.

Remarks. This name was made available from Giard’s (1887) meager description “les appendices terminaux sont de dimension inégales au lieu de former quatre lobes égaux comme chez les types étudiés par Kossmann” [= *Zeuxo porcellanae* and *Z. alpei*] [terminal appendages are of unequal

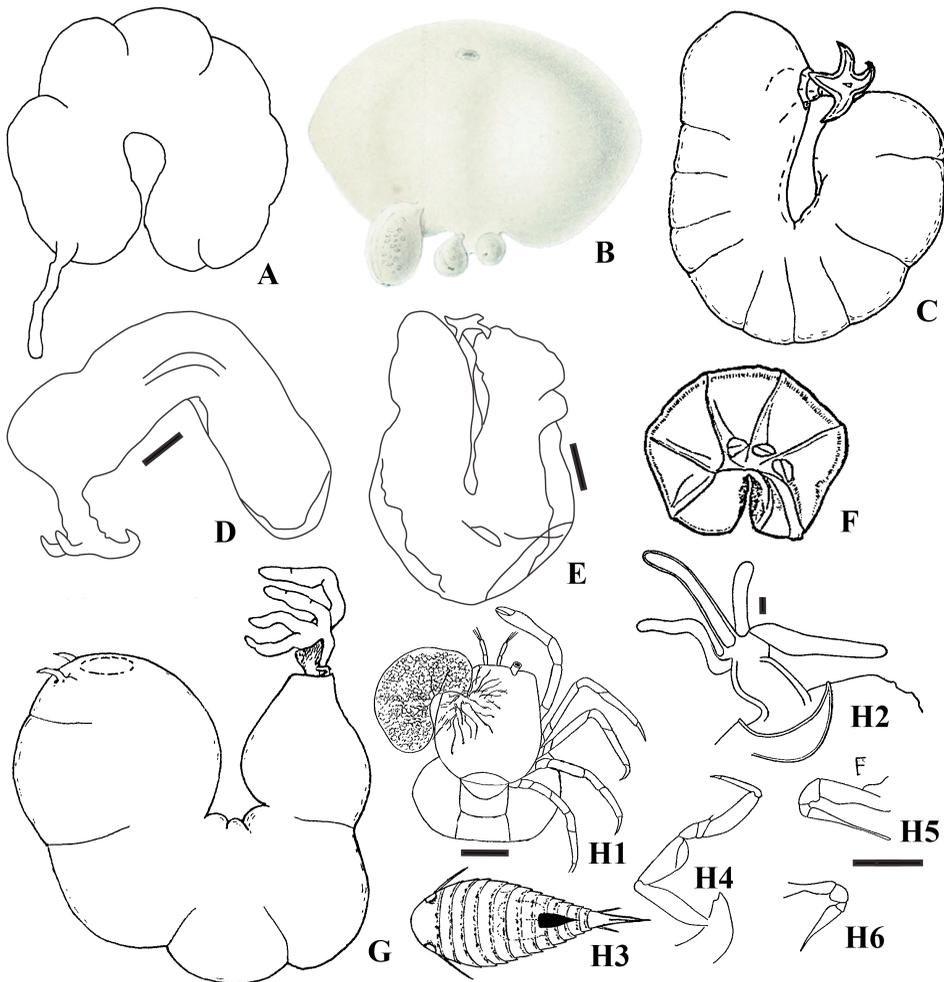


Figure 2. A, *Danalia longicollis* (Kossmann, 1872), attachment hook lacking. B, *Danalia dohrnii* (Giard, 1887), showing three individuals on a single *Sacculina benedeni* Kossmann, 1872, host. C–E, *Danalia ypsilon* Smith, 1906 with attachment hooks. F, *Danalia caulleryi* Nierstrasz & Brender à Brandis, 1923, attachment hooks lacking. G, *Danalia inopinata* Harant, 1925, with attachment hooks. H, *Danalia hapalocarcini* Fize, 1955: H1, adult female on host *Hapalocarcinus marsupialis* Stimpson, 1859; H2, close-up of attachment hooks; H3, cryptoniscus larva; H4–H6, cryptoniscus pereopods 4–6, respectively. A, from Kossmann, 1874; B, from Fraisse, 1878; C, from Altes, 1982; D, E, USNM 1251726; F, from Nierstrasz & Brender à Brandis, 1923; G, from Harant, 1925; H, from Fize, 1955. Scale = 0.1 mm (H2, H4–H6), 0.25 mm (D), 0.5 mm (E), 1 mm (H1) (rest not to scale).

size instead of forming four equal lobes as in the types studied by Kossmann]. This is the same character used by Giard (1887) to justify erecting the genus and there was no distinction made between *D. pellucida* and the other four taxa placed by Giard (1887) in *Danalia*; the species was not illustrated. Recollection from the type rhizocephalan host on *C. pagurus* is necessary to determine the status of the species. Although Giard (1887) used the characters of this species as the basis for erecting *Danalia*, Grygier (1993) wisely chose the more completely described *Cryptoniscus curvatus* as the type species, given the near complete lack of information about *D. pellucida*. The number of syntypes is unknown, but as the species was stated to occur at more than one location, there were at least two specimens.

***Danalia lobiancoi* Giard & Bonnier, 1890 (*nomen nudum*)**

Danalia Lo Biancoi Giard & Bonnier, 1890: 391; Bonnier, 1900: 198, 384; Richard, 1900: 73.

Danalia Lobiancoi:—Wimpenny, 1927: 6.

Danalia lobiancoi:—Fize, 1956: 27; Altes, 1982: 27; Grygier, 1993: 189-190.

Remarks. Giard & Bonnier (1890) listed “*Danalia Lo Biancoi*” from “*Portunascus corrugatus* Gd” from the Gulf of Naples but without mentioning the identity of the associated decapod host. Bonnier (1900) listed the species as “*Danalia Lo Biancoi* Giard” infesting “*Sacculina corrugatus* Giard” from “*Portunus corrugatus* Leach” [= *Liocarcinus corrugatus* (Pennant, 1777)] (Polybiidae) from Naples. As there was no description or indication of either the cryptoniscid or the rhizocephalan host at that time (or at any time subsequently), the names of the species *lobiancoi* (emended, see Grygier 1993) and *corrugatus*, as well as the nominal genus *Portunascus* are all *nomina nuda*. Boschma (1937, 1955) suggested that *Portunascus corrugatus* is probably a synonym of *Sacculina carcini* (Sacculinidae). If true, then this parasite is probably identical to either *D. larvaeformis* or *D. dohrnii* (also known from Naples) or perhaps all three are synonymous, but those two species are poorly described. Topotypic collections from type hosts are needed.

***Danalia ypsilon* Smith, 1906**

Figs. 2C–E

“*sacculinée*” A. Milne Edwards & Bouvier, 1900: 278.

Danalia ypsilon Smith, 1906: 100, pl. 7, fig. 32; Caullery, 1908: 589, 594; Guérin-Ganivet, 1911: 74; Wimpenny, 1927: 1–7, figs. 1–3; Veillet, 1942: 1–4; Veillet, 1945: 194–196, 303, 319–325, 336, figs. 30–31; Fize, 1956: 27; Boschma, 1958: 34; Altes, 1982: 23, 25–26, 28–29; Grygier, 1993: 189–190; Øksnebjerg, 2000: 48.

Danalia gypsilon (sic) Altes, 1982: fig. 4.2.

Type host and locality. Female holotype from *Galathea dispersa* Bate, 1859 (Galatheidae) from unspecified locality [Naples].

Other hosts and localities. Infesting *G. dispersa* from Naples (Smith 1906, Øksnebjerg 2000) and Beaulieu-sur-Mer, France (Mediterranean) (Wimpenny 1927); infesting *Galathea intermedia* Lilljeborg, 1851 from Cape Verde (A. Milne Edwards & Bouvier 1900) and Sète, France (Mediterranean) (Veillet 1942); infesting *Galathea bolivari* Zariquiey Álvarez, 1950; Bay of Cadaqués, Spain (herein).

Forms known. Female (described), cryptoniscus (undescribed, see Veillet 1942).

Material examined. 3 mature females, 3.9-4.0 mm (USNM 1251726), infesting *G. intermedia* (4.6 mm CL), one per host, St. SL8, Cape Verde Islands, 17 June 2011, coll. unknown; 1 mature female (6.7 mm) (RMNH CRUS.I.1737), infesting *G. bolivari* (9.1 mm CL), Bay of Cadaqués, Spain, 3–17 Aug 1950, coll. L.B. Holthuis.

