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First record of a potential philoblennid-polyplacophoran association with the description of *Acanthopleuricola sirenkoi*, new genus and new species

(Crustacea, Copepoda)

Enrico Schwabe

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Acanthopleuricola sirenkoi, a new genus and species of a mesoparasitic copepod, is described on specimens of both sexes and naupliar stages from the pallial cavity of its polyplacophoran host *Acanthopleura gemmata* (de Blainville, 1825). The new genus shows superficial similarities with chitonophilid copepods, but cannot group among them due to clear tagmosis in both sexes and a varying feeding strategy. Instead *Acanthopleuricola* gen. nov., is obviously more related to the philoblennid genus *Nippoparasitus* Uyeno, Ogasaka & Nagasawa, 2016 and represents probably the first record of a non-gastropod infection within this family. With the highly derived *Nippoparasitus*, the new genus shares a voluminous endosoma, but can clearly separate by an incorporated urosome and lacking of cephalic appendages in the female.

Enrico Schwabe, SNSB – Zoologische Staatssammlung München (Bavarian State Collection of Zoology), Münchhausenstr. 21, 81247 München, Germany;
e-mail: schwabe@snsb.de

Introduction

In 2006 the Bavarian State collection of Zoology in Munich, Germany (ZSM) purchased half of the private collection of the polyplacophoran specialist Hermann Leberecht Strack (HLS), who deposited the remaining part of his material to the malacological department of Naturalis in Leiden, the Netherlands (RMNH). The material currently under the present author's responsibility contains also numerous samples Strack collected during several field trips to Indonesia (e. g. Strack 1990, 1998, 2001).

While continuing the work on chitonophilid copepods associated with polyplacophorans (Schwabe et al. 2014, 2018), an unusual copepod-polyplacophoran association was detected among the material mentioned above. As summarized in Schwabe et al. (2014) earlier studies on parasitic copepods utilizing polyplacophoran hosts are restricted to the Chitonophilidae Avdeev & Sirenko, 1991, although these parasites also infest gastropods. The interactions of harpacticoid copepods with polyplacophorans were summarized by Huys (2016), to which the record of Schwabe & Els (2019) has to be added, but evidence for true parasitism could not be documented so far in this group.

Noteworthy, polyplacophorans do not show extern indications for an intimate association like meso- or endoparsitism (in the sense of Marchenkov 2001) and can hardly be studied in the field. Even mesoparasitic chitonophilids become usually only obvious if the copepod female is ovigerous. Their true diversity however, may also be hidden due the fact that polyplacophorans usually strongly enrol once removed from their substrata, which limits the examination of the ventrally laying mantle cavity, where the copepods pierce the footwall. Furthermore, several polyplacophorans also contain their brood or eggs in the target area and it would not be surprising, if some of the brooding records in polyplacophorans require a re-study in favour for a mesoparasite (see also Schwabe et al. 2014).

Object of the present study is the widely distributed Indo-Pacific polyplacophoran species *Acanthopleura gemmata* (de Blainville, 1825). The large species usually occurs at rocky shores in the intertidal zone (e.g. Ferreira 1986, Brooker 2003) and is thus easily to collect during low tides, which makes it together with its frequent reproduction phases (Stephenson 1934) and its density of up to six specimens per square meter (Thorne 1968) a target food source for local natives (e.g. Schwabe et al. 2008). Interestingly, despite its common occurrence, large size and easy accessibility the species is yet unknown to harbour any parasite. Strack (pers. comm.) mentioned a white flatworm in the species' mantle cavity, similar to what Kato (1935) observed in the related *Liolophura japonica* (Lischke, 1873).

Thus, the present record of a mesoparasitic copepod found in *A. gemmata* not only contributes to a better understanding of the host species biology, but will demonstrate the first non chitonophilid infestation by a highly modified copepod.

Material and methods

Specimen treatment as well as terminology follows Schwabe et al. (2014, 2018). Copepod systematics is in accordance with Uyeno et al. (2016). The extensions "Mol" and "A" behind the acronym ZSM refer to the departments Mollusca and Arthropoda, respectively.

Systematics

Class Copepoda H. M. Edwards, 1840
Order Cyclopoida Rafinesque, 1815
Family ? Philoblennidae Izawa, 1976

Acanthopleuricola gen. nov.

Diagnosis. Same as diagnoses of the following type species description.

Type species: *Acanthopleuricola sirenkoi* sp. nov., mesoparasitic in a polyplacophoran mollusc, by original designation.

Etymology. The generic name is derived from the stem of the generic name of the polyplacophoran host, *Acanthopleura*, and the Latin *colere*, meaning "inhabiting". Gender: masculine.

Acanthopleuricola sirenkoi sp. nov.

Figs 1–10

Material examined. One of two specimens of *Acanthopleura gemmata* (ZSM Mol 20170266 ex HLS 1796) from Indonesia, Maluku, Banda Islands, Karaka Island (=Pulau Keraka or Pulau Karaka [Crab Island]), 4°30'12''S 129°53'13''E, on intertidal rocks, leg. HLS, 23/Oct/1989 infested. Position of parasites in infested specimen (ventral view, head above): right pallial cavity: **Holotype:** One 'ovigerous' (see under "Nauplius") female (at level plates iii–iv) (Fig. 1D, K), in ethanol, with endosoma, stained in congo-red (ZSM A20190306); left pallial cavity: **Paratypes:** one female (at level plate iv) (Figs 1A [above], B, C, E, 2, 3), SEM mounted (ZSM A20190307) with one associated male (Figs 1G–H, 4–6), SEM mounted, (ZSM A20190308); one 'ovigerous' female (at level plates v–vi) (Fig. 1A [below], F), in situ (ZSM A20190309); **Other materials:** nine isolated nauplii in pallial cavity, six in ethanol (ZSM A20190310), three SEM mounted (ZSM A20190311). **Paratype:** One female (in situ) in the left pallial cavity (RMNH.CRUS.F.4189), occupying the space of the 10–14 posterior gills of one of three specimens of *Acanthopleura gemmata* (RMNH.MOL.HLS.1796), with the same data as above.

Type locality. Indonesia, Maluku, Banda Islands, Karaka Island, 4°30'12''S 129°53'13''E, intertidal rocks.

Microhabitat. Females of *Acanthopleuricola sirenkoi* sp. nov. live mesoparasitic in the dorsal pallial cavity of *Acanthopleura gemmata*, where they outward directed pierce the dorso-lateral muscles. A single male was found free sitting on a female's mouth cone.

Etymology. The species is named in honor of Dr. Boris Ivanovich Sirenko (St. Petersburg, Russia), a keen polyplacophoran specialist and among the first who studied the polyplacophoran–copepod associations.

Diagnosis. Female body highly transformed, without lobes, comprises of cylindrical inflated well segmented external trunk (ectosoma) connected to the branching rootlet system (endosoma) via a mid-ventral, anteriorly situated cylindrical tube. Cephalic appendages almost completely incorporated to voluminous cephalosome. 4 pedigerous somites without legs, 5th pedigerous somite indistinct, incorporated into trunk, with minute uniramous legs with 4 distal setae. Legs 6 form paired plated genital opercula with single distal seta, ventro-laterally situated at genital double-somite. Caudal ramus with 2 smooth setae, inner longer. Egg sacs elongate, presumably multiseriate.

