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*RENOCILA LORIAE* AND *R. RICHARDSONAE*  
(CRUSTACEA: ISOPODA: CYMOTHOIDAE),  
EXTERNAL PARASITES OF CORAL REEF FISHES  
FROM NEW GUINEA AND THE PHILIPPINES

Ernest H. Williams, Jr. and Lucy Bunkley-Williams

*Abstract.*—*Renocila loriae*, is described from *Apogon (Pristiapogon)* sp. collected at Motupore Island, Papua New Guinea; and *R. richardsonae*, is described from *Parupeneus macronema* collected at Jolo Island and a “snapper” collected at Bubuan Island, Philippines. *Renocila loriae* is distinguished by reduced posterolateral projections of the pereonites and long exopods of the uropods with acute apexes; and *R. richardsonae* by the combination of pereopods 1–2 with produced posterodistal corner of basis and pereopods 1–6 with knobs on distal outer margin of ischium. *Renocila richardsonae* is also the largest known species (>33 mm) of this genus. The diagnosis of the genus *Renocila* must be modified to incorporate the reduced projections in pereonites 6–7 of *R. loriae*, and the antenna 2 being longer than 1 in *R. colini*. Lutjanidae or Nemipteridae and Mullidae are new host families for *Renocila*, while the Apogonidae act as host to the most species ( $n = 5$ ) of *Renocila*. A key to the known species of *Renocila* is provided.

Williams & Williams (1980) established a circumtropical distribution for the genus *Renocila* by describing four new species from the Caribbean and the eastern Pacific. Bruce (1987b) further expanded the known range across Australia, and Williams & Williams (1987) extended the range up to the subtropical, northwest Pacific. The present study describes two new species from the western Pacific.

#### Materials and Methods

Materials and methods largely follow Williams & Williams (1987). Measurements are in mm unless otherwise stated. Some of the fish hosts (USNM 231172–74 and 40949) were collected with dynamite by the U.S. Bureau of Fisheries Albatross Philippine Expedition 1907–1909. A practice that is still destroying coral reefs in the Philippines.

#### *Renocila loriae*, new species

Fig. 1

*Type material.*—Holotype female (USNM 244233), allotype associated male (USNM 250995).

*Type host.*—*Apogon (Pristiapogon)* sp. (Apogonidae) 4.5 cm SL, 6.0 cm TL (USNM 320229).

*Type locality.*—Coral Sea, Motupore Island, southeast of Port Moresby, Papua New Guinea, 09°41'59"S 147°28'12"E, (Jul 1988).

*Attachment position.*—Attached on head (P. L. Colin, pers. comm.). Attachment wounds above both eyes on sides of head, larger (female) on right. Isopods were detached from the host when received.

*Description, holotype female.*—Total length 12.0 (11.3 excluding uropods), maximum width 6.0, with eyed embryos in brood pouch. No remnants of appendix masculina or penes lobes. Body elliptical.