Remarks. Smith (1906) did not provide any description for this species, only an illustration, and the type series only includes the single specimen illustrated. Wimpenny (1927) described the female form from two specimens and provided illustrations. Veillet (1942) discussed the mode of parasitism of this species and an associated rhizocephalan, *Lernaeodiscus galathea* [now *Triangulus galathea* (Norman & Scott, 1906); see Boyko & Harvey 2000] on a galatheid host. The new material examined in this study confirms the presence of the species in Cape Verde, as originally reported [erroneously as a “*sacculinée*” by A. Milne Edwards & Bouvier (1900); see Guérin-Ganivet 1911]. Although the species occurs in both the Lusitania and Tropical East Atlantic (TEA) Provinces (cf. Briggs & Bowen 2012), there are other known instances of crustaceans with a primarily Lusitanian distribution [e.g., *Albunea carabus* (Linnaeus, 1758), *Scyllarus pygmaeus* (Bate, 1888)] that also occur in the TEA.

The specimens from Cape Verde Island were all attached to the thin ventral cuticle of the ventral third pleomere of each host. The Spanish specimen is attached on the ventral surface at the junction of the third and fourth pleomeres. The body of *D. ypsilon* is strongly recurved and with less developed external lobes than seen in most of the species of *Danalia* where this character is known (e.g., *D. curvata*, *D. longicollis*, *D. inopinata*).

Danalia gregaria Caullery, 1908

Danalia gregaria Caullery, 1908: 593, 589, 597; Lo Bianco, 1909: 607; Wimpenny, 1927: 6; Fize, 1956: 27; Nielsen & Strömberg, 1965: 53; Altes, 1982: 27; Grygier, 1993: 189–190, 192; Øksnebjerg, 2000: 65.

Type host and locality. 11 female and 8 male syntypes from *Sacculina goneplaxae* Guérin-Ganivet, 1911 (originally as *Sacculina* sp.) (Sacculinidae) infesting *Goneplax rhomboides* (Linnaeus, 1758) (Goneplacidae) from Naples, Italy.

Other hosts and localities. None.

Forms known. Female and cryptoniscus.

Material examined. None.

Remarks. Caullery (1908) stated that he could not find any differences between the cryptonisci of *D. curvata* and *D. gregaria*, nor were any characters of the females consistently different between the two species. In fact, Caullery (1908) specifically stated he was following “la règle de Giard,” that states each host bears a different species of parasite. Given the fact that both *D. curvata* and *D. gregaria* are known from multiple specimens on their rhizocephalan hosts (though they are different host species) from the same locality (Naples) and lacking any morphological grounds for separating them, the two species are likely to be synonyms. However, a more detailed study of topotypic material of *D. gregaria* from the type host is needed before taking such action.

Danalia caulleryi Nierstrasz & Brender à Brandis, 1923

Fig. 2F

Danalia caulleryi Nierstrasz & Brender à Brandis, 1923: 62, pl. 4, fig. 1, pl. 9, figs. 35a–b; Altes, 1982: 28; Grygier, 1993: 189–190.

Danalia Caulleryi:—Wimpenny, 1927: 6.

Danalia caulleryi (sic) Fize, 1956: 27; Nielsen & Strömberg, 1965: 53.

Type host and locality. Female holotype from *Galathea australiensis* Stimpson, 1858 (Galatheidae) from Banda (“Paternoster-Inseln”), Indonesia.

Other hosts and localities. None.

Forms known. Female only.

Material examined. Holotype female (ZMA CRUS.I.100624), 8.2 mm, ex *Galathea australiensis* (not in jar), Stn. 37, 27 m, dredge, coral and coral sand, close to reef, Sailus Ketjil, Paternoster Islands, Flores Sea, 30–31 March 1899, coll. Siboga Expedition.

Remarks. The female holotype (and only known specimen) of *D. caulleryi* superficially resembles the general morphology of *D. curvata* (e.g., Fraisse 1878a: pl. 14, fig. 39; Øksnebjerg 2000: fig. 3A), but shows external segmentation and plate development similar to that seen in species of *Cabirops* Kossmann, 1884. Nierstrasz & Brender à Brandis (1923) noted that the attachment portion of the

holotype could not be found, but direct observation of the holotype shows that some kind of attachment process was present but was broken off (presumably when the specimen was removed from the host), which all *Cabirops* species (brood chamber parasites of isopods) lack. Based on the morphology, this species is not a *Cabirops* but probably not a *Danalia* either. However, because the only known specimen is lacking the attachment process, its proper placement cannot be determined without additional material.

***Danalia fraissei* Nierstrasz & Brender à Brandis, 1925 (= *Cabirops fraissei*)**

Danalia fraissei Nierstrasz & Brender à Brandis, 1925: 1–2, 7, pl. 1, figs. 1–6.

Cabirops fraissei — Boyko, 2013: 107 (complete synonymy), 112, fig. 3.

Material examined. Syntype female (RMNH CRUS.I.1390), 1.87 mm, ex “*Ergyne rissoi*” Nierstrasz & Brender à Brandis, 1925 [= *Cancricepon choprae* (Nierstrasz & Brender à Brandis, 1925)] (not in jar) ex *Domecia acanthophora* Desbonne, 1867 (not in jar), Caracas Bay, Curaçao, 7 April 1920, coll. C.J. van der Horst.

Remarks. Now placed in *Cabirops* (Cryptoniscoidea: Cabiropidae) (see Boyko 2013). The syntype female was originally in the collection of Hugo Frederik Nierstrasz (1872–1937) at the University of Utrecht but was transferred to Leiden in 1946 (*vide* L.B. Holthuis correspondence files in RMNH). The original label does not indicate type status but as there was only a single female described by Nierstrasz & Brender à Brandis (1925), this must be the female syntype. Later RMNH labels give the status as “type?” and “syntypes” but the cryptoniscus syntype is lost (the only other isopod in the jar is, inexplicably, a terrestrial isopod). The host brachyuran is given on the label as *Domecia acanthophora* but was cited by Nierstrasz & Brender à Brandis (1925) as *D. hispida* Eydoux & Souleyet, 1842. Guinot (1964) determined that *D. hispida* is a strictly Pacific species.

***Danalia inopinata* Harant, 1925**

Fig. 2G

Danalia inopinata Harant, 1925: 1–3, unnumbered figure; Wimpenny, 1927: 6; Harant, 1931: 373; Fize, 1956: 27; Nielsen & Strömberg, 1973: 88; Altes, 1982: 27–28, fig 4.1; Grygier, 1993: 189–190; Øksnebjerg, 2000: 60.

Type host and locality. Female holotype from *Sacculina* sp. (probably *S. gerbei* Guérin-Ganivet, 1911, see Øksnebjerg 2000) (Sacculinidae), infesting *Pilumnus hirtellus* (Linnaeus, 1761) (Pilumnidae), from Sète, France (Mediterranean).

Other hosts and localities. *Sacculina gerbei* infesting *Pilumnus spinifer* H. Milne Edwards, 1834 from Baie de Banyuls, France (Mediterranean), 3 m depth (see below).

Forms known. Female only.

Material examined. None.

Remarks. The name of the host rhizocephalan was given by Harant (1925) only as “*Sacculina* sp.”; its identity is inferred from the fact that the only *Sacculina* known from *Pilumnus hirtellus* is *S. gerbei*. However, the authorship of *S. gerbei* is not “Giard, 1887” (per Guérin-Ganivet 1911), “Bonnier, 1887” (per Boschma 1955), nor even “Giard in Bonnier, 1887” (per Øksnebjerg 2000). Bonnier (1887) merely listed the name as “*Sacculina Gerbei* Giard” without any description, illustration or indication; the name is therefore not available from Bonnier (1887). The first person to use the name and provide a description and illustration, thereby making the name available, was Guérin-Ganivet (1911). I have seen a good quality photograph of *D. inopinata* on the DORIS website

(<http://doris.ffessm.fr>) showing *D. inopinata* parasitizing the same rhizocephalan (*S. gerbei*) but from a new crab host (*P. spinifer*). It can be distinguished from the other well-described species of *Danalia* by its posterior end being markedly more swollen than the anterior and bearing two hook-like structures.

***Danalia* sp. Utinomi, 1944**

“Parasite” Utinomi, 1944: 696–697, fig. 4.

Host and locality. Three females from *Pseudocryptochirus viridis* Hiro, 1938 (Cryptochiridae) (one host with two parasites) from Japan.

Other hosts and localities. None.

Form known. Female.

Material examined. None.

Remarks. Utinomi (1944) remarked on the similarity of these specimens to the parasitic “copepod” *Faba*, but noted they were “not quite the same.” The recurved body and external lobes place these specimens in *Danalia*.

***Danalia hapalocarcini* Fize, 1955**

Fig. 2H

Danalia hapalocarcini Fize, 1955: 2444–2447, figs. 1–4; Fize, 1956: 22–28, figs. 15–18; Altes, 1982: 28–29; Grygier, 1993: 189–190.

