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Acanthochondria cyclopsetta Pearse, 1952 and *A. alleni* n. sp. (Copepoda; Cyclopoida; Chondracanthidae) from flatfish hosts of the U.S.A., with comments on the taxonomic position of *A. zebriae* Ho, Kim & Kumar, 2000 and *A. bicornis* Shiino, 1955 and the validity of *Pterochondria* Ho, 1973

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Abstract

A redescription of *Acanthochondria cyclopsetta* Pearse, 1952 (Copepoda; Chondracanthidae), hitherto reported only from the Mexican flounder, *Cyclopsetta chittendeni* Bean (Pleuronectiformes; Paralichthyidae), from Padre Island in the Gulf of Mexico, is presented based on female specimens from the spotfin flounder, *Cyclopsetta fimbriata* (Goode & Bean), collected off the coast of South Carolina, U.S.A. Furthermore, a description of the male of *A. cyclopsetta* is provided for the first time. *Acanthochondria alleni* **n. sp.** is also described based on specimens of both sexes collected from the fantail sole, *Xystreurys liolepis* Jordan & Gilbert (Pleuronectiformes: Paralichthyidae), caught in the Southern California Bight, U.S.A. These two species of *Acanthochondria* differ morphologically from their congeners by having a Type B-V antennule and elongate leg 2 rami (Type D), but can be distinguished from each other by differences in head shape, trunk shape, the relative size of the posterolateral processes of the trunk, the relative size of the abdominal somite, the insertion point of the caudal ramus, shape of the antennule tip, ornamentation of the antennal claw, ornamentation of the labrum, number of accessory teeth on the maxilliped claw, and ornamentation of legs 1 and 2 of the adult female. The taxonomic position of *Acanthochondria zebriae* Ho, Kim & Kumar, 2000 and *A. bicornis* Shiino, 1955 as well as the validity of the chondracanthid genus *Pterochondria* Ho, 1973 are also discussed.

Key words: taxonomy, parasite, Pleuronectiformes, Paralichthyidae, North America

Introduction

The chondracanthid copepod *Acanthochondria cyclopsetta* was cursorily described by Pearse (1952) based on only one adult female specimen removed from the Mexican flounder, *Cyclopsetta chittendeni* Bean, collected in the Gulf of Mexico off Padre Island, Texas, U.S.A. Ho (1971) re-examined the holotype of *A. cyclopsetta* but was unable to satisfactorily redescribe this species, as the type specimen was mounted on a slide in balsam. Ho concluded, however, that *A. cyclopsetta* is a valid taxon and could be distinguished from other congeners by the relatively large body size (10.58 mm long), swollen and fleshy antennule, spinules along the posterior margin of the labrum, and two sets of long, attenuated bilobate legs. Kalman (2001, 2006a, b) subsequently attributed her adult female chondracanthid specimens from the fantail sole, *Xystreurys liolepis* Jordan & Gilbert, caught in waters off southern California as *A. cyclopsetta* based on the information provided in Ho (1971). We recently examined in detail adult female chondracanthid specimens removed from the spotfin flounder, *Cyclopsetta fimbriata* (Goode & Bean), captured off the eastern seaboard of the U.S.A., which opportunely revealed that they are conspecific with *A. cyclopsetta* and, more importantly, the

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chondracanthid material reported in Kalman (2001, 2006a, b) as *A. cyclopsetta* indeed represent an undescribed species of *Acanthochondria* Oakley, 1927. The primary aims of this study are to provide: a) a thorough redescription of *A. cyclopsetta*, including the first description of the male, based on the new material collected from *C. fimbriata*; and b) a description of the new species from *X. liolepis*. Additionally, we utilize this opportunity to evaluate the taxonomic position of *Acanthochondria zebriae* Ho, Kim & Kumar, 2000 and *A. bicornis* Shiino, 1955 as well as the validity of the chondracanthid genus *Pterochondria* Ho, 1973.

Material and methods

Acanthochondria cyclopsetta specimens were collected from the branchial cavity wall of a single preserved *Cyclopsetta fimbriata* specimen housed in the collection of the Ichthyology Department of the California Academy of Sciences (CAS), San Francisco, California, U.S.A. Samples of *Xystreurys liolepis* were collected by a 7.6 m head-rope and 1.25 cm mesh cod-end otter trawl within the Southern California Bight during the Southern California Bight 1998 and 2003 Regional Marine Monitoring Surveys (Bight '98 and '03) (see Kalman 2001, 2006a, b).

Copepods were carefully removed from the hosts using fine-tipped forceps and preserved in 70% ethanol. Selected specimens were cleared in lactic acid for a minimum of 24 hr and then measured using a calibrated eyepiece micrometer. A subsample of the cleared specimens was dissected on a wooden slide (see Humes & Gooding 1964) and examined using a Nikon Labophot-2 compound microscope equipped with Phase Contrast. Drawings were made with the aid of a drawing tube, and morphological terminology follows Ho & Kim (1995) and Boxshall & Halsey (2004).

The holotype specimen of *A. cyclopsetta* (USNM 92664) deposited in the Department of Invertebrate Zoology of the National Museum of Natural History (USNM), Smithsonian Institution, Washington, D.C., U.S.A., was re-examined for comparative purposes. Vouchers of *A. cyclopsetta* collected in this study are deposited in the Department of Invertebrate Zoology and Geology of CAS. Type material and additional voucher specimens of *Acanthochondria alleni* **n. sp.** are deposited in the Crustacea Department of the Natural History Museum of Los Angeles County (LACM), Los Angeles, California, U.S.A., and Cabrillo Marine Aquarium (CMA), San Pedro, California, U.S.A.

Results

***Acanthochondria cyclopsetta* Pearse, 1952**
(Figs 1–4)

Material examined. 3 ♀ and 3 ♂ [1 ♀ with attached ♂, 1 ♀ with 2 attached ♂, and 1 ♀ without attached ♂] (CASIZ 180282), ex branchial cavity wall of 1 *Cyclopsetta fimbriata* (Goode & Bean) (170.2 mm SL; CAS Fish Catalogue No. SU 49886), from the northwest Atlantic Ocean (32°26′N, 79°13′W), off the coast of South Carolina, U.S.A., 4 February, 1940.

Redescription of adult female. Body (Figs 1A–B) divided into head, short neck, and large trunk. Total body length (from anterior margin of head to distal end of posterior processes on trunk) 5.67 mm; trunk width 2.33 mm (n = 1). Head composed of cephalosome only, about as long as wide. Neck region composed of first and second pedigers, former proportionately smaller than latter. Trunk composed of pedigers 3 and 4, delimited anteriorly from neck by transverse constriction, with pronounced mid-lateral constriction and pair of posterolateral processes; latter about 1.70 times as long as genito-abdomen. Genito-abdomen (Figs 1A–C) divisible as 2 tagmata by transverse constriction; anterior tagma (genital somite) about as long as posterior tagma (abdominal somite), former with ventral pair of genital apertures (usual mid-ventral pair of setae not observed); posterior tagma suboval, slightly narrower than genital somite, with dorsal pair of sensilla and anteroventral pair of caudal rami. Caudal ramus (Fig. 1C) spiniform, armed with 2 ventral setae, 1 dorsal seta, and 1 inner knob.