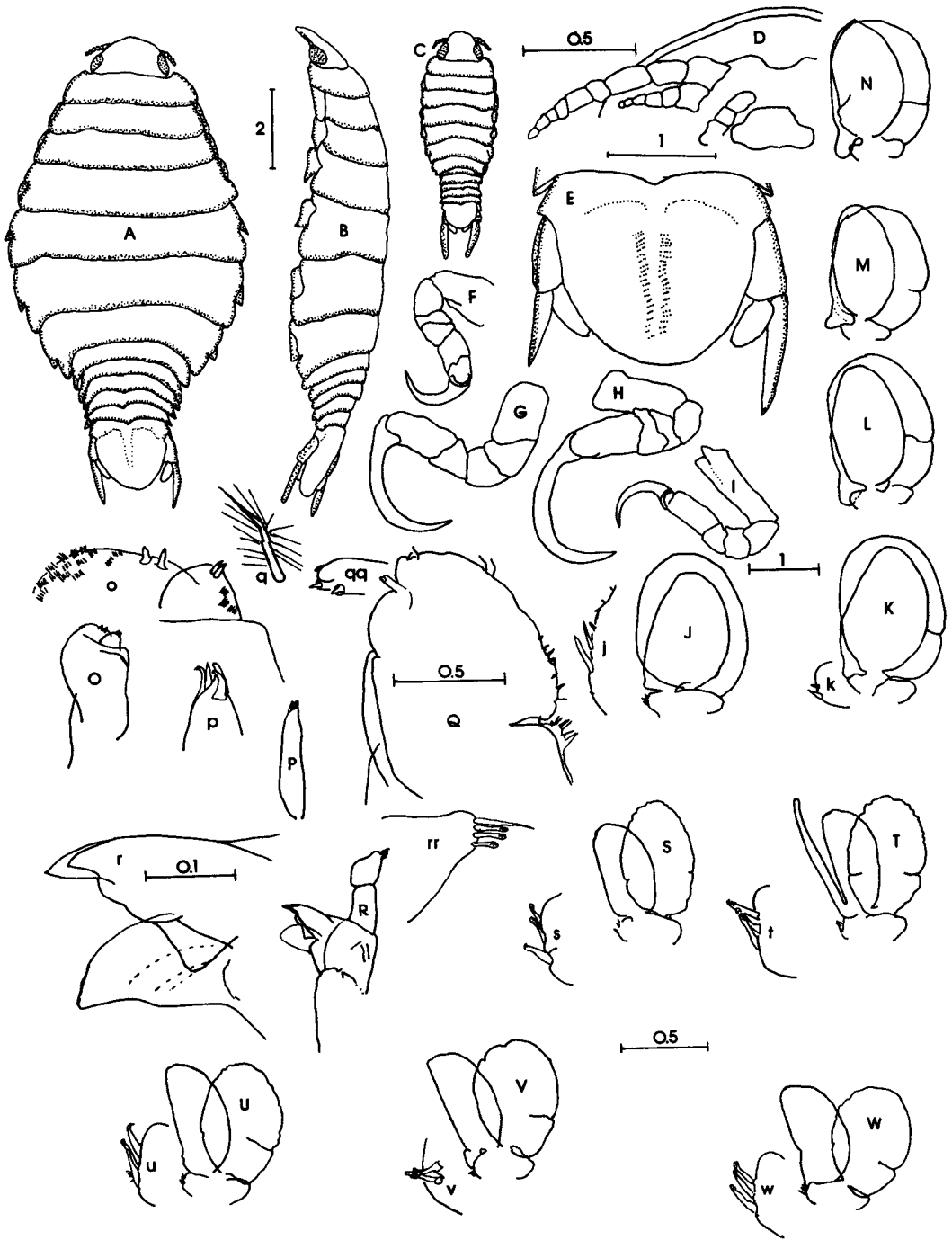


Fig. 1. A-W. *Renocila loriae*, new species (A-B, D-R = female holotype; C, S-W = male allotype) (Scale bars in mm; scale of A-C equal; scale of E-I equal; scale of J-N equal; scale of O-R equal; scale of o-r, qq, rr equal; and scale of S-W equal). A, Dorsal view; B, Lateral view; C, Dorsal view; D, Head, ventral view; E, Pleotelson and uropods, dorsal view; F, Pereopod 1; G, Pereopod 2; H, Pereopod 4; I, Pereopod 7; J, Pleopod 1; j, Seta of base of pleopod 1; K, Pleopod 2; k, Seta of base of pleopod 2; L, Pleopod 3; M, Pleopod 4; N,

Antennae 1, almost twice as long as antennae 2, 9-segmented, not reaching posterior border of head; antennae 2 5-segmented, very short, reaching third article of antennae 1. Anterior margin of head rounded, not flexed ventrally. Coxae of pereonites 4–7 projecting laterally. Posterolateral angle of pereonite 7 slightly produced. Pleonites 3–5 with pointed projection at middle of posterior border of segment. Pleotelson as wide as long. Exopods of uropods extending beyond posterior end of pleotelson, more than twice as long as endopods, apex acute. Pereopods without swelling of dactyls or lobate posterodistal corners of propodus. Dactyls increasing in length from 1 to 4–5 (which are equal) then decreasing to 7. Pleopods lamellar, base of 1–2 with few simple setae. Color, gray with diffuse black pigment spots. Posterior borders of all segments, anterior border of head, and lateral margins of uropods outlined by dark concentration of pigment spots. Pigment spots more diffuse on ventral surface.

*Allotype male*.—Total length 6.0 (5.0 without uropods), maximum width 2.0. Male similar to female, except smaller and with more narrow body, coloration similar. Appendix masculina approximately  $\frac{1}{4}$  longer than endopod of pleopod 2, almost as long as exopod, darkly pigmented, unlike remainder of pleopod. Base of each pleopod with 3 coupling setae. Penis lobes small, conical processes.

*Reproduction*.—Eyed embryos ( $n = 3$ ) from brood pouch of female. Typical oval body, rectangular head, eyes black. Total length 1.1, maximum width 0.5.

*Habitat and abundance notes*.—Shallow coral reef. This isopod is apparently not very common at Motupore Island (P. L. Colin,

pers. comm.). We were not able to find any additional specimens during 18 man-hours (11 scuba dives, EHW No. 1426–1436) of diving there 16–18 August 1988, although we examined thousands of cardinalfishes during day and night dives.

*Etymology*.—The name is in honor of Lori Colin, who helped in collecting this and other isopods from fishes in New Guinea.