Type host and locality. One female and three cryptoniscus syntypes from *Hapalocarcinus marsupialis* Stimpson, 1859 (Cryptochiridae) from Nhatrang, Vietnam.

Other hosts and localities. None.

Forms known. Female and cryptoniscus.

Material examined. None.

Remarks. Despite the unusual insertion of the female parasite into the dorsal carapace of the host crab, this species is clearly a *Danalia*. The female shows the characteristic U-shape and bears a 4-pronged attachment processes (Fig. 2H2); the cryptoniscid has the dactyli of pereopods 6 and 7 (Figs. 2H5, 2H6) elongate and tapering and very similar in shape and proportion to those seen in *D. curvata*.

***Danalia* sp. Øksnebjerg, 2000**

“*Danalia* sp.” Øksnebjerg, 2000: 67.

Host and locality. Four females from one host specimen *Sacculina zariquieyi* Boschma, 1947 (Sacculinidae) infesting *Monodaeus couchii* (Couch, 1851) (Xanthidae) from Turkey (Aegean Sea).

Other hosts and localities. None.

Form known. Female.

Material examined. None.

Remarks. Although these parasitic isopods were only provisionally identified by Øksnebjerg (2000), the host choice strongly suggests they belong to *Danalia*. As there are no other records of *Danalia* from the Aegean Sea, Turkey, or the host rhizocephalan, their identity is unknown.

Zeuxokoma Grygier, 1993

Zeuxo Kossmann, 1872: 332–333 (junior homonym of *Zeuxo* Templeton, 1840: 203 [Crustacea: Tanaidacea]).

Type species: *Zeuxo alpei* Kossmann, 1872, by subsequent designation of Grygier (1993).

Zeuxokoma Zimmer, 1927: 763; Neave, 1940: 700 (unavailable).

Faba Nierstrasz & Brender à Brandis, 1930: 1–2 (junior homonym of *Faba* Fischer, 1883: 602 [Mollusca]). Type species: *Faba setosa* Nierstrasz & Brender à Brandis, 1930, by original designation.

Zeuxokoma Grygier, 1993: 190, 193 (new replacement name for *Zeuxo*). Type species: *Zeuxo alpei* Kossmann, 1872, automatic.

Other described species. *Z. setosa* (Nierstrasz & Brender à Brandis, 1930), **n. comb.**, *Z. glabra* (Nierstrasz & Brender à Brandis, 1930), **n. comb.**, *Z. luetzeni* (Høeg & Bruce, 1988), **n. comb.**, *Z. musaeformis*, **n. sp.**, *Z. elongata*, **n. sp.**

Diagnosis. Female: Elongate relatively linear smooth sac with pronounced thickened anteroventral shield; internal subdivisions present in mature females but external lobes lacking; trunk short relative to body with 4 stout strongly sclerotized attachment hooks. Parasitizing shrimp hosts directly. Cryptoniscus unknown.

Remarks. Although Grygier (1993) stated only that he was designating *Zeuxo alpei* as the type species of *Zeuxokoma*, he was also designating it as the type species of *Zeuxo* Kossmann *non* Templeton, which was replaced by *Zeuxokoma*, as per ICZN Article 67.8. Nierstrasz & Brender à Brandis (1930) made the puzzling statement that “the embryos of *F. glabra* certainly are those of copepods; and no doubt *Faba* belongs to the Epicaridea,” but the mention of copepods was clearly a lapsus for isopods, possibly caused by a poor translation from the original German to English (this was their only paper published in English). That this was an error is confirmed by SEM study of embryos extracted from a *Z. glabra* female (see below).

Females of *Zeuxokoma* spp. differ from those of *Danalia* and *Avada*, n. gen. in being mature in a relatively linear sac shape, whereas those of *Danalia* and *Avada*, n. gen. are recurved. The attachment hooks of females of *Zeuxokoma* are strongly sclerotized and similar to those of *Avada*, n. gen., but very different from the soft, flexible attachment hooks of *Danalia*.

Zeuxokoma alpei (Kossmann, 1872)

Fig. 3A

Zeuxo alpei Kossmann, 1872: 333, pl. 18, fig. 11; Kossmann, 1874: 134, pl. 7, fig. 11; Bonnier, 1900: 196, 198, 384, fig. 32a; Richard, 1900: 73; Grygier, 1993: 188–190, 192–193.

Danalia (Zeuxo) alpei:—Wimpenny, 1927: 6; Fize, 1956: 27; Grygier, 1993: 188.

Faba alpeaei (sic):—Altes, 1982: 21, 30.

Type host and locality. Holotype female from “*Alpheus*” sp. (Alpheidae), Philippines.

Other hosts and localities. None.

Forms known. Female only.

Material examined. None.

Remarks. Although Kossmann (1872) gave the host as *Alpheus* sp., it is unidentifiable beyond Alpheidae. Attempts to locate the type specimen were unsuccessful and it is probably lost; recollection of topotypic material is needed to settle the specific identity of the species. Based on the shape of the holotype, the host choice, and locality, it is possible that *Z. alpei* is identical with *Z. glabra* and/or *Z. luetzeni*. However, the insertion point (in the region of the mouthparts) is unusual and the shape of the body is very elongate while being more curved than seen in other *Zeuxokoma* specimens.

Despite Grygier's (1993) selection of *Zeuxo alpei* as the type species of *Zeuxokoma* (and, automatically, the type species of *Zeuxo* Kossmann *non* Templeton), the combination *Zeuxokoma alpei* does not appear anywhere in Grygier's work.

***Zeuxokoma* sp. van Kampen & Boschma, 1925**

Thompsonia sp. van Kampen & Boschma, 1925: 58–59, pl. 1, fig. 31, text fig. 44; Høeg & Lützen, 1993: 369.

Host and locality. Female from *Alpheus malleodigitus* (Spence Bate 1888) (Alpheidae), 15 m, Sulu Archipelago, Philippines.

Other hosts and localities. None.

Forms known. Female only.

Material examined. None.

Remarks. Høeg & Lützen (1993) first suggested that this record of a “rhizocephalan” actually belonged to the genus *Faba* (now *Zeuxokoma*). The figures given by van Kampen & Boschma (1925) do not resemble any of the described species of *Zeuxokoma* and it may be an undescribed species, although possibly not belonging to this genus based on the semispherical shape of the body.

***Zeuxokoma setosa* (Nierstrasz & Brender à Brandis, 1930), n. comb.**

Fig. 3B

Faba setosa Nierstrasz & Brender à Brandis, 1930: 2–3, figs. 1–5; Altes, 1982: 30; Grygier, 1993: 190.

Type host and locality.—Holotype female from *Spirontocaris holmesi* Holthuis, 1947 (originally as *S. bispinosa* Holmes, 1900) (Hippolytidae), 167 fathoms (= 305.4 m), off central California, USA.

Other hosts and localities. None.

Forms known. Female only.

Material examined. Holotype female (USNM 62732), 7.3 mm, ex *Spirontocaris holmesi* Holthuis, 1947 (8 mm CL), 167 fms (= 305.4 m), 38°17'N, 123°29'W, Albatross Station 3170, off central California, USA.

Remarks. The female holotype is mature, as evidenced by embryos filling the sac. Very limited segmentation can be observed in this specimen and the anteroventral shield is very small (barely extending beyond the area where the trunk inserts into the body). Nierstrasz & Brender à Brandis (1930) described the species as having a row of six tubercles on the left side of the body and in having the body sparsely set with long setae. However, examination of the “tubercles” (Fig. 3B2) shows them to be nothing more than larger embryos placed close to the inner surface of the transparent cuticle. The “setae” (Fig. 3B5) are not a part of the organism, and are inserted into the cuticle with the tapered end pointing into the body of the specimen. The “setae” are actually foreign matter embedded in the holotype, probably during capture with the host. They appear quite similar to glass sponge (Porifera: Hexactinellida) spicules. Despite this “loss” of characters, this species is still easily distin-