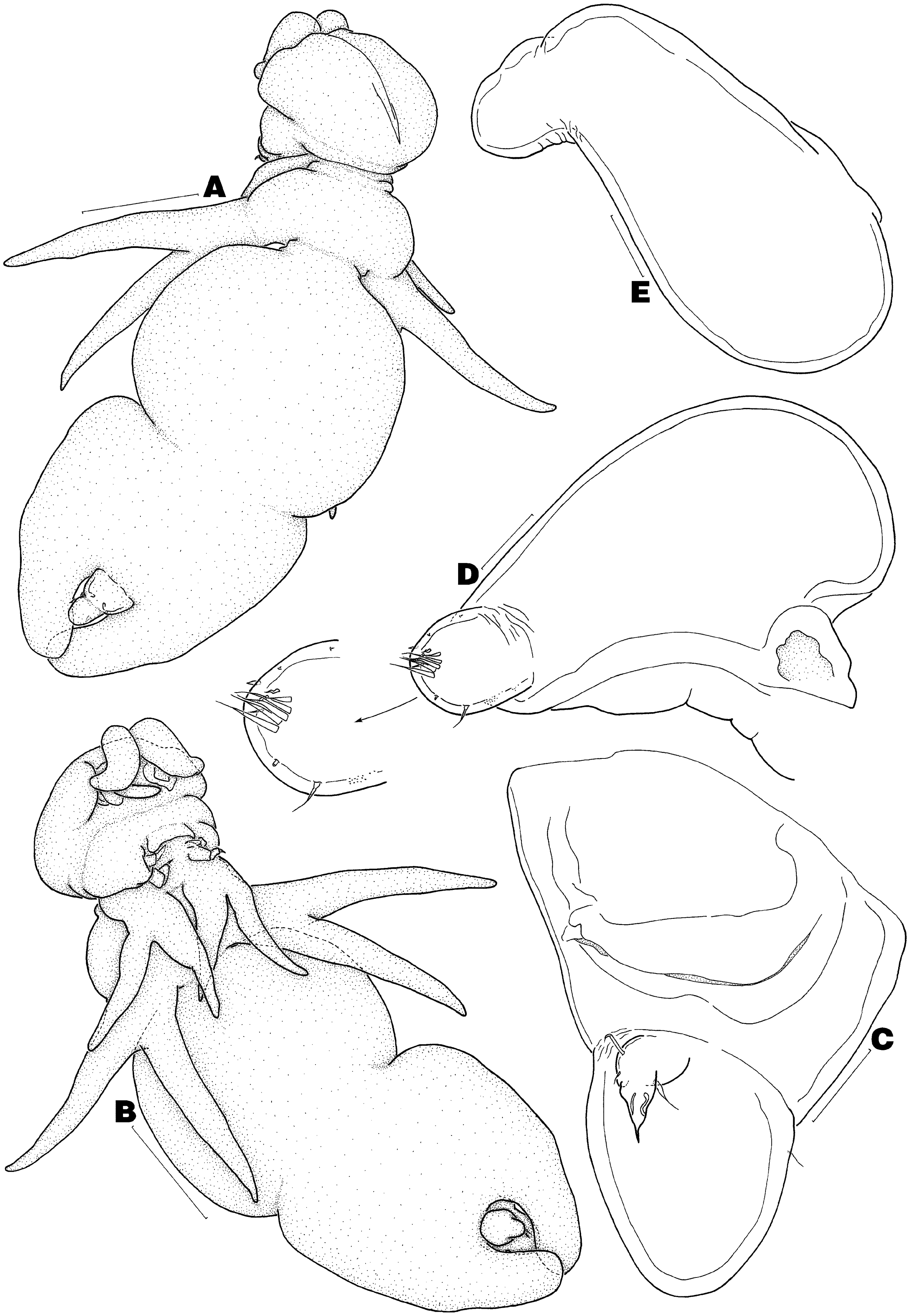

FIGURE 1. *Acanthochondria cyclopsetta* Pearse, 1952, adult female. (A) habitus, dorsal; (B) habitus, ventral; (C) genito-abdomen, lateral; (D) antennule, with enlarged view of distal end, dorsal; (E) antennule (armature elements omitted), anterior. Scale bars: A–B, 1.00 mm; C–E, 100 µm.

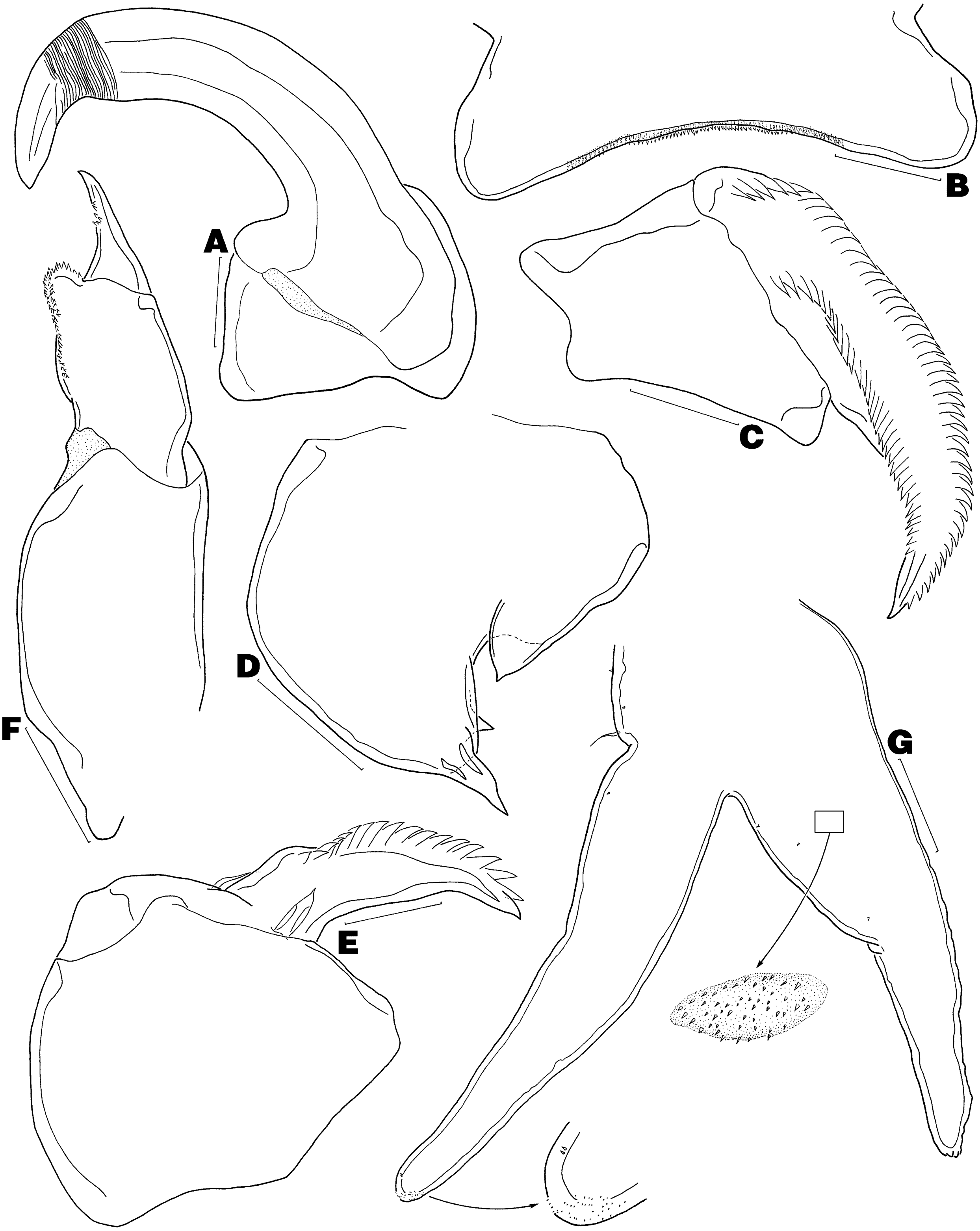

FIGURE 2. *Acanthochondria cyclopsetta* Pearse, 1952, adult female. (A) antenna, anterior; (B) labrum, ventral; (C) mandible, dorsal; (D) maxillule, dorsal; (E) maxilla, posterior; (F) maxilliped, posterior; (G) leg 1, with enlarged view of surface ornamentation and exopod tip, ventral. Scale bars: A–B, F, 100 µm; C–E, 50 µm; G, 200 µm.