Male Cyclopiform, distinctly smaller and less transformed than female, well segmented, with cephalothorax, 2 free pedigerous somites, one double somite and 2-segmented urosome. Anten-

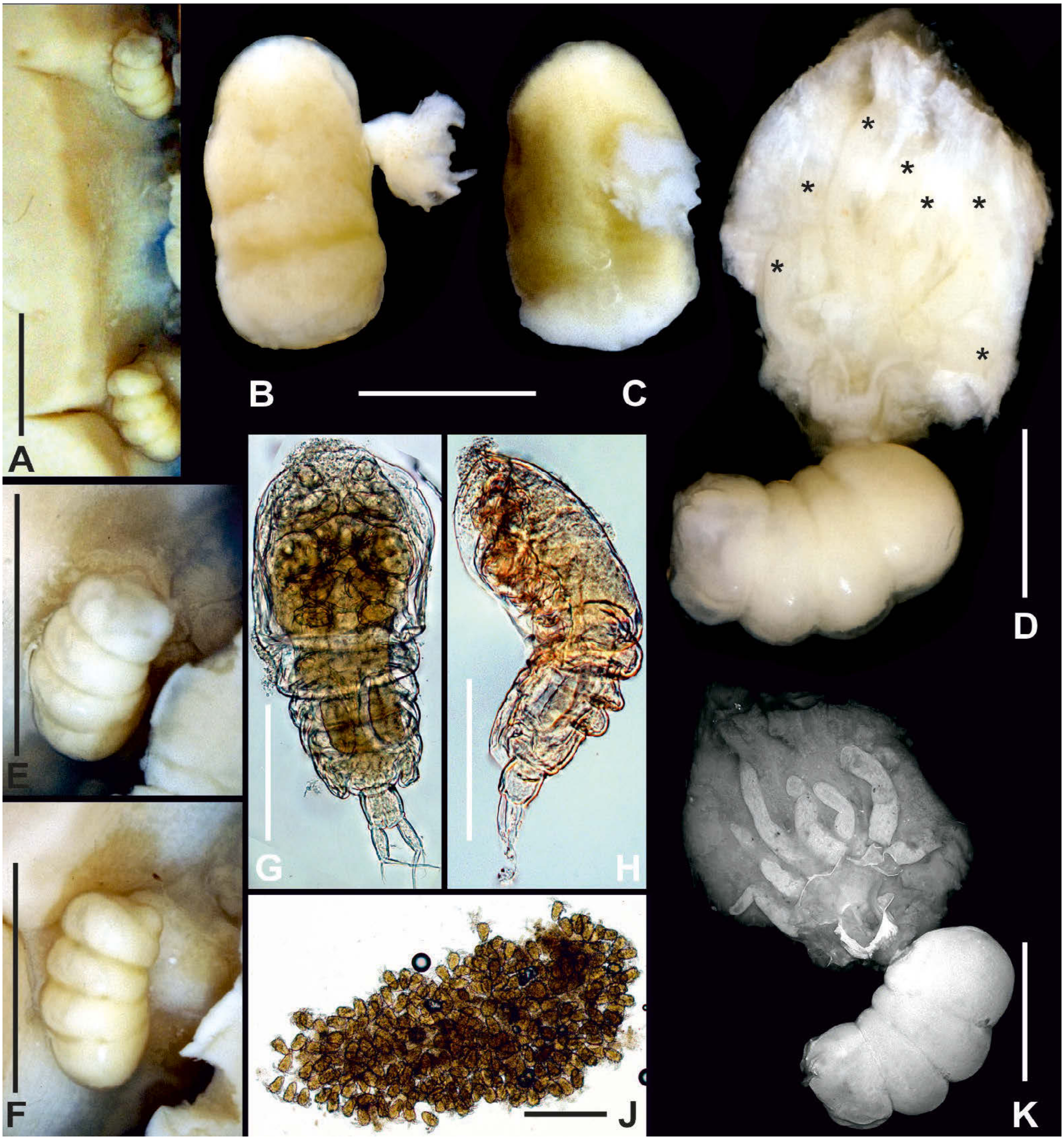

Fig. 1. Females (A–F, K), male (G, H) and "egg" mass (=bunch of nauplii) (J) of *Acanthopleuricola sirenkoi* sp. nov. **A.** Female paratypes in situ in left pallial cavity of *Acanthopleura gemmata* (ZSM Mol 20170266), above specimen ZSM A20190307, below specimen ZSM A20190309. **B–C.** Lateral and ventral aspect, respectively, of paratype ZSM A20190307 after incomplete removing. **D, K.** Lateral views of holotype ZSM A20190306 under light microscope (D) and from fluorescence microscope (K) (asterisks in "D" indicate the individual branches of the endosoma). **E.** In situ close-up of paratype ZSM A20190307 prior removing. **F.** In situ close-up of paratype ZSM A20190309. **G–H.** Dorsal and lateral aspect of male ZSM A20190308. **J.** bunch of nauplii, found attached to female. Scale bars A, E, F: 2 mm; B–D, K: 1 mm; G–H: 200 µm; J: 500 µm.

nule 5-segmented, antenna 4-segmented, wide horse-shoe shaped labrum, mandible not observed, maxillule stout with endopodal setae and seta bearing exopodal element, paragnaths fused to labium, maxilla 2-segmented, maxilliped 4-segmented. Legs 1–2 biramous, with tendency for reduction. Leg 3 almost incorporated into trunk, legs 4-5 absent, leg 6 forms genital aperture. Urosome with slender caudal rami with long smooth terminal seta and 4 additional elements.