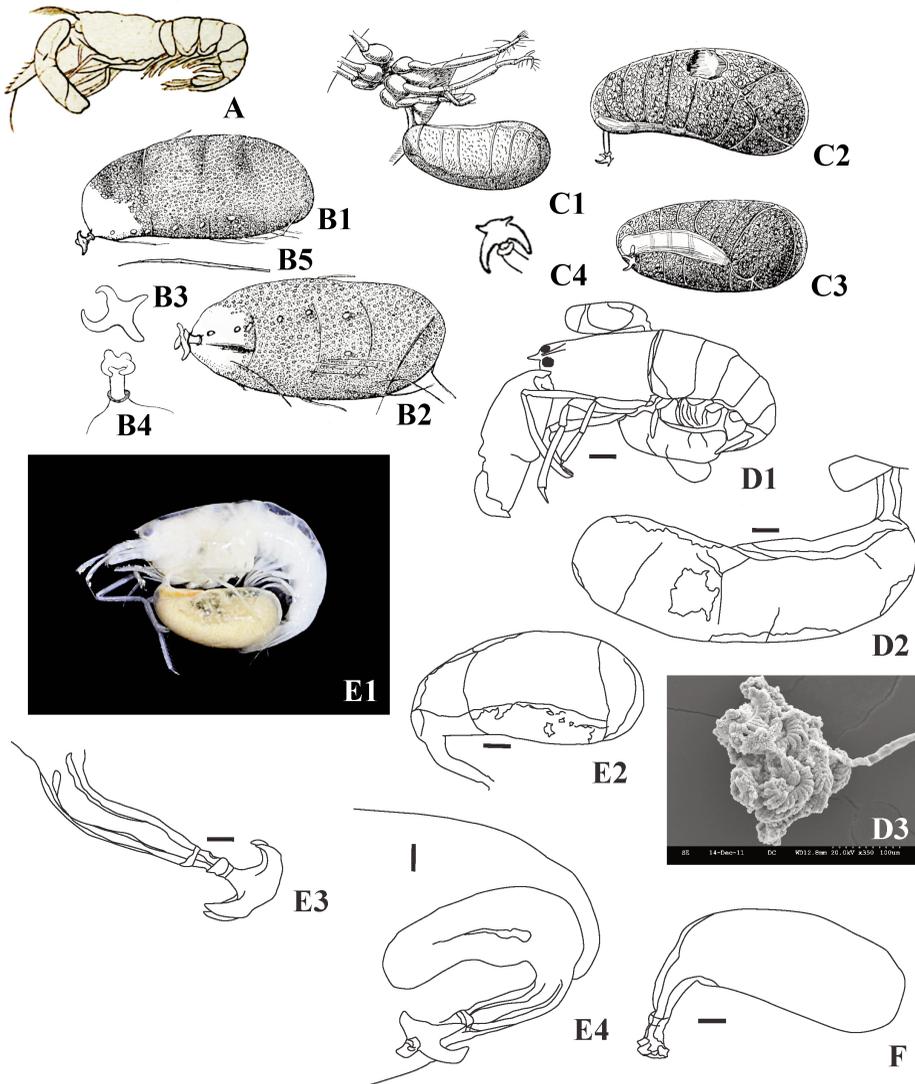


Figure 3. **A**, *Zeuxokoma alpei* (Kossmann, 1872) on alpheid host. **B**, *Zeuxokoma setosa* (Nierstrasz & Brender à Brandis, 1930): B1, adult female holotype, lateral view; B2, same, ventral view; B3, attachment hooks, head-on view; B4, attachment hooks and stalk, lateral view; B5, “seta” (= sponge spicule?). **C–E**, *Zeuxokoma glabra* (Nierstrasz & Brender à Brandis, 1930): C1, adult female holotype showing insertion on ventral abdomen of alpheid host; C2, same, lateral view; C3, same, ventral view; C4, attachment hooks, lateral view; D1, three females attached to one *Alpheus lobidens* De Haan, 1849; D2, adult female, lateral view; D3, embryos from female; E1, adult female and alpheid host; E2, same, lateral view; E3, same, attachment hooks and trunk, lateral view; E4, same, ventral view. **F**, *Zeuxokoma luetzeni* (Høeg & Bruce, 1988), holotype female. A, from Kossmann, 1874; B, from Nierstrasz & Brender à Brandis, 1930; C, from Nierstrasz & Brender à Brandis, 1930; D3, BPBM S15989; E, UF 20176; F, NTM CR 005275. Scale = 0.1 mm (D3), 0.2 mm (E3), 0.25 mm (E4, F), 0.5 mm (D2), 0.625 mm (E2), 1.43 mm (D1) (rest not to scale).

guished from the others in the genus by the small shield located circumanteriorly, the compact, bean-shaped body, and the very short attachment stalk. It is the only *Zeuxokoma* known from a hippolytid host and the only one known from the west coast of North or South America.

***Zeuxokoma glabra* (Nierstrasz & Brender à Brandis, 1930), n. comb.**

Figs. 3C–E

Faba glabra Nierstrasz & Brender à Brandis, 1930: 3–4, figs. 6–11; Altes, 1982: 30; Grygier, 1993: 190.

Holotype host and locality. Holotype female on unidentified alpheid shrimp (originally as *Crangon* sp.), Waikīkī reef, Honolulu, O‘ahu, Hawai‘i, USA.

Other hosts and localities. *Alpheus lobidens* De Haan, 1849, Hawaii Institute of Marine Biology reef flat, Kāne‘ohe Bay, O‘ahu, Hawai‘i, USA; *Alpheus* sp. (Alpheidae), Moorea, Society Islands, French Polynesia.

Forms known. Female only.

Material examined. Female holotype (RMNH CRUS.I.1373) (5.6 mm) from *Alpheus* sp. (4.5 mm CL), Waikīkī reef, Honolulu, O‘ahu, Hawai‘i, USA, coll. C. H. Edmondson; 1 ovigerous female (6.3 mm) plus two other mature females (5.0, 4.3 mm) from *Alpheus lobidens* De Haan, 1849 (6.7 mm CL), Hawaii Institute of Marine Biology reef flat, Kāne‘ohe Bay, O‘ahu, Hawai‘i, USA, 29 March 1979, coll. W.J. Cooke (BPBM S15989); 1 mature female (5.8 mm) from *Alpheus* sp. (damaged, sex indeterminate, 4.5 mm CL, UF 20175), Papetoai, Moorea, outer slope in *Pocillopora eydouxi* Milne Edwards & Haim, 1860, rubble, 6 m, Society Islands, French Polynesia, 18 May 2009, coll. M. Leray (UF 20176).

Redescription. Mature female: 4.3–6.3 mm long; elongate, widening distally, slightly recurved; surface smooth, without lobes; internal segmentation visible through cuticle; shield approximately 1/2 length of body, restricted to anteroventral region. Trunk moderately long (approximately 1/2 anteroventral shield length) and inserted into body at ca. 90° angle, 4 recurved attachment lobes. Directly parasitizing alpheid shrimp host.

Remarks. The holotype was long considered lost (L. Eldredge, pers. comm.) and, given the difficulty in identifying species in this family, one of the newly reported specimens of Hawaiian material cited here was going to be designated as a neotype. However, the holotype was located in the RMNH in June 2014. Although the species was stated to have its “type in the Bishop Museum” (Nierstrasz & Brender à Brandis 1930), Nierstrasz never actually sent the specimen to the Bishop Museum and, in 1946, it was transferred along with his other Utrecht collections to the RMNH (*vide* L.B. Holthuis correspondence files in RMNH). This species may be identical with *Z. alpei*, but that species is poorly described and illustrated and the holotype is lost, so this cannot be determined without topotypic material of *Z. alpei*. It may also be identical with *Z. luetzeni* and that also needs recollection. Molecular techniques will probably be necessary to determine if similar species (e.g., *Z. alpei*, *Z. luetzeni*) are synonymous with *Z. glabra*.

The attachment of the holotype to the host was ventrolateral to the left fifth pereopod (Fig. 3C1), whereas the French Polynesian specimen (Fig. 3E1) was attached at the base of the second pereopod on the right side of the host. The host of the newly reported Hawaiian material (Fig. 3D1) bears three mature female *Zeuxokoma* specimens: the largest was attached medioventrally between the pleopods on the fourth pleomere, the next largest was attached on the ventral surface of the pleuron of the first pleomere on the right side, and the smallest was attached high on the pleuron of the second pleomere on the right side. Although this host was infested by three female parasites, it still carried eggs; suggesting that the energy drain of infestation by cryptoniscoids did not result in parasitic castration.

Embryos (Fig. 3D3) from a 5.0 mm Hawaiian specimen possess characters typical of isopod embryos (cf. Boyko & Wolff 2014) and not characters of copepods, as per Nierstrasz & Brender à Brandis's (1930) erroneous statement.

***Zeuxokoma luetzeni* (Høeg & Bruce, 1988), n. comb.**

Fig. 3F

Thompsonia luetzeni Høeg & Bruce, 1988: 246–249, figs. 1–3; Høeg & Lützen, 1993: 369.

“*Thompsonia luetzeni*... a parasitic isopod related to the genus *Faba*” Høeg & Rybakov, 1992: 606.

“*Thompsonia luetzeni*... an isopod related to *Faba*” Grygier, 1993: 191.

“*Thompsonia*” *luetzeni* Grygier, 1993: 193.

Type host and locality. Holotype female (NTM Cr005275) and paratype female from *Alpheus parvirostris* Dana, 1852 (Alpheidae), from colonies of *Galaxea fascicularis* (Linnaeus, 1767), 26°26'N, 127°43'E, Zanpa-Misaki, Okinawa, Ryukyu Islands, Japan.