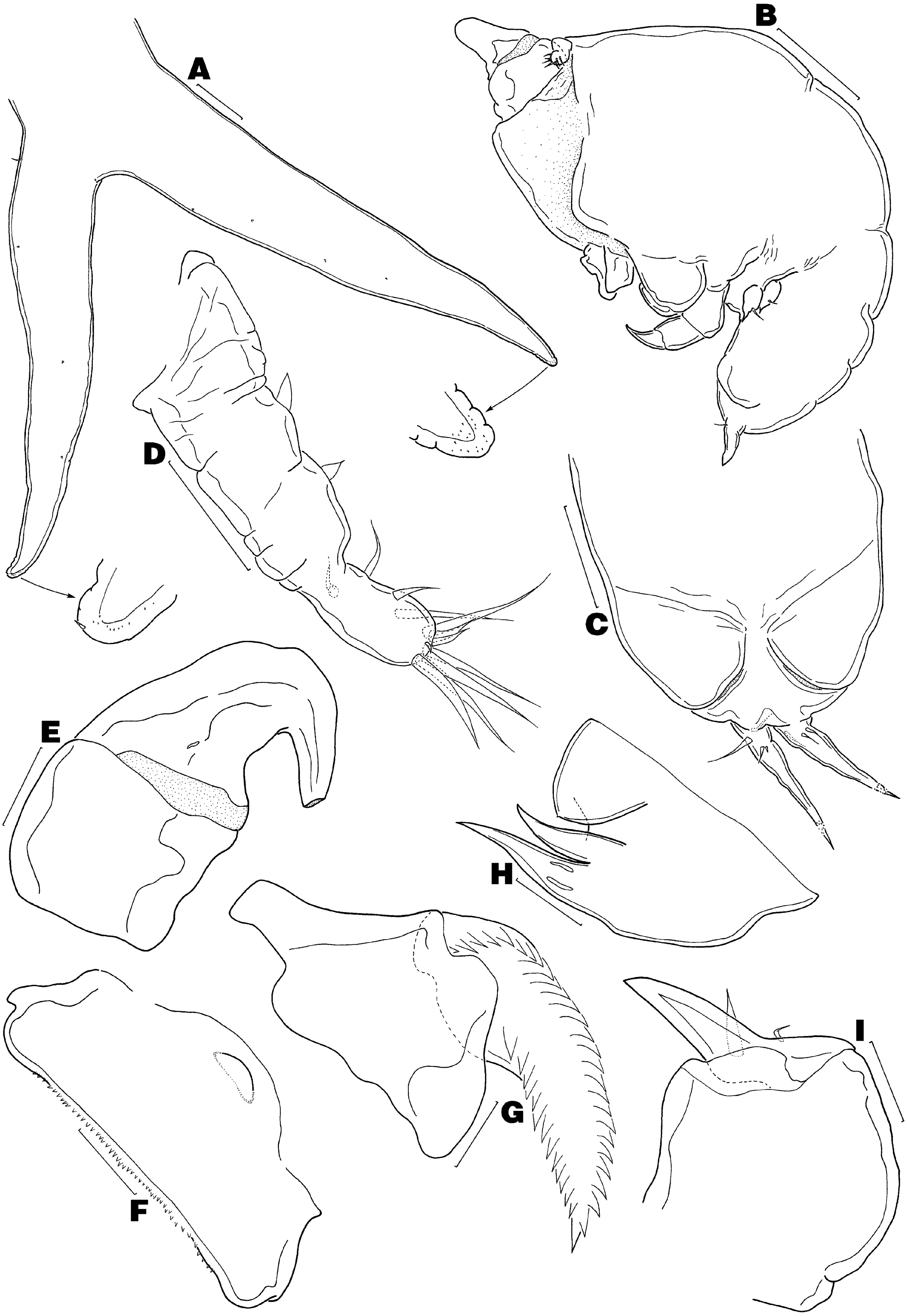

FIGURE 3. *Acanthochondria cyclopsetta* Pearse, 1952, adult female (A) and adult male (B–I). (A) leg 2, with enlarged view of each ramus tip, ventral (bullate patches omitted); (B) habitus, lateral; (C) genito-abdomen, ventral; (D) antennule, dorsal; (E) antenna, posterior; (F) labrum, ventral; (G) mandible, dorsal; (H) maxillule, ventral; (I) maxilla, anterior. Scale bars: A, 200 µm; B, 100 µm; C, 50 µm; D–F, I, 25 µm; G–H, 10 µm.

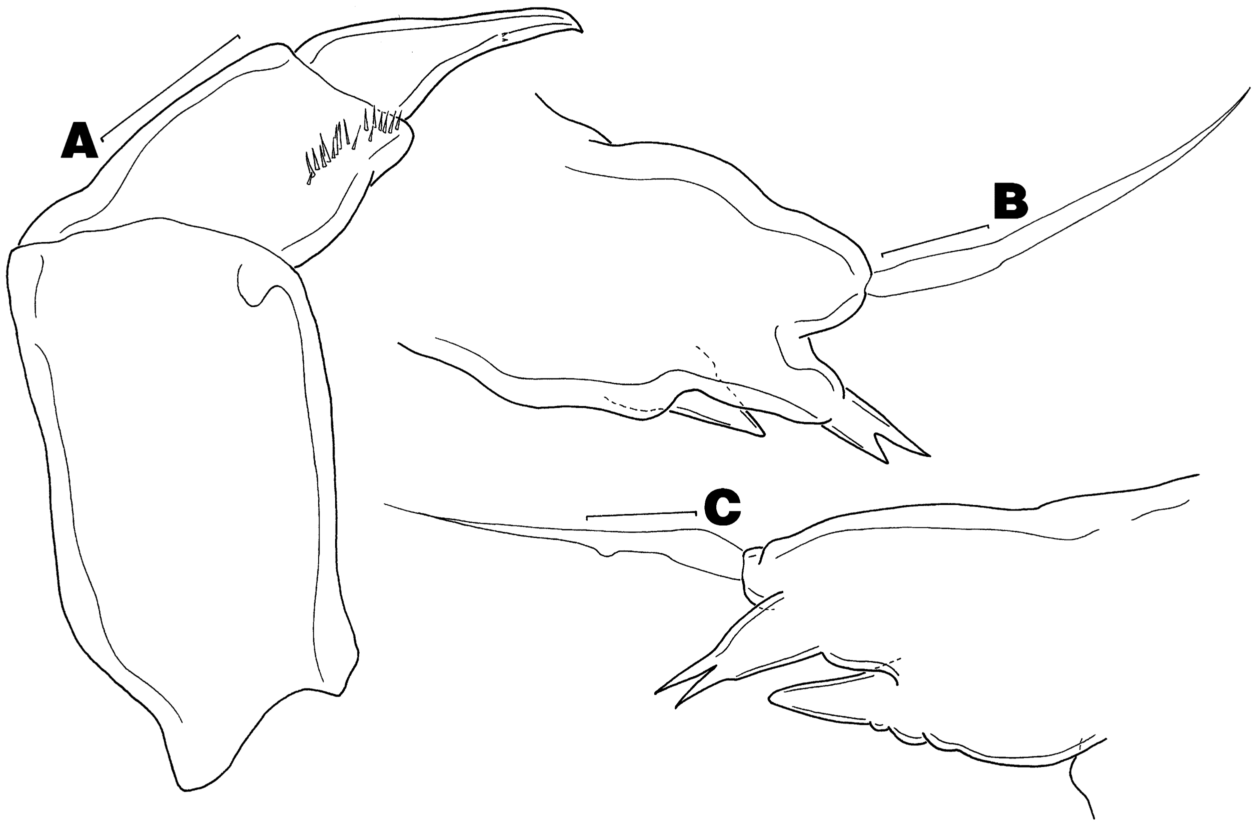

FIGURE 4. *Acanthochondria cyclopsetta* Pearse, 1952, adult male. (A) maxilliped, posterior; (B) leg 1, anterior; (C) leg 2, anterior. Scale bars: A, 25 µm; B–C, 10 µm.