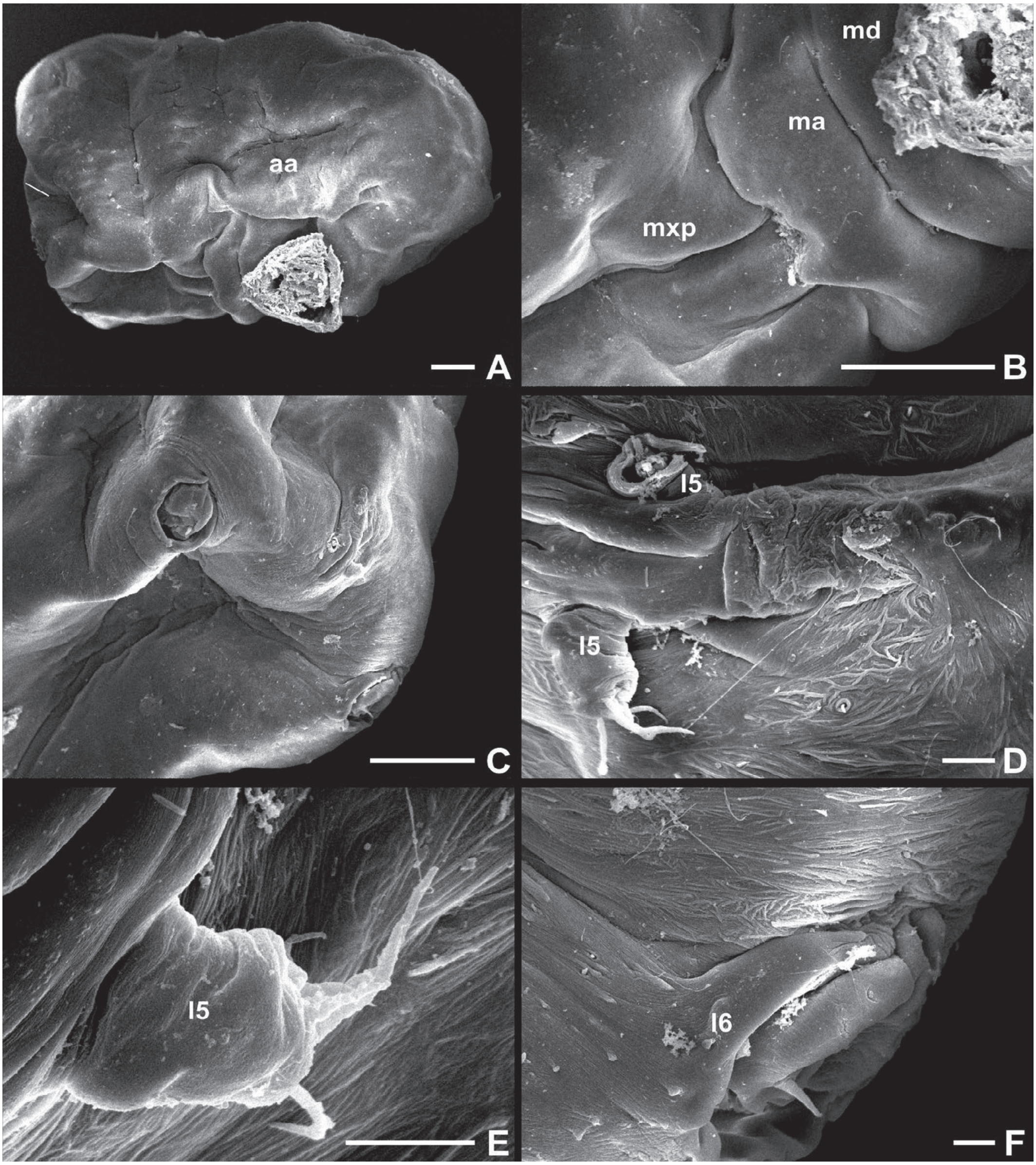

Fig. 2. Female paratype of *Acanthopleuricola sirenkoi* sp. nov. (ZSM A20190307), endosoma shortened. **A.** Ventro-lateral aspect, abdominal region indicated by an arrow. **B.** Ventral aspect of posterior region of cephalosome. **C.** Ventro-lateral aspect of genital double somite, showing the plated genital opercula. **D.** Transition zone between pedigerous somites 4 and 5, latter with distinct legs (l5), while arrowheads indicate individual single setae in somite 4. **E.** Ventral view of leg 5. **F.** Lateral view of leg 6 (l6), transformed to genital operculum. **aa**, probably incorporated antenna; **ma**, maxilla; **md,** mandible; **mxp**, rudiment of the maxilliped. Scale bars A, E, F: 2 mm; B–D: 1 mm; G–H: 200 µm; J: 500 µm.

Testes paired.

Nauplius ovoid, lecithotrophic; naupliar eye, labrum, mouth and anal slit not observed. Caudal with slender smooth setae. Antennule 2-segmented, antenna with 5-segmented exopod and 2-segmented endopod, mandible with 4-segmented exopod and 2-segmented endopod.

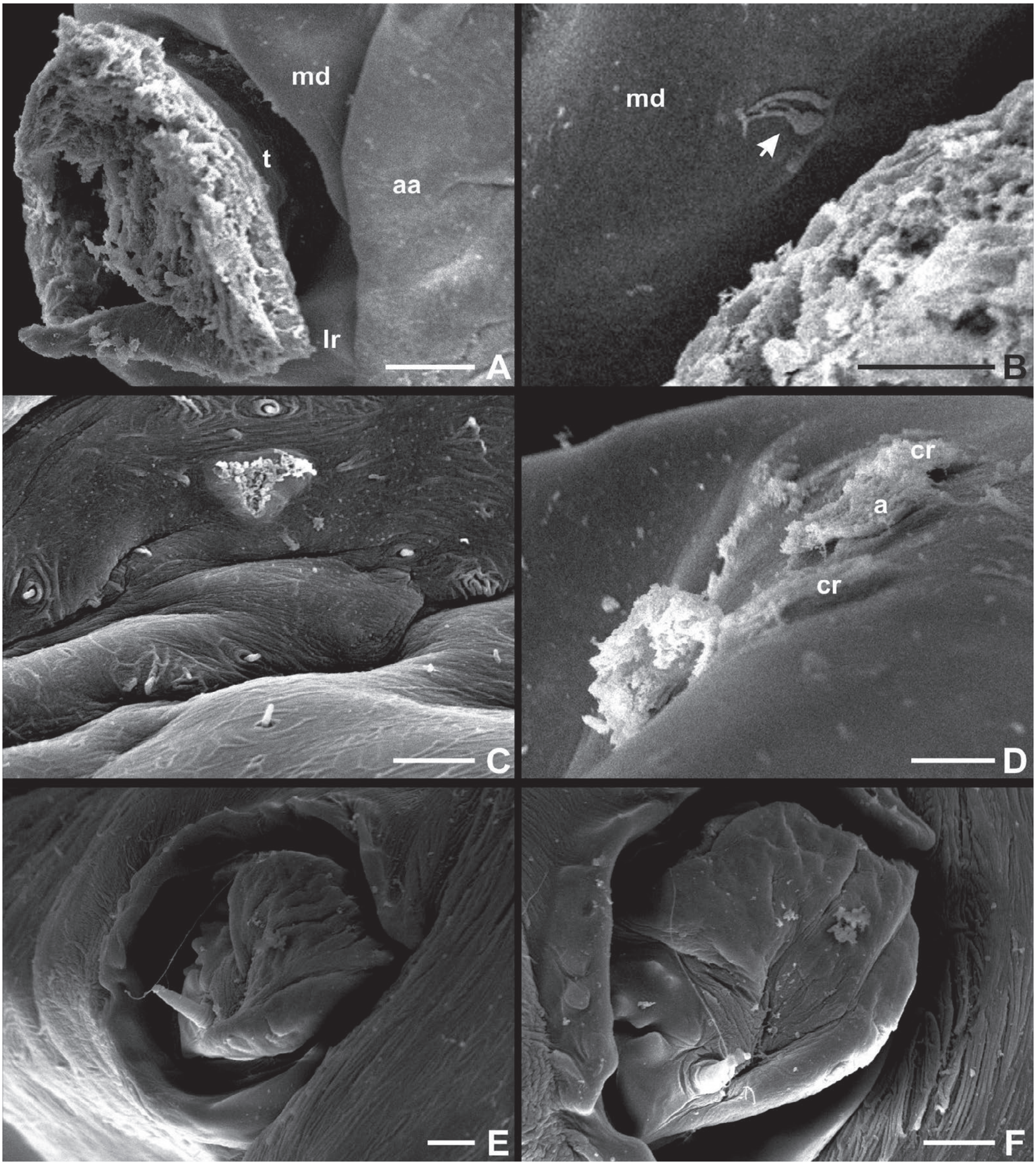

Fig. 3. Female paratype of *Acanthopleuricola sirenkoi* sp. nov. (ZSM A20190307), endosoma shortened. **A.** Lateral view of mouth region, anterior below. **B.** Lateral view of mandible, with setae highlighted by arrow. **C.** Ventral aspect of depressed abdominal region to show the scattered setae. **D.** Lateral view of anal region. **E–F.** Lateral (E) and ventral views of leg 6, transformed to genital operculum. **a**, anus; **aa**, antenna; **cr**, caudal rami; **lr**, labrum; **md**, mandible; **t**, tube. Scale bars A: 50 µm; B: 100 µm; C, E–F: 10 µm; D: 20 µm.