Other hosts and localities. None.

Forms known. Female only.

Material examined. Holotype mature female, 2.4 mm, type locality and host (2.8 mm CL), 24 Oct 1984, coll. H. Yamashiro.

Remarks. The holotype is mature (contains embryos) and was found inserted ventrally in the sternite of the first pleomere of the host. Two parasitized hosts are known (each bearing one parasite, the holotype and paratype). Originally described as a rhizocephalan, this species has been recognized as a cryptoniscid isopod since it was mentioned as such by Høeg & Rybakov (1992), and was thought to be a *Faba* (now *Zeuxokoma*), as indicated by Grygier (1993). The present paper marks the formal transfer of the species into this isopod genus. Because the original description considered the parasite as a rhizocephalan, there were no comparisons to any species of cryptoniscoid isopods. Examination of the holotype shows no characters that could be used to differentiate it from *Z. glabra* but given the substantial geographic distance between type localities (Japan and Hawaii), it would be premature to synonymize the two taxa in the absence of cryptoniscus larval and/or molecular data.

***Zeuxokoma musaeformis*, n. sp.**

Fig. 4A

Danalia sp. Brinkmann, 1984: 211–213, figs. 4–8; Støve, 1985: 83, 85–87.

Danalia musaeformis (Brinkmann MS name) Støve, 1985: 85 (unpublished dissertation, unavailable name).

Type host and locality. *Pandalina profunda* Holthuis, 1946 (Pandalidae) from Herdlaosen, Herdla, Norway.

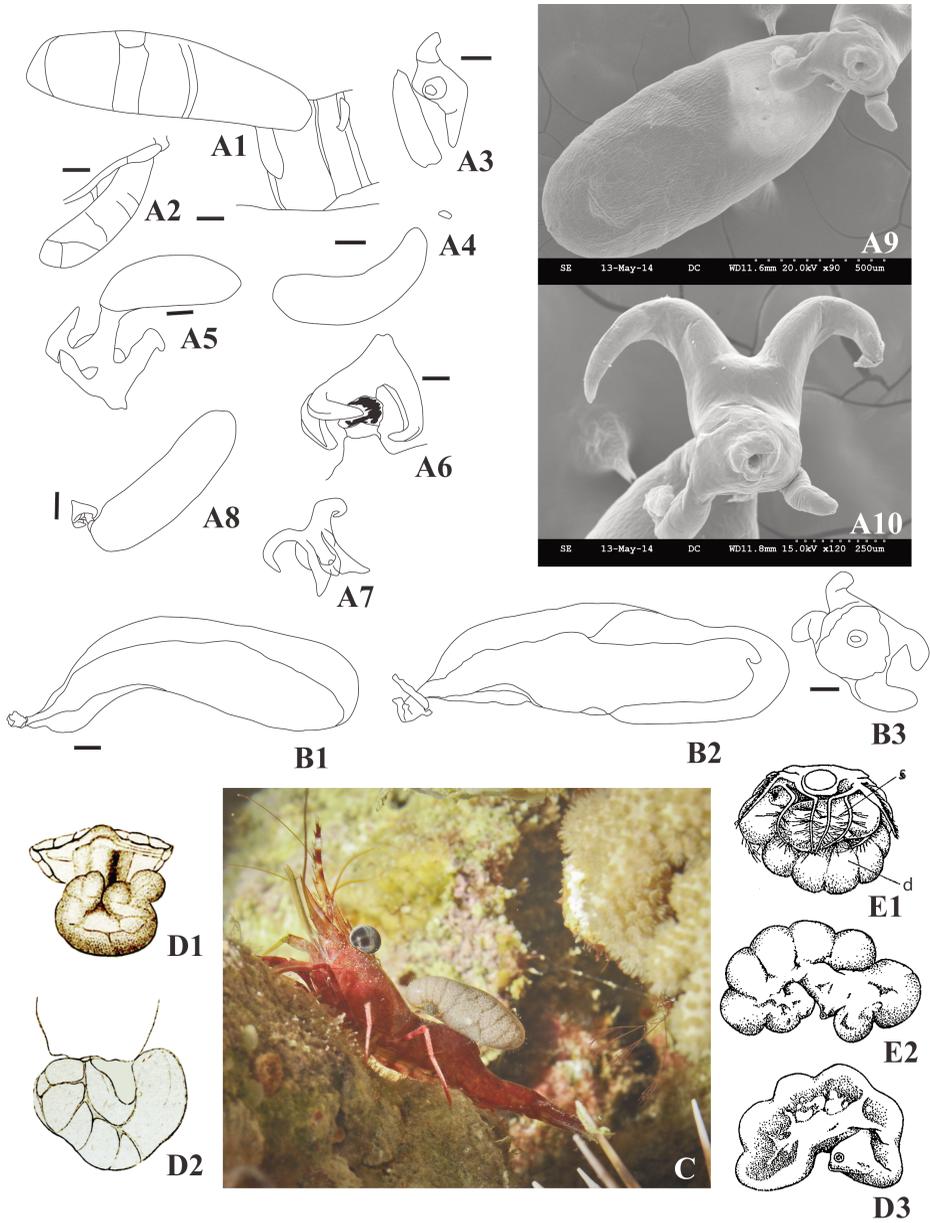
Other hosts and localities. None.

Forms known. Female only.

Etymology. From the Latin *musa* + *formis*, referring to the banana shape of the parasite. This is the name used by Brinkmann Sr. in his unpublished manuscript as cited by Støve (1985).

Material examined. Holotype mature female, 6.0 mm, infesting female *P. profunda* (7.0 mm CL), Herdlaosen, Herdla, Norway, coll. A. Brinkmann, 28 Oct 1939 (UBZM 98208); 7 paratype immature and mature females, 3.6–9.0 mm (UBZM 63862) mm, infesting 3 female *P. profunda* (6.5–12.6 mm CL, one female with three parasites, one with two, one with one), same data as holotype; 5 paratype

juvenile females, 0.6–2.6 mm (UBZM 98209), infesting *P. profunda* (no host in vial), Herdlaosen, Herdla, Norway, coll. A. Brinkmann, 25 July 1939; 1 female paratype, 5.4 mm (UBZM 98210), infesting *P. profunda* (no host in vial), Herdlaosen, Herdla, Norway, 14 July 1939, coll. A. Brinkmann; 1 female paratype, 1.6 mm (UBZM 64096), infesting *P. profunda* (no host in vial), Herdlaosen, Herdla, Norway, 10 Aug 1938, coll. A. Brinkmann; 2 mature females, 3.1–3.6 mm (UBZM 63857), infesting female *P. profunda* (carapace damaged), Herdlaosen, Herdla, Norway, 25 July 1939, coll. A. Brinkmann; 2 mature females, 3.9–8.3 mm (USNM 1251727), infesting two female *P. profunda* (one 8.7 mm CL, one posterior ½ of specimen only, Hardangerfjord, Norway, 12 Aug 2011, coll. C. Noever.



Description. Female: 0.6–9.0 mm long; mature females elongate, slightly widening distally, slightly recurved; surface smooth, without lobes, internal segmentation visible (Fig. 4A1); anteroventral shield small, confined to region around trunk (Fig. 4A9); 2 small ovate perforations in cuticle on either side of midline ventrally in shield region (Fig. 4A9). Trunk moderately extended, inserted into body at ca. 90° angle, with 4 recurved attachment lobes (Fig. 4A10); mouth ovate with large anterior semicircular lip and small posterior subquadrate lip (Fig. 4A10). Found parasitic on pandalid shrimp.

Remarks. Brinkmann Jr. (1984) and Støve (1985) repeated the assertion of August Brinkmann Sr. (unpubl.) that this species of *Danalia* parasitizes *Sylon hippolytes* M. Sars, 1870, at its attachment point with the pandalid hosts and (presumably) then can be found on the pandalid host when the rizocephalan dies. Examination of the present material does not support this hypothesis. No specimens of *Danalia musaeformis* n. sp. have been collected in conjunction with *Sylon* on pandalid hosts, and there is no evidence of prior *Sylon* parasitism on any of these *Danalia*-infested hosts. This species most closely resembles *Z. glabra* but does not have a well-developed anteroventral shield. Because Brinkmann, Sr. considered this species to belong to *Danalia* (in Brinkmann Jr. 1984), he only compared it to *D. curvata*; according to Brinkmann, Sr. (in Brinkmann Jr. 1984), mature females are ivory in color in life.