Antennule (Figs 1D–E) unsegmented, distinctly separated into large fleshy base and narrower tip (Type B-V); latter ornamented with 2 patches of minute spinules along ventral margin and armed with 13 elements in total. Antenna (Fig. 2A) 2-segmented, composed of coxobasis and 1-segmented endopod; coxobasis short, unarmed; endopod forming powerful uncinate claw bearing transverse surface striations near tip. Labrum (Fig. 2B) with row of spinules along posterior margin. Mandible (Fig. 2C) 1-segmented, with apical falcate blade armed with 46 teeth along convex margin and 33 teeth along concave margin (n = 1). Paragnath not observed. Maxillule (Fig. 2D) unilobate, with 2 unequal apical elements and inner knob bearing acuate tip. Maxilla (Fig. 2E) 2-segmented, composed of syncoxa and basis; syncoxa robust, unarmed; basis forming claw-like process, armed with 2 unequal basal setae and 17 marginal teeth (n = 1). Maxilliped (Fig. 2F) 3-segmented, composed of elongate syncoxa, robust basis and short terminal claw (endopod); syncoxa naked; basis with 2 patches of denticles along inner margin; claw with multiple accessory teeth. Leg 1 (Fig. 2G) rami relatively slender and elongate; surface of protopod and rami ornamented with several spiniform setules and numerous bullate patches each furnished with minute spinules (only 1 bullate structure drawn in Fig. 2G); exopod with 2 vestigial setal elements and patch of minute spinules apically. Leg 2 (Fig. 3A) similar to leg 1, except slightly larger in size, exopod with only 1 reduced apical seta, and endopod with additional distal spinule patch.

Description of adult male. Body (Fig. 3B) 0.40–0.42 mm long (n = 2), divided into globose cephalothorax and ventrally flexed genito-abdomen; latter with pair of unarmed opercula, each covering genital aperture (Fig. 3C). Caudal ramus (Fig. 3C) spiniform, bears 3–4 basal setae and minute spinules distally (usual small inner knob not observed).

Antennule (Fig. 3D) unmodified, wrinkled, with armature of 1-1-2-2-8. Antenna (Fig. 3E) short and stout, with both segments unarmed (tip broken off in illustration). Labrum (Fig. 3F) with anteromedian knob. Mandibular blade (Fig. 3G) with 26 teeth on convex side and 13 teeth on concave side (n = 1). Maxillule (Fig.

3H) similar to that of female. Maxilla (Fig. 3I) as in female, except without teeth on basis. Maxilliped (Fig. 4A) as in female, except with fewer spinules on basis and fewer accessory teeth on claw. Legs 1 and 2 (Figs 4B–C) rudimentary, each with long outer subapical seta, distal lobe bearing apical bifurcate element, and inner conical process.

Remarks. We attribute our adult female specimens of the Chondracanthidae Milne Edwards, 1840 from *Cyclopsetta fimbriata* (Goode & Bean) as *Acanthochondria cyclopsetta* Pearse, 1952 based on similarities in the relative size of the posterolateral processes of the trunk (each process is more than 1.50 times as long as the genitoabdomen), shape and size of the abdomen (this somite is ovate and nearly as long as the genital somite), insertion of the caudal rami (each ramus is inserted at the proximal end of the abdomen), and shape of legs 1 and 2 (the rami of both legs are relatively slim and highly elongate). The shape of the head, trunk, and antennule of our specimens could not be accurately compared with those of the holotype since these features were slightly distorted by coverslip compression in the latter material. Similarly, the fine details of the head appendages and ornamentation of both leg pairs could not be precisely compared as the holotype is poorly preserved. Despite these shortcomings, we are confident our specimens are conspecific with *A. cyclopsetta* considering the former were also collected from the western Atlantic Ocean and from the same host genus, i.e. *Cyclopsetta* Gill, as the latter; both host species have overlapping geographic distributions (see Khidir *et al*. 2004); and our specimens share salient morphological features with *A. cyclopsetta* as noted above. Collection of new *A. cyclopsetta* specimens from the type host is, however, still warranted (we must add that we did not recover any specimens of *A. cyclopsetta* from four *Cyclopsetta chittendeni* Bean specimens housed in the Ichthyology Department at LACM). For distinguishing features of *A. cyclopsetta*, see the Remarks section of the following taxon.

Acanthochondria alleni **n. sp.**

(Figs 5–7)

Type material. Holotype ♀ (LACM CR2003-0490), allotype ♂ (LACM CR2003-0490.1), and 4 paratypes [1 ♀ with attached ♂ (LACM CR2003-0490.2); another ♀ with attached ♂ (CMA 2010.04.0010)], ex branchial cavity wall of 1 *Xystreurys liolepis* Jordan & Gilbert (269.6 mm SL), from 61 m depth at Station 4006 (33°51′N, 118°26′E), Santa Monica Bay, Southern California Bight, eastern Pacific Ocean, U.S.A., 11 August, 2003.

Other material examined. Santa Monica Bay, Southern California Bight, eastern Pacific Ocean, U.S.A.: 5 ♀, ex branchial cavity wall of 2 *X. liolepis* (140 and 180 mm SL), from 25 m depth at Station 2385 (33°54′N, 118°27′E), 4 August, 1998; 1 ♀, ex branchial cavity wall of *X. liolepis* (190 mm SL), from 13 m depth at Station 2306 (33°56′N, 118°27′E), 4 August, 1998; 1 ♀, ex branchial cavity wall of *X. liolepis* (130 mm SL), from 58 m depth at Station Z2 (33°54′N, 118°31′E), 18 November, 1998; 2 ♀, ex branchial cavity wall of 1 *X. liolepis* (320 mm SL), from 60 m depth at Station C9a (33°51′N, 118°26′E), 18 November, 1998; 3 ♀, ex branchial cavity wall of 2 *X. liolepis* (150 and 220 mm SL), from 56 m depth at Station C6 (33°55′N, 118°32′E), 23 November, 1998; 8 ♀ [6 are deposited (LACM CR 1999-052.1)], ex branchial cavity wall of 2 *X. liolepis* (130 and 150 mm SL), from 58 m depth at Station Z2 (33°54′N, 118°31′E), 11 May, 1999; 16 ♀ (15 with attached ♂) [15 ♀ and 14 ♂ are deposited: 2 ♀ each with attached ♂ (LACM CR2003-0490.3 and CR2003-0490.5); 13 ♀ (12 with attached ♂) (CMA 2010.04.0011–2010.04.0015)], ex branchial cavity wall of 7 *X. liolepis* (173.9–218.5 mm SL), from 61 m depth at Station 4006 (33°51′N, 118°26′E), 11 August, 2003; 2 ♀ each with attached ♂ (CMA 2010.04.0018), ex branchial cavity wall of 1 *X. liolepis* (170.8 mm SL), from 61 m depth at Station 4150 (33°52′N, 118°28′E), 11 August, 2003; 1 ♀, ex branchial cavity wall of *X. liolepis* (166.7 mm SL), from 44 m depth at Station 4185 (33°59′N, 118°48′E), 21 August, 2003; 2 ♀ each with attached ♂, ex branchial cavity wall of 1 *X. liolepis* (166.7 mm SL), from 45 m depth at Station 4185 (33°59′N, 118°48′E), 21 August, 2003; 1 ♀ with attached ♂, ex branchial cavity wall of *X. liolepis* (190.7 mm SL), from 53 m depth at Station 4230 (33°53′N, 118°29′E), 4 September, 2003.