Description

Adult female (Figs 1A–F, K, 2, 3, 8A–B)

Body shining and yellowish (Fig. 1A–F). Length 3.5–4.3 mm, greatest width (at pedigerous somite 1) ca. 1.5 mm. Body highly transformed, without lobes, comprises of a cylindrical inflated ectosoma and a large branching endosoma. Ectosoma with distinctly constricted cephalosome, pedigerous somites 1 and 2 and genital double-somite. Evidences for pedigerous somites 3–4 by dorsal constrictions only, pedigerous somite 5 indistinct and incorporated into trunk. Cephalosome entirely fused by cephalic shield, rounded rostrum and cephalic appendages (Fig. 2A), but for a conical structure, here interpreted as potential antenna (Fig. 2A "aa") and for mouth area. Labrum narrow, postero-lateral slightly extended and backward directed. Mandible voluminous, hammer-shaped, no distinct blade, but with three minute claw-like setae (Fig. 3B). Evidence for maxillule not seen, probably fused with mandible. While labrum and mandible encircle a cylindrical tube (see below), the mandible is also interpreted fusing in the posterior part with the maxilla, indicated by a rectangular transversal flat, unsegmented rudiment with posterior slight depression (Fig. 2B). The latter is partly covering, what is here interpreted as rudiments of the maxilliped. The latter, swollen structure of conical shape, anteriorly about double the width of its posterior part. Pedigerous somites 1–4 without legs, ventrally with individual single setae only, of irregular arrangement (Fig. 2D). Pedigerous somite 5 with distinct legs, which are uniramous, comprising of an unsegmented protopod with a distal segment, bearing 4 setae (Figs 2D–E, 8A–B). Legs 5 separated by a deep longitudinal furrow. Genital double-somite with paired ventro-laterally situated gonopores, which are covered by plated genital opercula (Fig. 2C), itself formed by leg 6 (Figs 2F, 3E–F). Each operculum with a single seta only. Abdominal region (Fig. 2A, arrow) rounded, ventrally depressed with several minute setae (Fig. 3C), completely integrated into genital double-somite. Anus between reduced caudal rami (Fig. 3D). Latter armed with 2 smooth setae per ramus, both incompletely incorporated into abdomen. Outer seta about rectangular, 36 x 17.3 µm, inner seta slender and elongate, about 44 µm in length (measured on longest broken) x 14.6 µm.

Endosoma arises from a short cylindrical tube (labium?). Tube completely filled with mesenchymatous tissue (Figs 2A–B, 3A–B). Immediately underneath the host tissue the tube widens to a squarish cup-shaped sclerotized structure (Fig. 1K), which causes a swelling of the host tissue (Fig. 1E–F). This structure expands distal to seven more flexible tube-like structures deeply embedded in the muscular tissue of the host (Fig. 1D, K). Within the individual tubes one may find the same reddish pigmented granules that occur in the polyplacophoran muscle collagen between the fibers.

"Egg sacs" from two females were observed on a single gonopore in two individuals only.

Adult male (Figs 1G–H, 4–6, 9–10)

Cyclopiform, distinctly less transformed than female, well segmented, comprising of prosome (cephalothorax and 2 free pedigerous somites + fused double somites 5–6) and 2-segmented abdominal region. Total length (slightly curled, excluding caudal setae), about 615 µm, maximum width (level of labrum) 265 µm. Cephalic shield about oval in dorsal aspect, approximately half of the total body length. Cephalon with rounded short ventrally directed rostrum.

Antennule (Figs 4C–D, 5A, 9A) club-shaped, 5-segmented; armature formula 1-[3], 2-[4], 3-[2], 4-[1], 5-[3]. Segment 2 longest and slender, slightly constricted in middle. Segment 4 shortest.

Antenna (Figs 4B, E–F, 5A, 9B–C) uniramous, squat, 4-segmented. Coxobasis with basal seta; endopod 3-segmented, segments 2–3 of equal size, segment 3 with three setae, segment 4 shortest, partly fused with segment 3. Distal segment with four claws, anterior most distinctly longer, last three claws, short, size-decreasing posterior wards, penultimate claw with 4 setal elements, other claws with three.

Labrum (Figs 5A, C, 9A) prominent, horse-shoe shaped but much wider than long, posterolateral corner hardly extended but thickened to a small bulb. Centrally with a slight beak.

Mandible not observed.

Paragnaths (Figs 5A, C, 9A) distally fused to form a roundish labium with central protuberance, coxa with solid intercoxal sclerite (Fig. 5D).

Maxillule (Figs 5A-C, 9A) stout and solid, rectangular with two distal slightly curved endopodal setae, anterior most longer. Posterior with a single seta bearing exopodal element.

Maxilla (Figs 4B, 5A–C, 9E) 2-segmented, comprising of voluminous syncoxa and allobasis in shape of strong hook-like process, with a posterior accessory setal element on its base. Syncoxa shows anteriorly two swellings, one distal the other slightly below, which are interpreted as rudiments of endites.

Maxilliped (Figs 5E, 9F–G) 4-segmented, syncoxa only partly visible, obviously unarmed; basis small, discoid with single distal seta; first endopodal segment with vestiges of two basal setae, second endopodal segment terminates into a single claw. Segments 3–4 of equal size.

Leg 1 (Figs 5F, 10A), with well-developed intercoxal sclerite. Leg biramous, much reduced but with wide basis, coxa distinctly shorter; protopod without seta or projections, but for the distal part of basis, where patches of dense denticles occur. Exopod, distinctly lower situated than endopod, 2-segmented, both segments of similar size, first segment without seta, second with single smooth