The small ovate perforations in the shield region (Fig. 4A9) are of unknown function and were not observed on specimens of other species in the genus. They may be oviductal pores (sensu Shiino 1952) but, if so, they are less numerous and concentrated in the shield region in *Zeuxokoma* compared to those seen in *Danalia* (compare Fig. 4A9 with Fig. 1E3). The shape of the shield region is similar to that seen in *Z. setosa*, being found surrounding the anterior region and not extended ventrally as seen in *Z. glabra*.

Three cryptoniscid larvae (ex UBZM 64096) were found among the material of *Z. musaeformis* from UBZM and it was hoped that these would allow the first description of larvae from this genus. Unfortunately, they all were cryptoniscid larvae of a bopyroid species (4 antennal flagellae, pereopods 6 and 7 not different from 5) not a cryptoniscoid (5 antennal flagellae, pereopods 6 and 7 different than 5). The antennules of the cryptoniscid larvae are identical to those illustrated and described by Hansen (1916: 203–205, pl. 15, figs. 11a–d) for *Bopyroides hippolytes* (Krøyer, 1838) and differ from those of *B. cluthae* (Scott, 1902) as described and figured by Bourdon (1968). This appears to be the first record of *B. hippolytes* on *Pandalina profunda*, while *B. cluthae* (Scott, 1902) is known from *P. brevisrostris*.

Figure 4. **A.** *Zeuxokoma musaeformis* n. sp.: A1, adult female showing attachment to *Pandalina profunda* Holthuis, 1949; A2, another adult female and host pleopod; A3, immature female partially developed attachment hooks (body, left, detached from head, right); A4, adult female (left) and very immature female (right, as small dot), showing size variation during development; A5, immature female showing large attachment hooks relative to small body; A6, close up of attachment hooks, lateral view; A7, close up of attachment hooks, anterior view; A8, adult female, lateral view. A9, immature female, arrow indicating ovate perforations in shield region. A10, same, close up of head region. **B.** *Zeuxokoma elongata* n. sp.: B1, adult female paratype. Lateral view; B2, adult female holotype, lateral view; B3, close up of attachment hooks, head-on view. **C.** *Zeuxokoma* sp. on *Cinetorhynchus hendersoni* (Kemp, 1925). **D.** *Avada porcellanae* (Kossmann, 1872): D1, adult female with porcelain crab abdomen, external lateral view; D2, another adult female and porcelain crab abdomen, external lateral view. D3, adult female from Japan, internal lateral view. **E.** *Avada* sp. (Shiino, 1952): E1, adult female (d), external lateral view, showing attachment to *Sacculina imberbis* Shiino, 1943 (s) host on *Pachygrapsus crassipes* Randall, 1840 abdomen; E2, adult female, external lateral view, removed from sacculinid host. A1–A4, A6–A8, UBZM 63862; A5, UBZM 98209; A9–A10, UBZM 64096. B, USNM 103736; C, courtesy of Shawn Miller; D1, D2, from Kossmann, 1874; D3 from Shiino, 1952; E1 from Shiino, 1952. Scale = 0.16 mm (A5, A6, A7), 0.2 mm (A3), 0.25 mm (A10, B3), 0.5 mm (A1, A9), 0.625 (A8), 1 mm (A2, B1, B2), 1.43 mm (A4) (rest not to scale).

Zeuxokoma elongata n. sp.

Fig. 4B

Type host and locality. *Nematocarcinus cursor* A. Milne Edwards, 1881 (Nematocarcinidae), off Mississippi Delta, Gulf of Mexico, 600 fms (= 1097 m).

Other hosts and localities. None.

Forms known. Female only.

Etymology. From the Latin *elongatum*, referring to the very elongate shape of the parasites.

Type host and locality. Holotype female, 14.3 mm (USNM 1251741), 4 paratype females, 10.4–16.4 mm (USNM 103736) infesting two female *N. cursor*, 31.3–31.4 mm CL (only one parasite still attached to host), Sta. 1426, 29°07'N, 87°54'W, off Mississippi Delta, 600 fms (= 1097 m), 24 Sept 1955, coll. R/V *Oregon*.

Description. Mature female: 10.0–16.4 mm long; elongate, widening distally, not recurved; surface smooth, without lobes; anteroventral shield small. Trunk short with 4 recurved attachment lobes. Found parasitizing nematocarcinid shrimp hosts.

Remarks. The only specimen still attached to a host is located ventrally between the second and third pleomeres. This species can be distinguished from all others in the genus by its large size (smallest mature specimen larger than largest mature specimen of any other species; largest specimen nearly 50% larger than largest specimen of any other species) and elongate body with very short trunk and small anteroventral shield region (although the poor preservation makes identification of the size of the shield region difficult). The only other species in the genus with a comparably short trunk is *Z. setosa*, but in that species the body is bean-shaped and not elongated.

Zeuxokoma sp.

Fig. 4C

Host and locality. *Cinetorhynchus hendersoni* (Kemp, 1925) (Rhynchocinetidae), 1881, small cave, 25 ft (= 7.6 m), reef pocket, Kadena steps, Okinawa, Japan, photographed 8 April 2012 on night dive (approximately 7:45 pm) by Shawn Miller.

Other hosts and localities. None.

Forms known. Female only.

Material examined. None (specimen photographed alive, not collected).

Remarks. Based on the appearance of the female and given the locality where the specimen was observed, the most likely identification for this parasite is *Z. luetzeni* (possibly identical with *Z. alpehi*) that was also collected in Japan. However, all specimens of *Z. luetzeni* and *Z. alpehi* were found on alpheid hosts, and those parasites are not known to insert on the dorsal surface of the host's abdomen. The only other host species belonging to Nematocarcinoidea (*Z. elongata* n. sp.) is found in the Gulf of Mexico and is morphologically different in female parasite shape (short trunk not arising from the parasite at ca. 90° angle, parasite proportionally much thinner compared to length). The combination of host choice, infestation position, and body shape all suggest that this specimen is not identical to *Z. luetzeni*, *Z. alpehi*, or *Z. elongata*, n. sp. Collection of specimens is needed to determine the identity of the *Cinetorhynchus*-infesting *Zeuxokoma*.

Avada, n. gen.

Danalia:—Shiino, 1952: 329–335 (not *Danalia* Giard, 1887).

Type species. *Avada kedavra*, n. sp.

Other species. *Avada porcellanae* (Kossmann, 1872), n. comb., A. sp. *sensu* Shiino, 1952, *A. eldredgei*, n. sp.

Etymology. The genus is named after the killing curse uttered by Lord Voldemort in J.K. Rowling's *Harry Potter* series. For a host to be parasitized by a species of *Avada* is to suffer probable reproductive death by sterilization.

Diagnosis. Female: Strongly convex dorsal margin smooth (Fig. 5B1) or divided into 7–9 lobes (Fig. 5A1), ventral side shorter, shallow medial indentation. Attachment trunk short with four short strongly sclerotized attachment lobes (Figs. 5B2, 5B5). Parasitizing sacculinid rhizocephalans or crab hosts.

Cryptoniscus (only known for *A. kedavra*, n. sp.): Head anterior margin with triangular median region reflexed posteroventrally (visible in ventral view) (Fig. 5A3). Antennule of 3 articles (Fig. 5A3), first (basal) article smooth, anterior margin with 2 spines, covered by reflexed median of anterior head margin, article 2 triangular with one transverse ridge medially, article 3 with 2 flagella (inner with 3 long setae, outer with 2 shorter setae) and bundle of aesthetascs. Pereopods 1 and 2 (Fig. 5A5) subequal in size, ischium with elongate lateral spine. Pereopods 3–5 (Fig. 5A6, 5A7) ambulatory. Pereopod 6 (Fig. 5A8) of 3 segments; basis elongate, hourglass shape, ischium approximately 2/3 length of basis, third segment extremely long and slender, tapering toward recurved tip, more than 2x as long as ischium and basis combined. Pereopod 7 (Fig. 5A9) of 4 segments, basis similar in shape to that of pereopod 6 but smaller; ischium short, subquadrate; carpus small and cylindrical; terminal segment long, slender, subdivided by median slit into ventral and dorsal portions, dorsal portion 2x length of ventral, recurved at tip.

Remarks. Although only a single species is known with cryptoniscus larvae, possible morphological synapomorphies for the larvae in this genus are the presence of two teeth on the anterior margin of the first segment of the antennule (see below, also see Nielsen & Strömberg, 1965) and the terminal segments of pereopods 6 and 7 which are different in shape and proportions from those of larvae in other genera (where known). Differences between the new genus and *Danalia* and *Zeuxokoma* are given in the Remarks for those two genera.

Avada porcellanae (Kossmann, 1872), n. comb.

Fig. 4D

Zeuxo porcellanae Kossmann, 1872: 333, pl. 18, figs. 9–10, 12; Kossmann, 1874: 134, pl. 7, figs. 9–10, 12; Kossmann, 1880: 124; Kossmann, 1884: 459; Giard, 1887: 48–50; Bonnier, 1900: 196, 198, 384, fig. 32b; Richard, 1900: 73; Altes, 1982: 21; Grygier, 1993: 187, 189, 192.