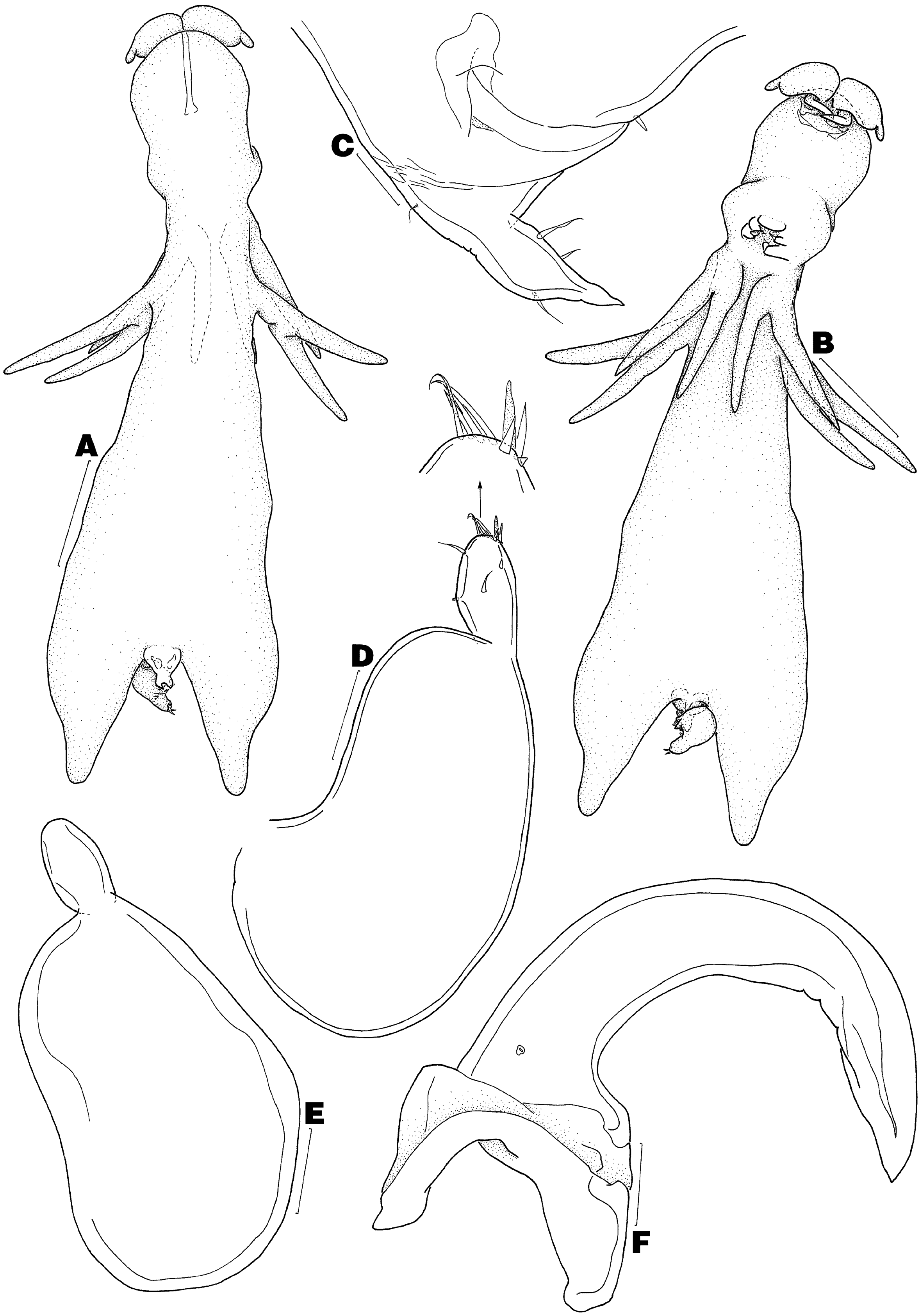

FIGURE 5. *Acanthochondria alleni* **n. sp.**, adult female. (A) habitus, dorsal; (B) habitus, ventral; (C) genito-abdomen, lateral; (D) antennule, with enlarged view of apical armature, ventral; (E) antennule (armature elements omitted), anterior; (F) antenna, posterior. Scale bars: A–B, 1.00 mm; C, F, 50 µm; D–E, 100 µm.