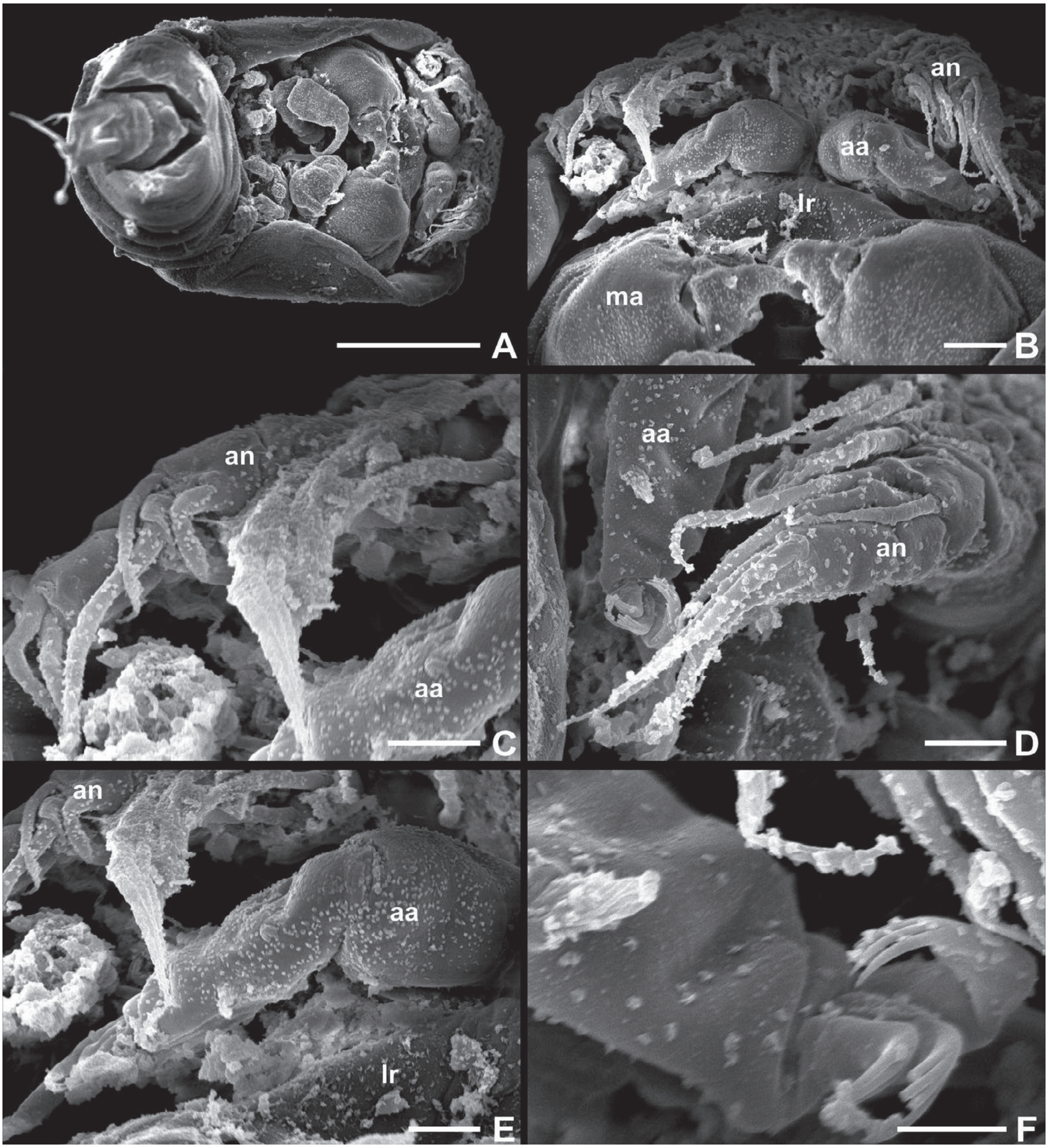

Fig. 4. Male paratype of *Acanthopleuricola sirenkoi* sp. nov. (ZSM A20190308). **A.** Ventral view of whole specimen. **B.** Postero-ventral view of head region. **C.** Lateral aspect of left antennule. **D.** Distal ends of right antennule (right) and antenna (left). **E.** Lateral aspect of left antenna. **F.** Distal segment of right antenna to show the claws. **an**, antennule; **aa**, antenna; **lr**, labrum; **ma**, maxilla. Scale bars A: 100 µm; B: 20 µm; C–E: 10 µm; F: 5 µm.

distal seta. Endopod unsegmented, distal without seta and obtuse.

Leg 2 (Figs 6A–B, 10B), without intercoxial sclerite, of similar appearance as leg 1, but more reduced, coxa incorporated into somite, endopod almost degenerated.

Leg 3 (Figs 6A–B, 10C), hardly discernible, a single (exopodal?) seta only.

Legs 4–5 absent, leg 6 (Fig. 6D, F) overlay the paired genital openings, and shows a single distal spine. Leg bearing somite fused with pedigerous somite 5 forming a double somite, which extends behind first urosomite. Genital openings at the posterior inner ventral side.

Urosome (Figs 1G, H, 6C, E, 10D) elongate and slender, 2-segmented, posterior urosomite squar-

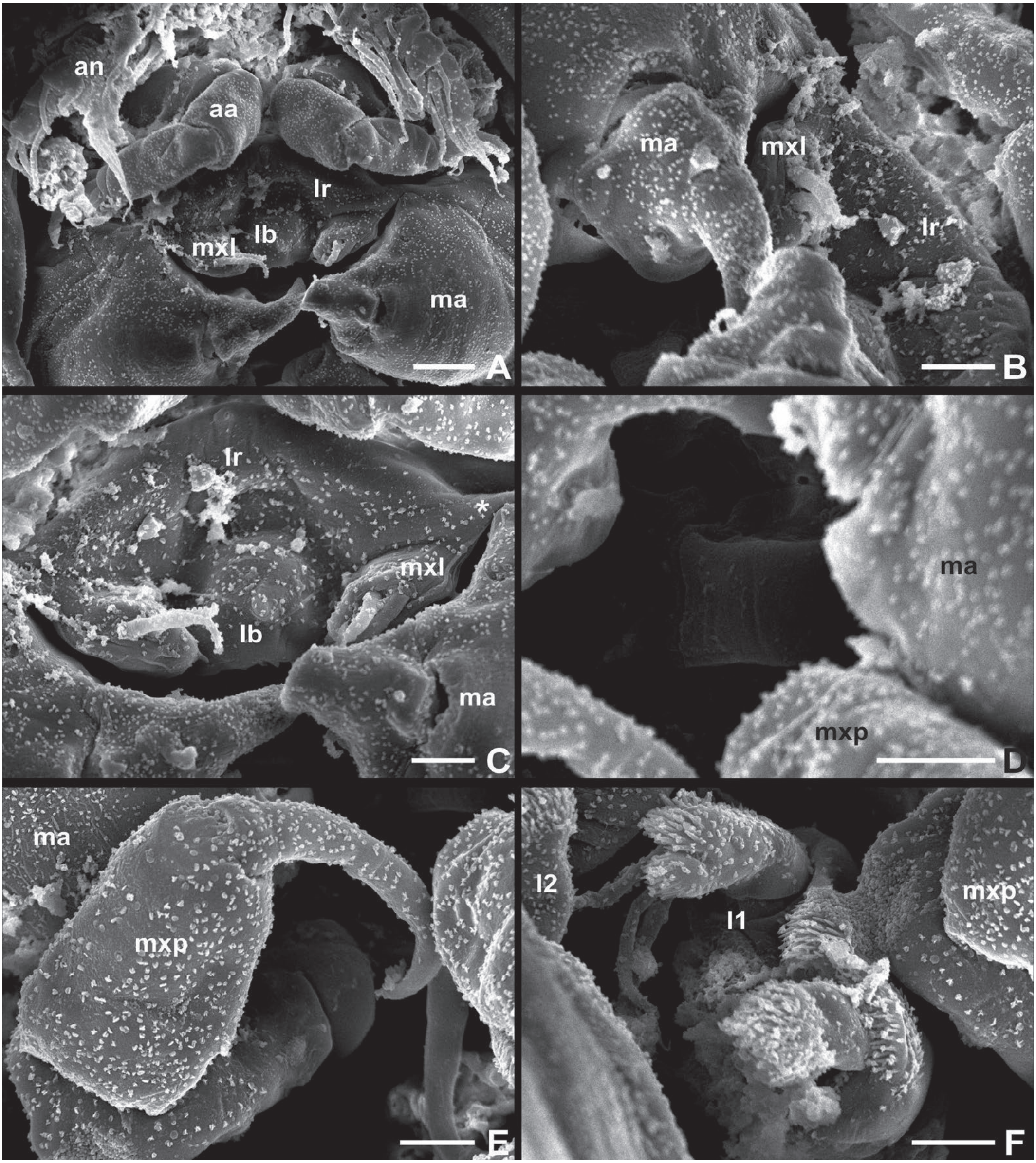

Fig. 5. Male paratype of *Acanthopleuricola sirenkoi* sp. nov. (ZSM A20190308). **A.** Ventral view of cephalic appendages. **B.** Oblique lateral view of oral appendages. **C.** Ventral view of oral appendages, asterisk indicates thickened labral posterolateral bulb. **D.** Intercoxal sclerite of paragnaths. **E.** Postero-lateral aspect of left maxilliped. **F.** Ventral view of leg 1. **an**, antennule; **aa**, antenna; **lb**, labium (fused paragnaths); **lr**, labrum; **l1, l2**, legs 1 and 2; **ma**, maxilla; **mxl**, maxillule; **mxp**, maxilliped. Scale bars A: 20 µm; B–F: 10 µm.

ish, first slightly covered by double somite. Caudal rami cylindrical, virtually the same length as last urosomite, dorsally at half-length with single short seta, terminally with single long inner seta and at outer distal corner with stubby spine, two setae with half the length of terminal seta in between. All elements are smooth.