Cryptoniscus porcellanae Fraise, 1878b: 421.

Danalia porcellanae Caullery, 1908: 589, 630; Grygier, 1993: 189.

Danalia (Zeuxo) porcellanae Wimpenny, 1927: 6; Altes, 1982: 28; Grygier, 1993: 188.

Danalia (Zeuxo) porcellana (sic) Fize, 1956: 27.

“*Danalia* du Japon sur... *Petrolisthes*” Fize, 1956: 27.

Danalia 3 Shiino, 1952: 334–335, figs. 1A, E.

Type host and locality. 2 female syntypes from unidentified porcelain crabs, Philippines.

Other hosts and localities. *Petrolisthes japonicus* (De Haan, 1849) (Porcellanidae) from Seto, Japan.

Forms known. Female only.

Material examined. Female (ZMA CRUS.I.261172), 6.8 mm, ex *Porcellana streptochira* Miers, 1884 [= *Lissoporcellana quadrilobata* (Miers, 1884)] (not in jar), Stn. 50, Bay of Badjo, west coast of Flores, Indonesia, 16–18 April 1899, coll. Siboga Expedition.

Remarks. This parasite is very irregular in shape with 8 or 9 variably-shaped lobes dorsally. Kossmann (1872) illustrated the hook-like attachment lobes that are similar to those seen in *A. eldredgei*, n. sp., also from a porcelain crab host but differing from this species by its smooth dorsal surface that lacks lobes. Nierstrasz & Brender à Brandis (1923) reported on another specimen from Indonesia but did not illustrate it. Examination of that specimen shows that it is nearly identical both in general morphology and the shape of the attachment hook to the specimen illustrated by Kossmann (1872; fig. 4D1 herein). Shiino (1952) suggested that his *Danalia* 3 might be identical with Kossmann's *porcellanae*. Although Kossmann's (1872) description is meager and his illustration is not detailed, both sets of specimens appear to belong to the same species. The mature parasite is orange-red in color (*vide* Shiino, 1952).

Avada sp.

Fig. 4E

Danalia 1 Shiino, 1952: 330–331, figs. 1c, d.

"*Danalia* du Japon sur... *Sacculina*" Fize, 1956: 27.

D[analia] sp. Altes, 1982: 28.

Host and locality. 1 female specimen from *Sacculina imberbis* Shiino, 1943 (Sacculinidae), infesting *Pachygrapsus crassipes* Randall, 1840 (Grapsidae), from Seto, Japan.

Other hosts and localities. None.

Forms known. Female only.

Material examined. None.

Description. Female (modified from Shiino, 1952): 11.4 mm long, yellowish in color, irregular in shape. Strongly convex dorsal margin divided into 9 lobes, ventral side shorter, medially indented. Trunk short, bifurcated into two branches which each bifurcate again. Parasitizing sacculinid rhizocephalon on grapsid crab host.

Remarks. The female morphology is very much like that of other *Avada* species, but the original description, lacking the cryptoniscus and any illustrations of the attachment process, is not sufficient to warrant description of the species at this time. Based on the description of the attachment process as having four lobes, but one pair borne on each half of a subdivided trunk, this taxon appears distinct from *A. porcellanae* and *A. eldredgei*, n. sp., which each have four short attachment lobes borne on a single undivided stalk.

Avada kedavra, n. sp.

Fig. 5A

Danalia 2 Shiino, 1952: 331–334, figs. 1B, 2; Nielsen & Strömberg, 1965: 53.

"*Danalia* du Japon sur... *Pugettia*" Fize, 1956: 27.

Type host and locality. 1 female (holotype) and 3 cryptoniscus larvae (paratypes) infesting *Pugettia quadridens* (De Haan, 1839) (Epiplatidae) from Seto, Japan.

Other hosts and localities. None.

Forms known. Female and cryptoniscus.

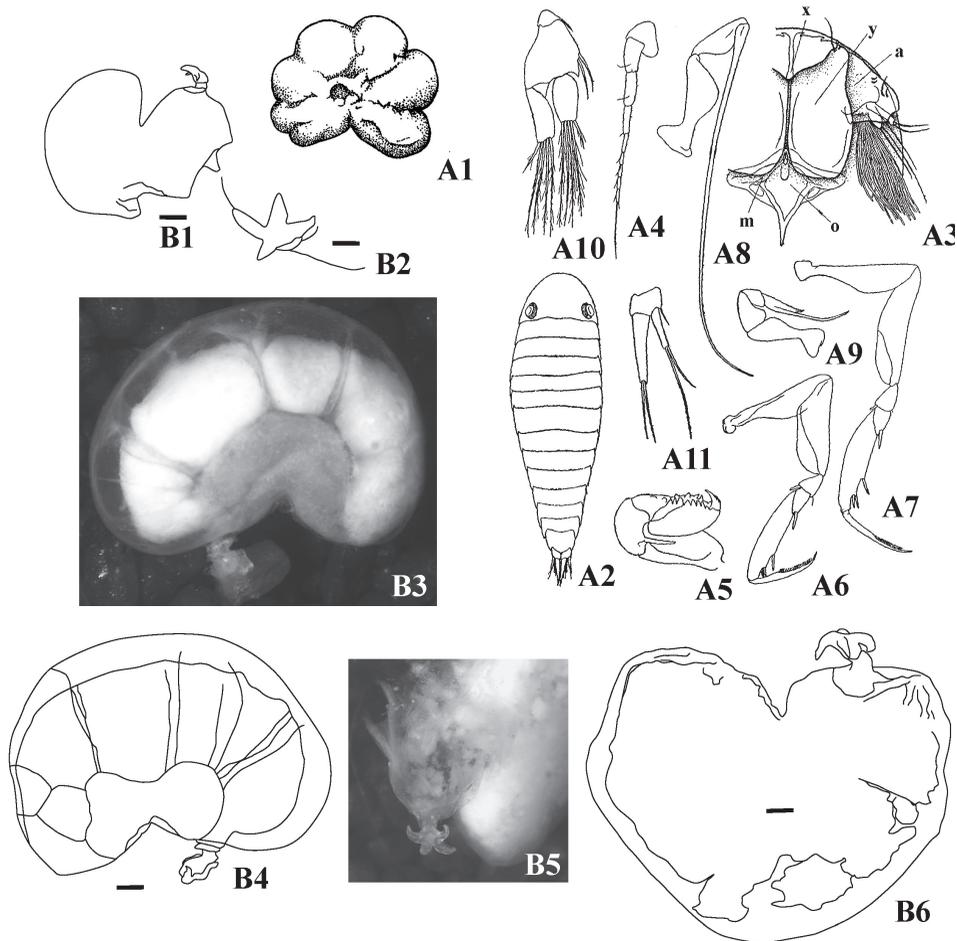


Figure 5. *A. Avada kedavra* n. sp.: A1, adult female, lateral view; A2-A11, cryptoniscus larvae: A2, dorsal view; A3, ventral view of head and antennule; A4, antenna; A5, pereopod 2; A6, pereopod 4; A7, pereopod 5; A8, pereopod 6; A9, pereopod 7; A10, pleopod 1; A11, uropod. *B. Avada eldredgei* n. sp.: B1, adult female, lateral view; B2, same, close up of attachment hooks; B3, adult female, lateral view; B4, same, opposite side, lateral view; B5, adult female, close up of attachment hooks; B6, same, lateral view. A, from Shiino, 1952; B1, B2, BPBM S16162; B3, B4, BPBM S16160 (holotype); B5, B6, BPBM S16161. a, antennule, m, mandible, o, oral cone, x, frontal lobe of head, y, basal segment of antennule. Scale = 0.25 mm (C2), 0.32 (C4, C6), 0.625 (C1) (rest not to scale).

Etymology. The species name in conjunction with the genus name completes the killing curse uttered by Lord Voldemort in J. K. Rowling's *Harry Potter* series.

Material examined. None. The holotype is the specimen figured by Shiino (1952: figs. 1B, 2) deposited in NSMT. It may be one of the specimens currently catalogued as NSMT-Cr 14504 but attempts to confirm its current status and condition though contact with the relevant curator were unsuccessful.

Description. Female (modified from Shiino 1952): 4.5 mm long, yellowish in color; semi-circular in shape. Strongly convex dorsal margin divided into 7 lobes, ventral side shorter, medially indented. Attachment hook shape and trunk length unknown. Directly parasitizing epialtid crab host.