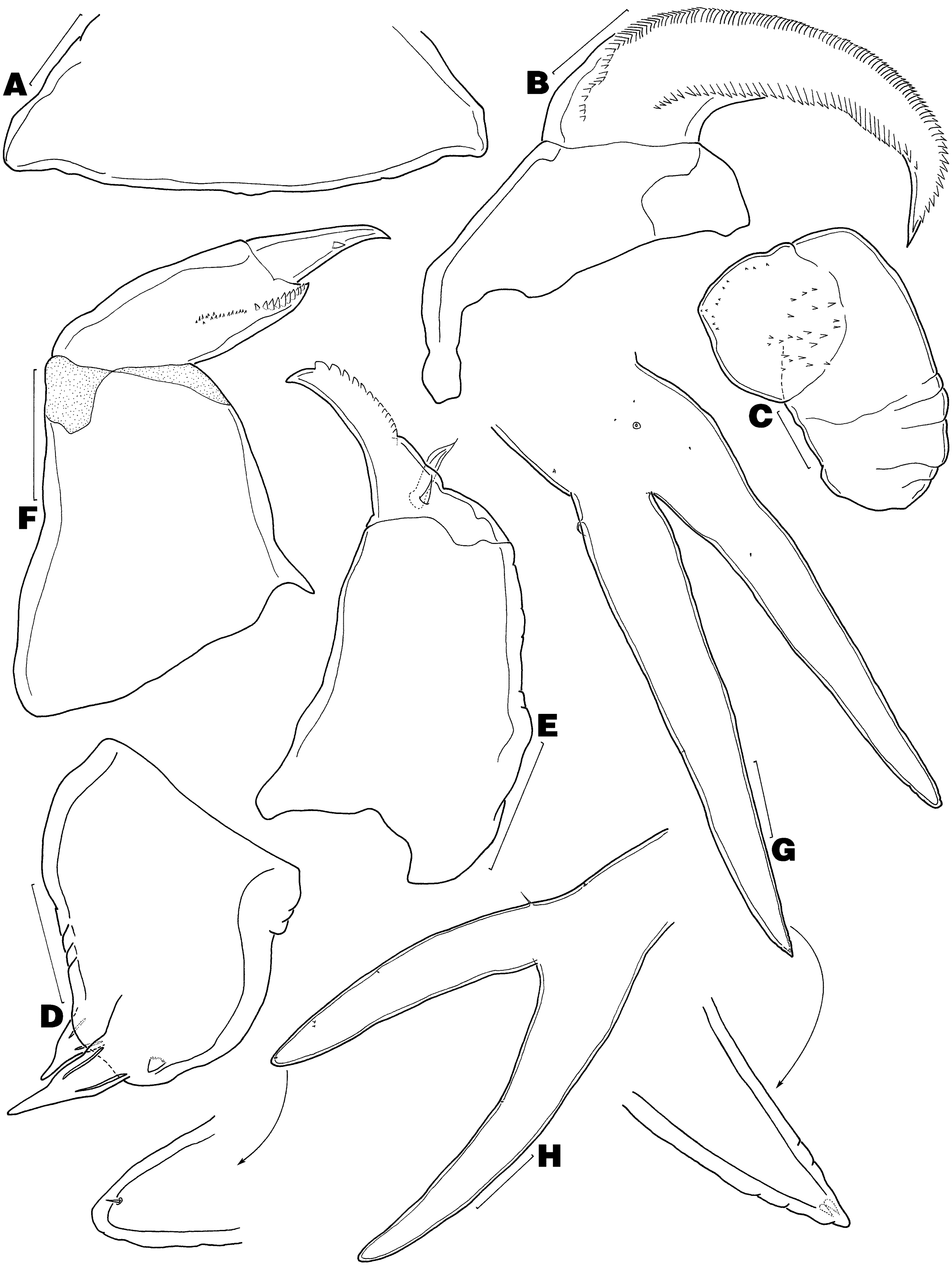

FIGURE 6. *Acanthochondria alleni* **n. sp.**, adult female. (A) labrum, ventral; (B) mandible, dorsal; (C) paragnath; (D) maxillule, dorsal; (E) maxilla, anterior; (F) maxilliped, posterior; (G) leg 1, with enlarged view of exopod tip, ventral; (H) leg 2, with enlarged view of exopod tip, ventral. Scale bars: A, E–F, 50 µm; B, D, 25 µm; C, 10 µm; G–H, 200 µm.

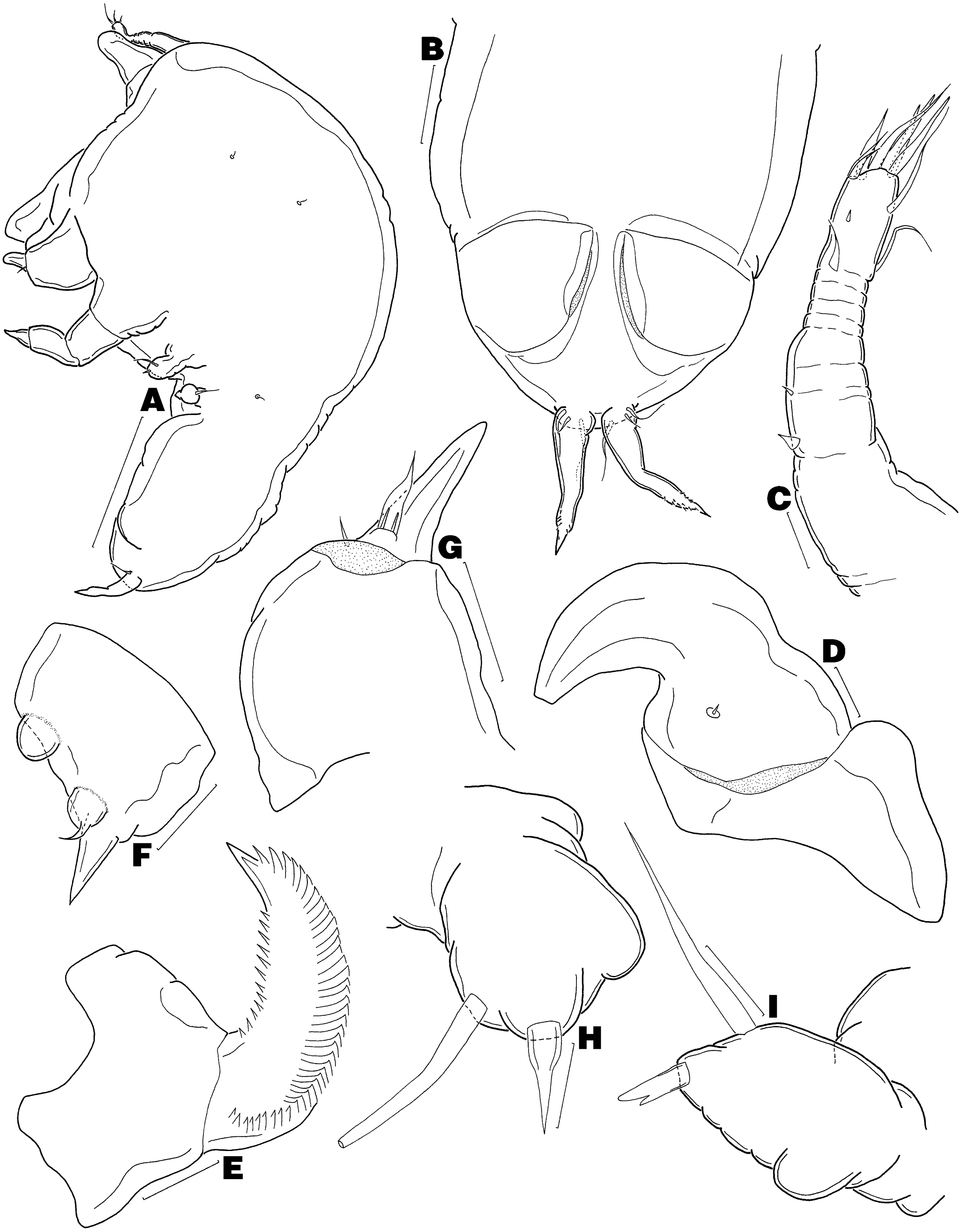

FIGURE 7. *Acanthochondria alleni* **n. sp.**, adult male. (A) habitus, lateral; (B) genito-abdomen, ventral; (C) antennule, anteroventral; (D) antenna, posterior; (E) mandible, dorsal; (F) maxillule, ventral; (G) maxilla, posterior; (H) leg 1, posterior; (I) leg 2, inner. Scale bars: A, 100 µm; B, G, 25 µm; C–F, H–I, 10 µm.

Oceanside Shelf, Southern California Bight, eastern Pacific Ocean, U.S.A.: 2 ♀ each with attached ♂ (CMA 2010.04.0011), ex branchial cavity wall of 1 *X. liolepis* (209.3 mm SL), from 32 m depth at Station A-14-S (32°57′N, 117°17′E), 4 September, 2003.

San Pedro Shelf, Southern California Bight, eastern Pacific Ocean, U.S.A.: 3 ♀ each with attached ♂ [all deposited: 1 ♀ with attached ♂ (LACM CR2003-0490.4); 2 ♀ each with attached ♂ (CMA 2010.04.0016)], ex branchial cavity wall of 1 *X. liolepis* (164.3 mm SL), from 34 m depth at Station 4154 (33°37′N, 118°04′E), 26 August, 2003; 1 ♀ with attached ♂ (LACM CR2003-022.1), ex branchial cavity wall of *X. liolepis* (208.6 mm SL), from 41 m depth at Station 4113 (33°35′N, 117°58′E), 27 August, 2003; 1 ♀ (CMA 2010.04.0017), ex branchial cavity wall of *X. liolepis* (207.1 mm SL), from 33 m depth at Station 4241 (33°36′N, 118°02′E), 27 August, 2003.

Description of adult female. Body (Figs 5A–B) divided into head, neck, and large trunk. Average body length (from anterior margin of head to distal end of posterior processes on trunk) 6.95 mm (5.75–7.45 mm); average trunk width 1.85 mm (1.53–2.25 mm) (n = 7). Head composed of cephalosome only, about 1.4 times longer than wide. Neck region composed of first and second pedigers, about as long as head. Trunk composed of pedigers 3 and 4, indistinguishably fused to neck, flask-shaped, with pair of posterolateral processes; latter about 3 times as long as genito-abdomen. Genito-abdomen (Figs 5A–C) divisible as 2 tagmata by transverse constriction; genital somite with ventral pair of genital apertures and mid-ventral pair of spiniform setae; abdominal somite short, considerably narrower than genital somite, with dorsal pair of sensilla and apical pair of caudal rami. Caudal ramus (Fig. 5C) spiniform, armed with 2 ventral setae and 1 dorsal seta (usual inner knob not observed).