Reproductive system (Fig. 1G, H) completely paired, testes elongate, dorsally situated underlying free pedigerous somites and half of the double somite. Vasa deferentia ventrally at mid trunk region but connections with testes and genital pores

Fig. 6. Male paratype of *Acanthopleuricola sirenkoi* sp. nov. (ZSM A20190308). **A.** Postero-ventral view of legs 1–3. **B.** Postero-ventral view of right legs 2–3. **C.** Ventral view of urosome. **D.** Ventral aspect of genital region. **E.** Posterior view of usosome. **F.** Posterior view of fig. D. **l1, l2, l3, l6**, legs 1–3, 6; **u**, urosome. Scale bars A, C, E: 20 µm; B, D, F: 10 µm.

not clearly traceable, due to specimens curling. No spermatophore sac(s) discerned.

Nauplius (Figs 7, 8C–F)

Lecithotrophic. Ovoid (Fig. 7A, B), size 130–145 µm x 77–80 µm (measured on two SEM specimens). Maximum width in anterior half. Exoskeleton delicate. Pigmented nauplius eye not observed, labrum, mouth, and anal slit lacking. Caudal region with pair of slender, naked setae (Fig. 7F).

Antennule (Figs 7D, 8C–D) 2-segmented; basal segment about squarish with two lateral setae, a

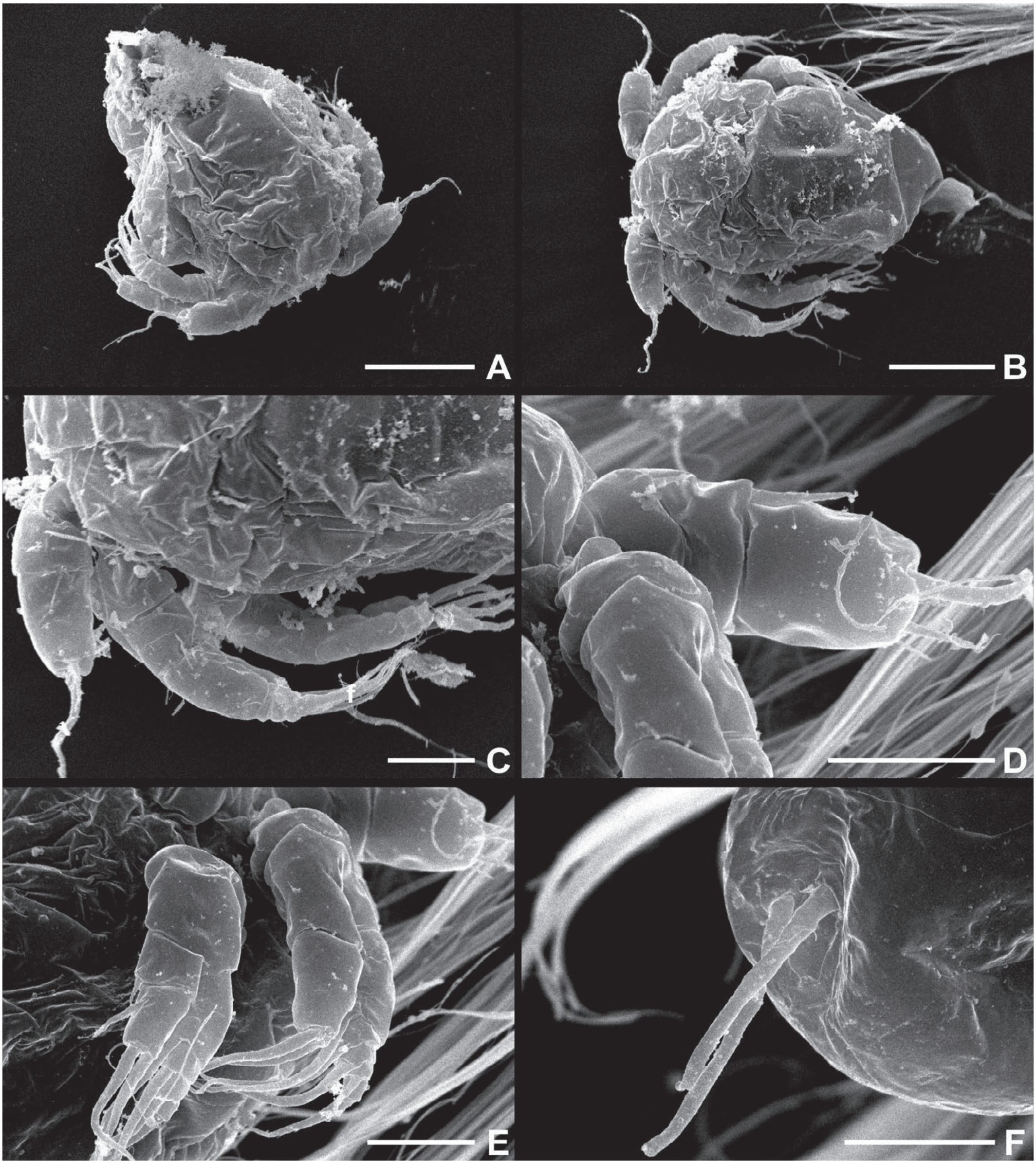

Fig. 7. Various aspects of three nauplii of *Acanthopleuricola sirenkoi* sp. nov. (ZSM A20190311). **A–B.** Different views of habitus. **C.** Enlargement of Fig. B, to show the dorsal aspect of left cephalic appendages. **D.** Posterior view of right antennule. **E.** Ventral aspect of right antenna and mandible. **F.** Posterior view caudal setae. Scale bars A–B: 50 µm; C–F: 20 µm.

larger distally and an extreme short one, at middle; distal segment broad rectangular with two naked setae apically.

Antenna (Figs 7C, E, 8E) biramous; protopod without projections or setae, consisting of unarmed coxa and basis, Exopod 5-segmented, first segment squarish, second segment largest with single long seta, further distal segments minute, each with single smooth seta. Endopod about the same width of exopod; 2-segmented; with first segment being slightly longer, second segment with two smooth apical setae.