*Remarks*.—The lack of posterolateral projections of pereonites 5–6, and slight projection of 7, of *R. loriae* separate it from all of the known species of *Renocila* and from Bruce's (1987b) definition of the genus. This character is important because it was one of the useful distinctions between the genera *Renocila* and *Anilocra*. Pereonites 6–7 of *R. loriae* are more similar to those found in species of *Anilocra*, than those of *Renocila*; however, this species otherwise conforms to the genus *Renocila*. The uropods of this species are similar to those of *R. heterozota* Bowman & Mariscal and *R. yamazatoi* Williams & Williams, except that the apex of the exopods is acute. The dark pigment stripes on the body and midposterior projections of the pleonites are similar to, but less intense than, those found in *R. bollandi* Williams & Williams.

*Renocila richardsonae*, new species  
Figs. 2–4

*Renocila ovata*: Richardson, 1910:22

*Renocila* sp. Bruce, 1987:169

*Specimens examined*.—Six specimens: 1 male and 1 female, 18 Sep 1909, Sulada Id. Dyn., U.S. Bureau of Fisheries Albatross Philippine Expedition 1907–1909 (USBFAPE), USNM 231173; USBFAPE 9095550B, N. Sulada Island, dynamite, 14

←  
Pleopod 5; O, Maxilla 2; o, Distal lobes of maxilla 2 with semilunar pectinate scales; P, Maxilla 1; p, Apex of maxilla 1; Q, Maxilliped; q, Seta from margin of maxilliped; qq, Apex of maxillipedal palp; R, Mandible & palp; r, Incisor process of mandible; rr, Apex of mandibular palp; S, Pleopod 1; s, Coupling seta of base of pleopod 1; T, Pleopod 2; t, Coupling seta of pleopod 2; U, Pleopod 3; u, Coupling seta of pleopod 3; V, Pleopod 4; v, Coupling seta of pleopod 4; W, Pleopod 5; w, Coupling seta of pleopod 5.

shots, 10–15 feet, 17 Sep 1909(?). 1 male and 1 female, 7 Mar 1908, Jolo Island, Philippines, *Pseudupeneus macronema*, 7 and  $\frac{3}{16}$  inches long, "In each the smaller isopod was on caudal peduncle and the larger on side of fin under soft dorsal.", USNM 231174; USBFAPE 9085174F, Jolo W of anchorage, dynamite, 4–10 feet; 5°58'N, 121°06'E. 1 male, 14 Feb 1908, Bubuan Island, southwest side of Island, off Jolo, Jolo Island, Philippines, Sulu Archipelago, Sulu Sea, "On tail of snapper," 06°03'07"N, 122°14'13"E, USNM 40949; USBFAPE 9085140B, vicinity of Jolo, dynamite, 8–20 feet; 6°11'N, 120°58'E. 1 female, 21 Sep 1909, Singaan Id. Dyn., USNM 231172; EUSBFAPE 9095562E, N Singaan Island between Jolo and Tawi Tawi, dynamite, 17 shots, 9–25 feet; 5°45'N 120°25'E.

*Type specimens.*—Holotype (female) USNM 231173, allotype (associated male) USNM 250607 (formerly USNM 231173); 4 paratypes USNM 40949, 231172, 231174.

*Type locality.*—Sulada Island, Philippines 05°50'N 120°47'E.

*Host.*—"Pseudupeneus macronema" was indicated as the host for specimens USNM 231174. This is probably the longbarbed goatfish, *Parupeneus macronema* (Lacepede) (Mullidae). Unfortunately, Fischer & Whitehead (1974) suggest that this fish does not occur in the Philippines. "Snapper" (Lutjanidae? Nemipteridae?) was noted as the host for specimen USNM 40949. All fishes deposited in the USNM Ichthyology Collection with similar localities and dates of USNM 40949 lacked damage indicating the attachment of an isopod.

*Attachment position.*—The USNM 231174 label records the male attached on the caudal peduncle of the host and the female forward of the male on the side of the host under the soft dorsal fin. The record also suggests that this was seen more than once, although only one pair of isopods was preserved. The USNM 40949 (Fowler 1931) record was from the tail of snapper. We did not observe these hosts. No damage

to the host, which could have served to substantiate the record, was noted on the labels or by Richardson (1910).