Antennule (Figs 5D–E) distinctly separated into large fleshy base and narrow tip (Type B-V); latter armed with 12 elements in total. Antenna (Fig. 5F) 2-segmented, composed of coxobasis and 1-segmented endopod; coxobasis short, unarmed; endopod forming powerful uncinate claw bearing proximal pore. Labrum (Fig. 6A) naked. Mandible (Fig. 6B) 1-segmented, with apical falcate blade armed with 106 teeth along convex margin and 41 teeth along concave margin (n = 1). Paragnath (Fig. 6C) lobate, with 2 proximal groups of spinules. Maxillule (Fig. 6D) unilobate, with 2 unequal apical elements and small outer knob. Maxilla (Fig. 6E) 2-segmented, composed of syncoxa and basis; syncoxa robust, unarmed; basis forming claw-like process, armed with 2 unequal basal setae and 14 marginal teeth (n = 1). Maxilliped (Fig. 6F) 3-segmented, composed of stout syncoxa, relatively thinner basis and short terminal claw (endopod); syncoxa naked; basis with 2 groups of denticles along inner margin; claw with 1 accessory tooth. Leg 1 (Fig. 6G) with elongate rami and several spiniform setules; exopod with 2 rudimentary apical elements. Leg 2 (Fig. 6H) similar to leg 1, except exopod with only 1 reduced apical seta.

Description of adult male. Body (Fig. 7A) composed of large cephalothorax and narrower genito-abdomen; latter with pair of unarmed opercula, each covering genital aperture (Fig. 7B); average body length 0.39 mm (0.36–0.42 mm) (n = 3). Caudal rami (Fig. 7B) spiniform, each with 3 basal setae and minute spinules apically (usual small inner knob not observed).

Antennule (Fig. 7C) unmodified, with multiple surface annulations and armature of 1-1-2-2-7. Antenna (Fig. 7D) stout, with unarmed coxobasis and uncinate claw (tip broken off in illustration) bearing 1 minute seta. Mandibular blade (Fig. 7E) with 42 teeth on convex side and 12 teeth on concave side (n = 1). Maxillule (Fig. 7F) lobate, with 2 apical elements (1 pointed and 1 with globose base and setiform tip) and inner rounded knob. Maxilla (Fig. 7G) as in female, except without teeth on basis. Maxilliped (not figured) as in female. Legs 1 and 2 (Figs 7H–I) rudimentary, each with 1 naked mid-lateral seta, distal lobe armed with 1 apical seta (apically bifurcate in leg 2), and rounded inner process.

Variability. One adult female (LACM CR2003-0490.5) from Santa Monica Bay, Station 4006, 11 August, 2003 sample with endopod on left leg 2 reduced to a rounded lobe. Another adult female from same collection (but not deposited) lacking exopod on left leg 1. Adult male (not deposited) from Santa Monica Bay, Station 4230, 4 September, 2003 sample with 2 teeth along outer distal margin of left maxillary basis.

Etymology. This species is named in honor of Dr. M. James Allen, an expert on the taxonomy and ecology of southern California marine fishes, particularly those of the order Pleuronectiformes.

Remarks. *Acanthochondria alleni* **n. sp.** resembles *A. soleae* (Krøyer, 1838), *A. elongata* (Bassett-Smith, 1898) and *A. cyclopsetta* Pearse, 1952 in having relatively slim and elongate rami on legs 1 and 2 of the adult female; all four species are also parasitic on flatfish hosts. The new species can be distinguished from those species, except *A. cyclopsetta*, by having a Type B-V antennule in the adult female. *Acanthochondria alleni* **n.**

sp. differs from *A. cyclopsetta* by having a head that is longer than wide (Figs 5A–B) (vs. head about as long as wide (Figs 1A–B)), a flask-shaped trunk lacking a mid-lateral constriction (Figs 5A–B) (vs. linguiform trunk with a prominent mid-lateral constriction (Figs 1A–B)), a relatively longer pair of posterolateral processes on the trunk (each process is about 3 times vs. slightly more than 1.5 times longer than the genito-abdomen (cf. Figs 5A–B and 1A–B)), a considerably shorter abdominal somite relative to the genital somite (Fig. 5C) (vs. nearly as large as genital somite (Fig. 1C)), caudal rami inserted terminally on the abdominal somite (Fig. 5C) (vs. inserted proximally on the abdominal somite (Fig. 1C)), a relatively narrower tip on the antennule (cf. Figs 5D–E and 1D–E), a naked antennal claw (Fig. 5F) (vs. surface striations present near the tip (Fig. 2A)), a naked labrum (Fig. 6A) (vs. spinular row present along posterior margin (Fig. 2B)), only 1 accessory tooth on the maxilliped claw (Fig. 6F) (vs. with multiple accessory teeth (Fig. 2F)), and relatively naked legs 1 and 2 (Figs 6G–H) (vs. numerous bullate patches present, each bearing minute spinules (Fig. 2G)) in the adult female.

Acanthochondria alleni **n. sp.** is, to the best of our knowledge, the only parasitic copepod reported from *Xystreurys liolepis* Jordan & Gilbert, a paralichthyid flatfish species distributed from Monterey Bay, California, U.S.A., to the Gulf of California, Mexico (Miller & Lea 1972). Furthermore, this parasite species is probably host specific to *X. liolepis* as it has not been found on 14 other pleuronectiform species collected within the Southern California Bight (see Kalman 2006a, b). In contrast, *A. cyclopsetta* appears to be host specific to the paralichthyid flatfish genus *Cyclopsetta*, particularly those species, viz. *C. chittendeni* and *C. fimbriata*, occurring in the western central Atlantic Ocean (see Khidir *et al*. 2004). Sampling of the two *Cyclopsetta* species that are known to occur in the eastern central Pacific Ocean, namely *C. panamaensis* (Steindachner) and *C. querna* (Jordan & Bollman), are needed to determine whether or not *A. cyclopsetta* also occurs in other geographic regions.

Discussion

The genus *Acanthochondria* is presently characterized by the absence of outgrowths on the head and trunk (with the exception of the paired posterolateral processes on the latter tagma) and presence of two pairs of modified bilobate legs in the adult female (Kabata 1979, 1984; Ho & Kim 1995). Furthermore, the adult male typically has a relatively well-developed antennule armed with several setae along the anterior margin plus a group of setae at the distal end and two sets of reduced legs that are represented by a distinct lobe armed with a long outer seta and one or more apical elements which tend to be proximally fused to the lobe. Among the 49 valid species of *Acanthochondria* (see Østergaard 2003; Kalman 2003; Alves *et al*. 2003; Braicovich & Timi 2009), including *A. alleni* **n. sp.** described herein, the following two species do not conform to the morphological criteria of this genus as described above.