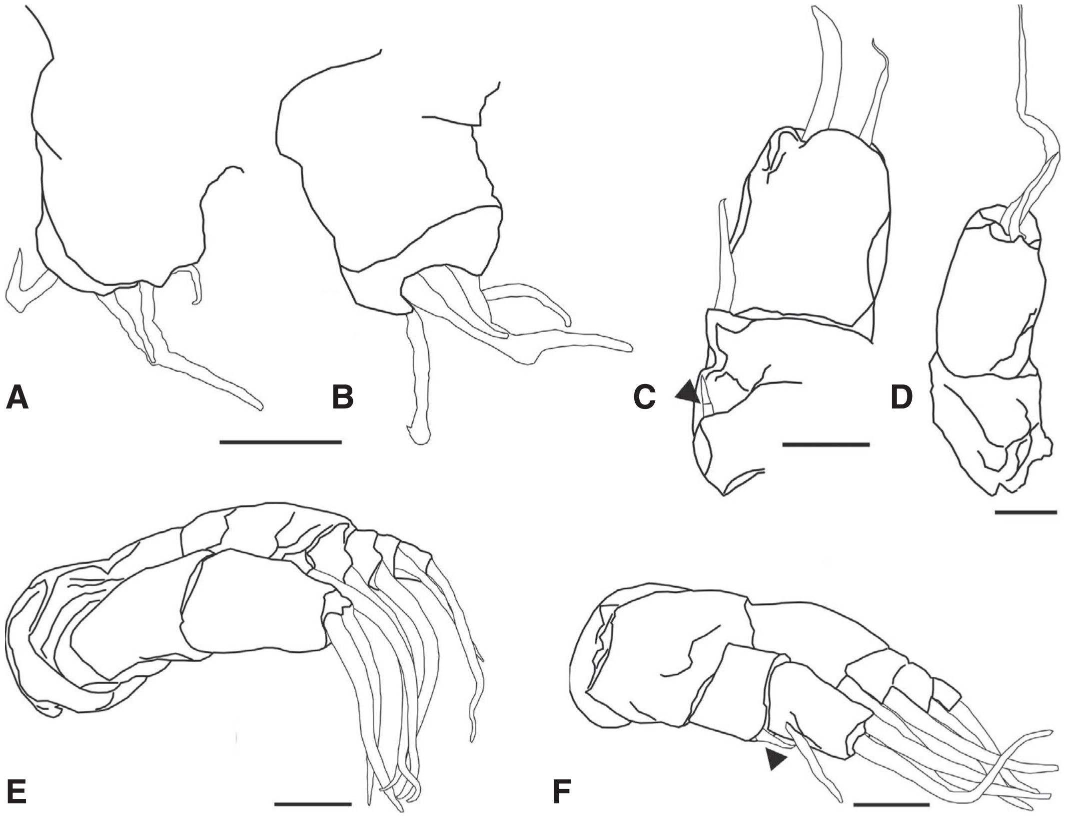

Fig. 8. Female paratype of *Acanthopleuricola sirenkoi* sp. nov. (ZSM A20190307) (A–B), and nauplii of *Acanthopleuricola sirenkoi* sp. nov. (ZSM A20190311) (C–F). **A-B.** Ventral and lateral views, respectively, of leg 5. **C-D.** Ventral and lateral views, respectively of antennule, short seta at first segment indicated in Fig. C. **E.** Posterior view of antenna. **F.** Posterior view of mandible, distal short seta at first endopodal segment indicated. All scale bars: 10 µm.

Mandible (Figs 7C, E, 8F) biramous, without gnathobasal structures on rectangular protopodal segments. Exopod 4-segmented, first segment elongated, following segments of similar length; each segment with one smooth seta. Endopod narrower than exopod, 2-segmented, first segment squarish, with inner distal corner showing a short smooth seta (Fig. 8F), second segment distinctly longer, with similar but slightly longer seta in the lower third plus two long smooth apical setae.

All nauplii are obviously of the same stage. While 9 were found freely in the host's mantle cavity, all other were clustered at the females' genital region but at one of the two openings only. The arrangement of the nauplii give the appearance of an egg-sac (Fig. 1J), and although neither fresh eggs, nor the egg membrane were traceable, a single egg strings to the genital pores were observed, which all lead to the assumption that egg masses had a previous multiseriate order.

Affinities. *Acanthopleuricola sirenkoi* sp. nov. resembles mesoparasitic species of the Chitonophilidae. The highly transformed female, the mesoparasitism in a polyplacophoran host as well as a branching rootlet system would support this family attribution. Huys et al. (2002) re-defined the family Chitonophilidae and according to their observations and the subsequent definition by Boxshall & Halsey (2004), the present material may not attribute to this family, due to the following characters: clear tagmosis in both sexes (vs lacking of segmentation in Chitonophilidae), lacking of frontal or lateral lobes (vs usually with such lobes in mesoparasitic Chitonophilidae), cyclopiform male with numerous appendages found free sitting near mouth cone of female (vs globulose males usually attached to genital region by means of antennae or maxillipeds as sole appendages in Chitonophilidae), male spermatophore sac probably lacking (vs spermatophore sacs present in Chitonophilidae). Further, all yet observed mesoparasites in