Cryptoniscus (modified from Shiino 1952): Body tear-drop shaped, 0.96 mm length, strongly convex dorsally (Fig. 5A2). Cuticular surface smooth. Head anterior margin ovate in dorsal view but with triangular median region reflexed posteroventrally (visible in ventral view (Fig. 5A3x), posterior margin straight, widest at posterolateral junction with pereomere 1 (Fig. 5A2). Diffuse, moderately large eyes located proximolaterally, eyes with irregular pigment most prominent around medially directed edge (Fig. 5A2). Antennule of 3 articles (Fig. 5A3), first (basal) article smooth, approximately 2 times longer than broad, anterior margin with 2 spines, covered by reflexed median of anterior head margin, posterior margin and surface smooth (Fig. 5A3y), article 2 triangular with one transverse ridge medially (Fig. 5A3a), overhanging terminal article, article 3 with 2 flagella (inner with 3 long setae, outer with 2 shorter setae) and bundle of aesthetascs (Fig. 5A3). Antennae of 9 articles (4 peduncular and 5 flagellar) (Fig. 5A4), flagellar articles much narrower than peduncular articles, peduncular articles each with 1 subterminal setae, flagellar articles each with 1 terminal seta, proximal flagellar article longest, flagellar articles 2–5 of approximately equal length, terminal article with 1 long seta. Oral cone anteriorly directed (Fig. 5A3o).

Pereomere 5 broadest, tapering anteriorly and posteriorly. Body pigmentation lacking. Pereomeres with entire (not toothed) quadrangular coxal plates 1–7. Pereopods 1 and 2 subequal in size, short and stout, gnathopodal with dactyli entire (non-bifid) (Fig. 2A5), ischium with elongate lateral spine, merus with 2 low small lobes on inner margin, propodus and carpus nearly fused, carpus with acute denticles in 2 rows along inner border, dactylus with 2 or 3 acute spines on outer margin. Pereopods 3–5 (Figs. 5A6, 5A7) ambulatory, smooth; dactyli long, straight, slender, smooth margins, with ventral setal comb, tip hooked via ventral indentation of margin; propodi straight, medially inflated (progressively more inflated from pereopod 3 to 5), 1 stout ventral seta at 1/3 from distal margin and 2 smaller setae near junction with dactylus; carpi of pereopods 3–5 with one stout terminal ventral seta; meri with one thin terminal dorsal seta; ischium proportionally longer from pereopod 3 to 5. Pereopod 6 (Fig. 5A8) of 3 segments; basis elongate, hourglass shaped, being constricted 1/3 from proximal margin with ventral triangular expansion in distal 1/2; ischium approximately 2/3 length of basis, narrow proximally and moderately expanded distoventrally; third segment (homology uncertain) extremely long and slender, tapering toward recurved tip, more than 2x as long as ischium and basis combined and nearly 1/3 of total body length. Pereopod 7 (Fig. 5A9) of 4 segments, basis similar in shape to that of pereopod 6 but smaller; ischium short, subquadrate; carpus small and cylindrical; terminal segment (homology uncertain) long, slender, subdivided by median slit into ventral and dorsal portions, dorsal portion 2x length of ventral, recurved at tip, ventral portion with 2 distal spinules.

Pleon with 5 pleopods composed of basis (sympod), exopod, and endopod (Fig. 5A10). Sympod 2-jointed: small proximal portion triangular with short setae at inner angle, larger distal portion similar in shape, with 2 medially directed setae, endopod with 4 long plumose setae and 1 short plumose seta on outer margin, exopod with 4 plumose setae and 1 short plumose setae on inner margin. Pleotelson quadrangular, uropodal endopods approximately twice as long as exopods, basis with 1 distolateral seta, endopods and exopods with 2 long simple terminal setae (Fig. 5A11).

Remarks. The presence of dorsal lobes on the female distinguishes this species from *A. eldredgei* n. sp. The highly symmetrical shape of the body contrasts with the asymmetrical shape seen in *A. porcellanae*. This is the only species in the genus with a well described cryptoniscus larva that provides additional characters distinguishing the genus from the *Danalia*. The homology of the terminal segments of pereopods 6 and 7 are not clear; they could be fused dactyli and propodi (and in the case of pereopod 6, also meri) or one or more of the other segments could be lacking with the terminal segment being a hyperextended dactylus.

Despite attempts to ascertain if the material studied by Shiino (1952) still exists in NSMT, I was not able to locate it. It is definitely not in the collections of either the Seto Marine Lab or the Mie University, institutions where Shiino worked.

Avada eldredgei, n. sp.

Fig. 5B

“*Sacculina*-like form” Edmondson, 1946: 226.*Lernaediscus* sp. Boschma, 1953: 190-191.“close to... *Danalia porcellanae*” Boyko & Harvey, 2000: 673.

Type host and locality. 3 females, each infesting a single *Pachycheles pisoides* (Heller, 1965) (Porcellanidae) from Hawai‘i.

Other hosts and localities. None.

Forms known. Female only.

Etymology. The species is named after Lu Eldredge (1938–2013) whose knowledge of the Hawaiian fauna, especially the marine invertebrates was exceptional. His generous nature will be sorely missed. His assistance in planning The Crustacean Society meeting in Honolulu in 2011 was invaluable, and his welcoming of his colleagues into his home is fondly remembered.

Material examined. 1 mature female holotype, 3.5 mm (BPBM S16160, Fig. 5B3, 5B4), infesting female *P. pisoides* (3.5 mm CL) (ex BPBM 3427), Kahala, O‘ahu, Hawai‘i, April 1931, coll. C.H. Edmondson; 1 mature female paratype, 4.0 mm (BPBM S16161, Fig. 5B5, 5B6), infesting male *P. pisoides* (4.0 mm CL) (ex BPBM 4314), Kawela, O‘ahu, Hawai‘i, 10 July 1937, coll. unknown; 1 mature female paratype, 4.3 mm (damaged) (BPBM S16162, Fig. 5B1, 5B2), infesting female *P. pisoides* (4.3 mm CL) (ex BPBM 5902), Mā‘ili Point, O‘ahu, Hawai‘i, 10 July 1953, coll. C.H. Edmondson.

Description. Female, length 3.5–4.3 mm. Body of female sac-like, composed of two stout lobes weakly recurved with small indentation on ventral surface medially. Outline of body smooth, without lobes. Body with developing ovarian tissue showing internal segmentation (Fig. 5B3, 5B4). Attachment hooks of four short, stout, lobes born on short trunk slightly longer than width of hooks (Fig. 5B5). Directly parasitizing porcelain crab host.

Remarks. Boyko & Harvey (2000) first correctly identified this species as an isopod and not a rhizocephalan. This species can be distinguished from the others in the genus by its smooth outline, lacking in externally differentiated lobes as seen in *A. porcellanae* and *A. kedavra*, n. sp.

Keys to Genera Based on Females and Cryptoniscus Larvae

Females

- 1a. Female body shape linear, not recurved *Zeuxokoma* Grygier, 1993
 1b. Female body shape recurved 2
 2a. Female body shape strongly recurved, body as two large lobes with large space medially, attachment hooks flexible, not sclerotized *Danalia* Giard, 1887
 2b. Female body shape weakly recurved, little to no space between right and left sides of body, attachment hooks rigid, sclerotized *Avada*, n. gen.

Cryptoniscus larvae (larvae not known for *Zeuxokoma*)

- 1a. Antennule segment 2 with spines, pereopod 6 with 3 segments, terminal segment longer than basis and ischium combined, pereopod 7 terminal segment bifid *Avada*, n. gen.
 1b. Antennule segment 2 unarmed, pereopod 6 with 4 segments, terminal segment approximately as long as basis and ischium combined, pereopod 7 terminal segment entire
 *Danalia* Giard, 1887

Acknowledgments

I thank Rafael Lemaitre, Karen Reed and Frank Ferrari (USNM) for loan of specimens and for hosting a visit in February 2012. Special thanks to the late Lu Eldredge (BPBM) for loan of material and for hosting a visit in June 2011 and to Holly Bolick (BMPM) for answering follow up questions about specimen data. Gavin Dally (NTM), Jon Anders Kongrund (UBZM), and Christoph Noever (UBZM), loaned or donated invaluable specimens. Danièle Guinot (Muséum National d'Histoire Naturelle, Paris) is thanked for her help with translations from the French. A visit to Naturalis Biodiversity Center in June 2014 was funded by a Temminck Fellowship. Thanks also to Arthur Anker for permission to reproduce the photograph of *Zeuxokoma glabra* from French Polynesia and to Shawn Miller for the photograph of the parasitized *Cinetorhynchus* from Japan. Michael Türkay (Senckenberg Forschungsinstitut) searched for traces of Kossmann's specimens in his institution, for which he has my appreciation for undertaking this fruitless task. Drs. Taeko Kimura (Mie University) and Keiichi Kakui (Hokkaido University) are thanked for help in ascertaining the whereabouts of Shiino's (1952) specimens.

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