(1) *A. zebriae* Ho, Kim & Kumar, 2000

Acanthochondria zebriae was originally described by Ho *et al*. (2000) based on 24 adult and three juvenile females plus 19 adult males collected from the gill filaments of Indian zebra sole, *Zebrias synapturoides* (Jenkins), caught off the coast of Kerala, India. According to Ho *et al*. (2000), this species is characterized by having the endopod on both legs 1 and 2 reduced to a small knob in the female, a subchelate female maxilliped, and a male with leg 1 reduced to a spiniform seta and leg 2 absent. We must also add that the absence of setae on the caudal ramus, reduction of the antennule to a simple seta, presence of teeth on the maxillary basis, and the dorsally-directed maxilliped claw (rather than parallel with the main axis of the basis) of the male are also unique for this *Acanthochondria* species. This combination of apomorphic features exhibited by *A. zebriae* is clearly divergent from the diagnostic features of *Acanthochondria* given above, but is, on the other hand, congruent with that of *Heterochondria* Yü, 1935 (see Ho 1970; Østergaard 2003). One major difference between *A. zebriae* and the six valid species of *Heterochondria* is, however, the absence of posterolateral processes on the trunk in the latter species. Despite the fact that the presence/absence of trunk processes has been historically used to define some chondracanthid genera, e.g. *Chondracanthus* Delaroche, 1811 vs. *Acanthochondria*, we believe it is premature at this point in time to establish a new genus for *A.*

zebriae based on this single character difference from species of *Heterochondria*. As such, we believe it is appropriate to slightly modify the generic diagnosis of *Heterochondria* to include "trunk with or without posterolateral processes" to accommodate the inclusion of *A. zebriae*. *Heterochondria zebriae* (Ho, Kim & Kumar, 2000) **comb. nov.** resembles *H. pillaii* Ho, 1970 in having a relatively elongate exopod and a reduced, nipple-like endopod on legs 1 and 2 of the female. The former species can be distinguished from the latter, however, by having: a) tubercles on the antennal claw, an apical seta on the endopod of legs 1 and 2 and a pair of posterolateral processes on the trunk in the female; and b) the antennule reduced to a simple seta and the antennal claw furnished with a proximal conical process in the male.

(2) *A. bicornis* Shiino, 1955

Acanthochondria bicornis was originally described by Shiino (1955) based on a total of nine specimens (five adult females and four adult males) collected from the gill arches of two scorpaeniform fishes, *Helicolenus dactylopterus dactylopterus* (Delaroche) (as *Helioclenus* [sic] *dactylopterus*) and *Setarches longimanus* (Alcock), and one zeiform fish, *Zenion japonicum* Kamohara. The female of *A. bicornis* is unusual in that it has a pair of well-developed anterolateral processes on the head. One or more pairs of head outgrowths are also found in species of 24 other chondracanthid genera (Table 1). Indeed, Shiino (1955) explicitly stated that *A. bicornis* is an intermediate form between *Acanthochondria* and *Chondracanthus* due to the absence of trunk processes (one diagnostic feature of the former genus as stated above) and presence of head processes (a characteristic found in some members of the latter genus) in the female of this species. It is worth noting here that ten other *Acanthochondria* species also possess head outgrowths (but in the form of knobs or protrusions rather than processes): *A.cornuta* (Müller, 1776), *A. soleae* (Krøyer, 1838), *A. sicyasis* (Krøyer, 1863), *A.clavata* (Bassett-Smith, 1896), *A. rectangularis* (Fraser, 1920), *A. pingi* (Yü & Wu, 1932), *A. brevicorpa* Yü, 1935, *A. macrocephala* Gusev, 1951, *A. priacanthi* Shiino, 1964, and *A. fraseri* Ho, 1972. Ho & Kim (1995) and Østergaard (2003) recognized *A. bicornis* as a valid species of *Acanthochondria*, but Kabata (1979) considered it to be a doubtful member of *Acanthochondria*. We determined during the course of this investigation that *A. bicornis* shares several features, such as presence of prominent head processes and absence of trunk processes (except for the paired posterolateral processes) in the female, with *Pterochondria alatalongicollis* (Heegaard, 1940). The latter species was originally described as *Acanthochondria platycephali* forma *alata-longicollis* by Heegaard (1940) based on a single female removed from the branchial cavity wall of a sand flathead, *Platycephalus bassensis* Cuvier, collected in Oyster Harbour, Albany, Western Australia. Ho (1973) subsequently established a new genus, *Pterochondria*, to accommodate this chondracanthid species after having compared the type material of *A. platycephali* forma *alata-longicollis* with new specimens taken from the lower jaw of a 'common flathead' from South Australia. Østergaard (2003) considered *Pterochondria* as a valid chondracanthid genus. The diagnostic features of *Pterochondria*, as enumerated by Ho, are the presence of a greatly elongated neck region carrying two pairs of widely separated legs, presence of cephalic processes, and absence of trunk processes (except a pair of posterior processes) in the female. The establishment of this genus based on these features is rather dubious considering that: a) a greatly elongated neck region bearing two pairs of widely separated legs is also a characteristic of some species of *Acanthochondria* such as *A. diastema* Kabata, 1965 and *A. uranoscopi* Ho & Kim, 1995; b) some of the polytypic chondracanthid genera listed in Table 1 contain members with and without head outgrowths (e.g., *Chondracanthus*, *Chondracanthodes* Wilson, 1932, and *Pharodes* Wilson, 1935); and c) trunk processes, apart from the paired posterolateral processes, are also absent in the female of all the currently recognized species of *Acanthochondria*. Furthermore, the cephalic appendages and structure of the two leg pairs in the female and morphology of the male of *P. alatalongicollis* are identical to those of *Acanthochondria*. The erection of *Pterochondria* is, in our opinion, not justifiable. Thus by slightly expanding the generic diagnosis of *Acanthochondria* to include "head with or without outgrowths (in the form of processes, protrusions or knobs)", as previously implemented by Ho (1970), *A. bicornis* is retained in this genus. Likewise, *P. alatalongicollis* is transferred back to *Acanthochondria*, and *Pterochondria* is accordingly treated formally as a junior synonym of *Acanthochondria*.

TABLE 1. Genera of the Chondracanthidae Milne Edwards, 1840, excluding *Acanthochondria* Oakley, 1927, containing species that possess one or more pairs of head outgrowths (genera are given in chronological order and monotypic genera are indicated by the symbol †).

Genus	Example
Chondracanthus Delaroche, 1811	*C. merlucci* (Holten, 1802)
Strabax von Nordmann, 1864†	*S. monstrosus* von Nordmann, 1864
Pseudochondracanthus Wilson, 1908	*P. diceraus* Wilson, 1908
Juanettia Wilson, 1921	*J. cornifera* Wilson, 1921
Chondracanthodes Wilson, 1932	*C. tuberofurcatus* Kabata & Gusev, 1966
Humphreysia Leigh-Sharpe, 1934	*H. floreata* Leigh-Sharpe, 1934
Immanthe Leigh-Sharpe, 1934†	*I. campanulata* Leigh-Sharpe, 1934
Pharodes Wilson, 1935	*P. tortugensis* Wilson, 1935
Acanthocanthopsis Heegaard, 1945	*A. quadrata* Heegaard, 1945
Protochondracanthus Kirtisinghe, 1950	*P. alatus* (Heller, 1868)
Brachiochondria Shiino, 1957	*B. pinguis* Shiino, 1957
Pseudacanthocanthopsis Yamaguti & Yamasu, 1959	*P. bicornutis* (Shiino, 1960)
Prochondracanthopsis Shiino, 1960†	*P. quadricornutus* Shiino, 1960
Lateracanthus Kabata & Gusev, 1966	*L. quadripedis* Kabata & Gusev, 1966
Neobrachiochondria Kabata, 1966†	*N. quadrata* Kabata, 1969
Rhynchochondria Ho, 1967†	*R. longa* Ho, 1967
Praecidochondria Kabata, 1968	*P. setoensis* Izawa, 1975
Cryptochondria Izawa, 1971†	*C. tricaudata* Izawa, 1971
Pseudodiocus Ho, 1972†	*P. scorpaenus* Ho, 1972
Pterochondria Ho, 1973†	*P. alatalongicollis* (Heegaard, 1940)
Auchenochondria Dojiri & Perkins, 1979†	*A. lobosa* Dojiri & Perkins, 1979
Hoia Avdeev & Kazatchenko, 1985†	*H. hoi* Avdeev & Kazatchenko, 1985
Lagochondria Ho & Dojiri, 1988†	*L. nana* Ho & Dojiri, 1988
Apodochondria Ho & Dojiri, 1988†	*A. medusae* Ho & Dojiri, 1988

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