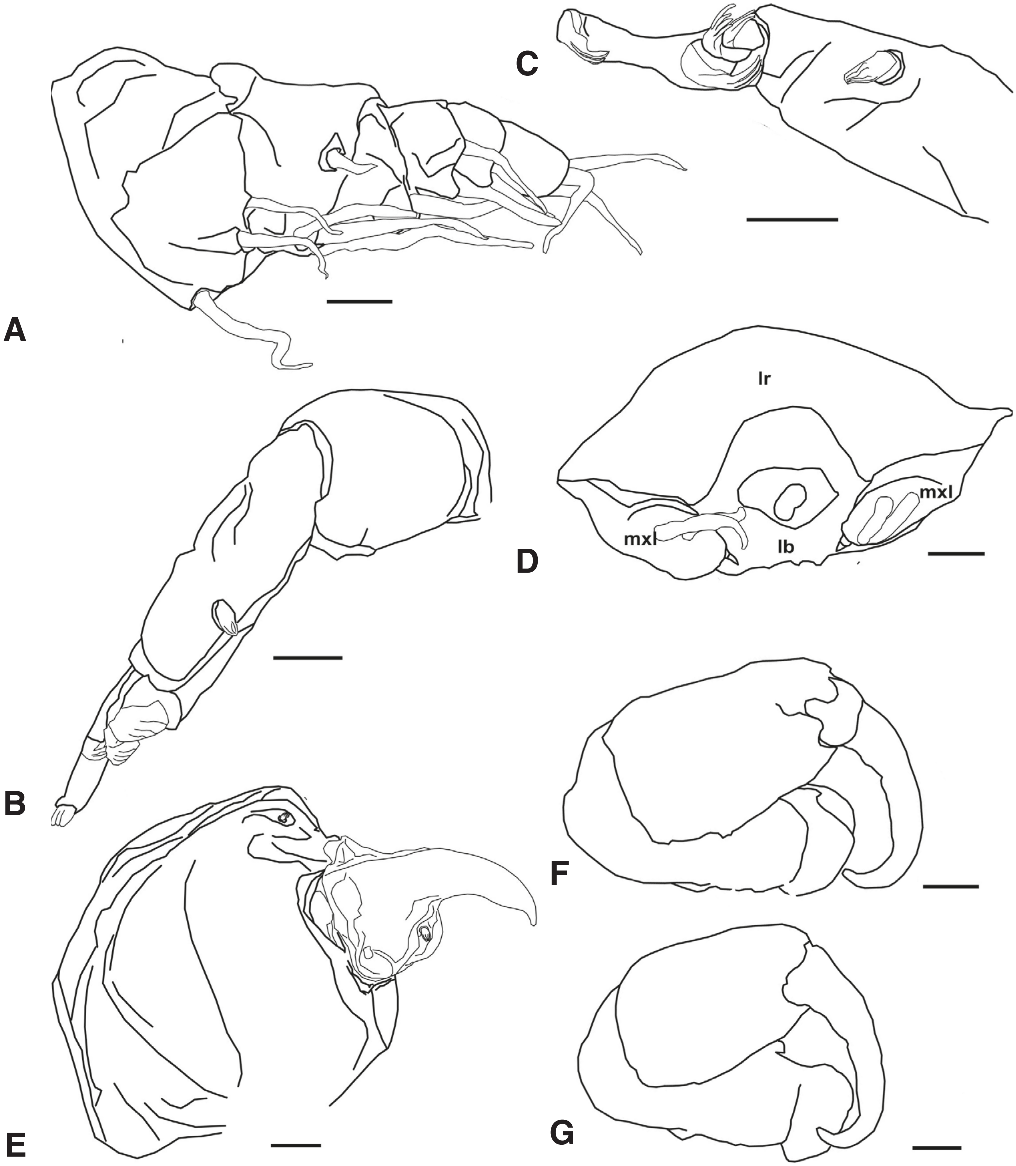

Fig. 9. Cephalic appendages of male paratype of *Acanthopleuricola sirenkoi* sp. nov. (ZSM A20190308). **A.** Posterior view of right antennule. **B.** Posterior view of left antenna. **C.** Posterior view of distal segments of right antenna. **D.** Postero-ventral view of oral appendages, short setae of maxillular exopodal elements indicated. **E.** Ventro-lateral view of maxilla, arrow head indicates an endite, arrow refers to an accessory setal element. **F–G.** Posterior and lateral views, respectively, of maxilliped. **lb**, labium (fused paragnaths); **lr**, labrum; **mxl**, maxillule.All scale bars: 10 µm.

polyplacophorans were, as the current species, found in the pallial cavity of their hosts, but *A. sirenkoi* sp. nov. unlike others does not pierce into the coelomic cavity. The microhabitat of this species seems to be completely different by gaining food (collagen) from the host's dorso-lateral muscle system.

In accordance with Boxshall & Halsey (2004) the most characters defining the new genus, are shared with the Philoblennidae, whose representatives however may also show some transitions towards other

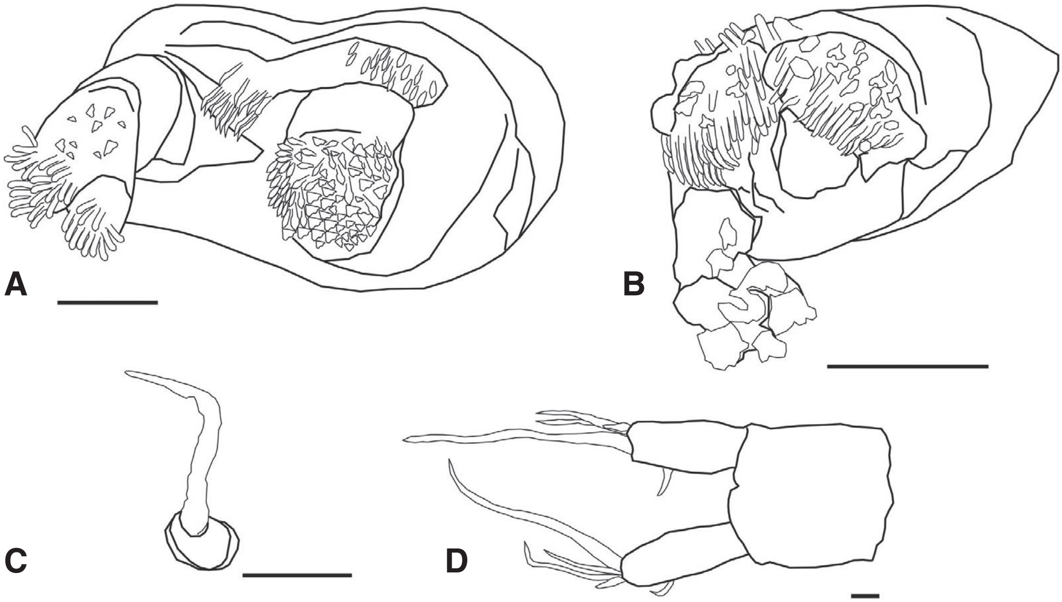

Fig. 10. Body appendages of male paratype of *Acanthopleuricola sirenkoi* sp. nov. (ZSM A20190308). **A.** Ventral view of left leg 1. **B.** Ventral view of left leg 2, please note that the exopod is distally manky. **C.** Anterior view of right leg 3. **D.** Dorsal view of last urosomite and caudal rami, short stubby spine indicated. All scale bars: 10 µm

families (e. g. Salmen et al. 2010). It was subsequently shown (Anton & Schrödl 2013) that the family under its current conception is paraphyletic and requires a restudy. Nevertheless, the family composition of Uyeno et al. 2016 is followed here, which is based on Boxshall & Halsey (2004). Regarding these authorities, the family comprises eleven species, within five genera, all known from gastropod hosts. Within this family *A. sirenkoi* sp. nov. shows a superficial similarity to *Nippoparasitus unoashicola* Uyeno, Ogasaka & Nagasawa, 2016, whose closest relative might be found in *Myzotheridion* Laubier & Bouchet, 1976 (Uyeno et al. 2016). Both taxa, however, show females with slender urosomes, which is completely integrated in the trunk in *Acanthopleuricola sirenkoi* sp. nov. Additionally, females of both monotypic genera have at least well developed antennae expressed, which are fused into the cephalosome in the new genus. These both female characters alone, make the new genus unique among the philoblennids.

Discussion

Due to the present study, a further polyplacophoran host, previously unknown to be utilized by parasitic copepods, is added to the lists, Schwabe et al. (2014, 2018) provided. As stated above, all yet mentioned parasites (if we disclaim the free living harpacticoids as parasites) belong to the Chitonophilidae only. Although *Acanthopleuricola sirenkoi* sp. nov. shows superficially some similarities with mesoparasitic forms of the Chitonophilidae, its morphology, as stated above, differs. In addition, almost all chitonophilids gain their food from the coelomic cavity of their hosts, with two exceptions: a single female specimen of the endoparasitic *Tesonesma reniformis* Avdeev & Sirenko, 1994 and another, yet undescribed endoparasite "Chitonophilidae gen. sp. 2" (for both records see Schwabe et al. 2018), both found more or less associated to the host's dorso-ventral muscles. As Schwabe et al. (2018) failed to show evidence for nutrition in these particular taxa, the finding of the same pigmented substances in the endosoma of *Acanthopleuricola sirenkoi* sp. nov. that occur in the muscle collagen of the present host is of interest, as it suggests a different feeding strategy compared to the chitonophilids.

Following Bush et al. (1997) the prevalence of *Acanthopleuricola sirenkoi* sp. nov. within the sample of *Acanthopleura gemmata* (6 specimens) is 0.33. The parasite intensity ranges from three females (and an associated male) in one host to a single female in the other host specimen. Unfortunately, nothing is known about the host's abundance at the collection site, so the infection rate of the parasite remains unknown.

The copepod-infested *A. gemmata* (ZSM Mol 20170266) shows on the ventral girdle also several ribbon-shaped egg plates that strongly resembles what Morita (2018) figured for the commensal polyclad *Stylochoplana parasitica* Kato, 1935 and its host species *Liolophura japonica* (Lischke, 1873). It is assumed, that they originate from the whitish flatworm Strack (see introduction) earlier observed in this species, but no adult polyclad specimen could be detected.

According to Uyeno et al. (2016: table 1) philoblennids are known from gastropod hosts only, thus the present record from a polyplacophoran host may contribute to a better understanding of the biology of this molluscan associated group of copepods.

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