*Description, holotype female.*—Total length 35.2, maximum width 16.1. No remnants of appendix masculina or penes lobes present. Body rectangular. Antennae 1 7–8-segmented (7 segments in females with fully developed brood pouches, the proximal segment appears as if two segments have fused to make one large segment), reaching mid-length of pereonite 1 sometimes a little farther but never reaching posterior margin of pereonite; first 2 segments of antennae 1 broadened and flattened. Antennae 2 7–8-segmented, approximately  $\frac{2}{3}$  length of antennae 1; much thinner than antennae 1. Anterior margin of head straight. Coxae of pereonite 7 covered laterally by posterolateral projections of pereonite 6. Posterolateral angles of pereonites 6–7 produced, 7 covering lateral margins of pleonites 1–3 and extending posterior to anterior margin of pleotelson. Pleotelson wider than long. Uropods not extending to posterior end of pleotelson, exopod longer than endopod. Pereopods without swellings of dactyls or lobate posterodistal corners of propodus. Pereopods 1–2 (and 3 in one specimen) with projection of posterodistal corner of basis. Pereopods 1–6 with knobs on distal outer margin of ischium. Pereopods very gradually increasing in length from 1 to 6, 7 abruptly longer. No spines or setae present on any pereopods. Proximomedial lobe of endopods 3–5 of pleopods becoming progressively larger. Pleopods 3–4 with small folds on endopod, more pronounced on endopod of 5. No coupling setae on bases of pleopods. Color (in alcohol) uniform beige.

*Allotype male.*—Total length 18.0, maximum width 7.5. Similar to female, except smaller and with more narrow body shape, coloration similar. Projections on basis and ischium of pereopods lacking in the smaller two specimens. In the largest male, however, projections of the distal outer margin

of the basis of pereopods 1 and 2 are apparent, no swellings or projections on the ischium of the pereopods are noticeable. Pleopods lamellar, bases of 1–2 with coupling setae. Appendix masculina approximately  $\frac{2}{3}$  as long as endopod of pleopod 2. Penis lobes small, conical process.

*Other females.* —  $n = 2$ . Total length 31.9 & 33.4, maximum width 14.7 & 15.2. No remnants of appendix masculina or penes lobes present.

*Other males.* —  $n = 2$ . Total length 14.6 & 18.0, maximum width 5.6 & 7.5. Similar to allotype.

*Reproduction.* — Uneyed embryos from brood pouch of female (USNM 231172), not counted, as number remaining may be less than those originally present. Typical oval body, rectangular head. Total length 1.89–2.26 (1.99), maximum width 1.06–1.28 (1.11) ( $n = 10$ ).

*Habitat, relationship and association notes.* — Collected between 1.3 and 8.3 m depth apparently in coral reef areas. Pereopods, pleopods and portions of pereonite 7 were bitten off or damaged presumably by other fishes. Hydroids (Coelenterata: Hydroidea) and other encrusting organisms covered portions of the pleotelson, pleopods and pereonite 7.

*Etymology.* — The specific name is in honor of Harriet Richardson and her work with isopods.

*Remarks.* — *Renocila richardsonae* differs from all known species of *Renocila* by having pereopods 1–2 with projections on posterodistal corner of basis, pereopods 1–6 with knobs on distal outer margin of ischium, and by its large size.

The oostegites of pereonites 1–4 were fully formed in the female USNM 231174, while there were no oostegites on pereonites 5–7. This suggests that this female was in the process of molting when preserved, and that oostegites in this species form in a single molt.

The confirmed hosts for species of *Renocila* have been small coral reef fishes (Bruce

1987b). *Renocila bollandi* has been reported from scorpaenids, which are moderately-sized fishes, but has thus far only been collected from immature hosts (Williams & Williams 1987; unpubl. data). The 18.3 cm goatfish is a departure from this pattern.

Richardson (1910) assumed that the specimen she examined (USNM 40949) (Fig. 3A, B) was a male, possibly because the appendix masculina is approximately  $\frac{2}{3}$  the length of the endopod of pleopod 2. The specimen may be a male-female transitional since the pereopod projections of the female are beginning to develop in this specimen, and it seems to be intermediate in body shape between the three females (including Fig. 2A, B) and the two males (Fig. 2C, D). Actually, the sexual status of this specimen cannot be determined without a series of specimens to study and/or histological examination of the reproductive organs.

## Discussion

The genus *Renocila* is characterized by having antenna 1 longer and broader than antenna 2 (Bruce 1987b) and the posterolateral margins of pereonites 6–7 produced (Bowman & Mariscal 1968, Bruce 1987b). Antenna 2 of *R. colini* Williams & Williams is longer and only slightly narrower than antenna 1 (Williams & Williams 1980); and the posterolateral margins of the pereonites of *R. lorae* are not produced (slightly in pereonite 7). These two species are otherwise in agreement with the genus, and they should remain in *Renocila*. These characters should be modified in the diagnosis of the genus.

Size should never be used as a diagnostic character, but size alone once conveniently distinguished members of the genera *Renocila* and *Anilocra*. Our description of *A. partiti* (Williams & Williams 1981, 12–16 mm) and the description of *A. apogonae* (Bruce 1987a, 11.5–19.5 mm) and *A. pomacentri* (Bruce 1987a, 11.0–12.5 mm) defined species of *Anilocra* that were as small

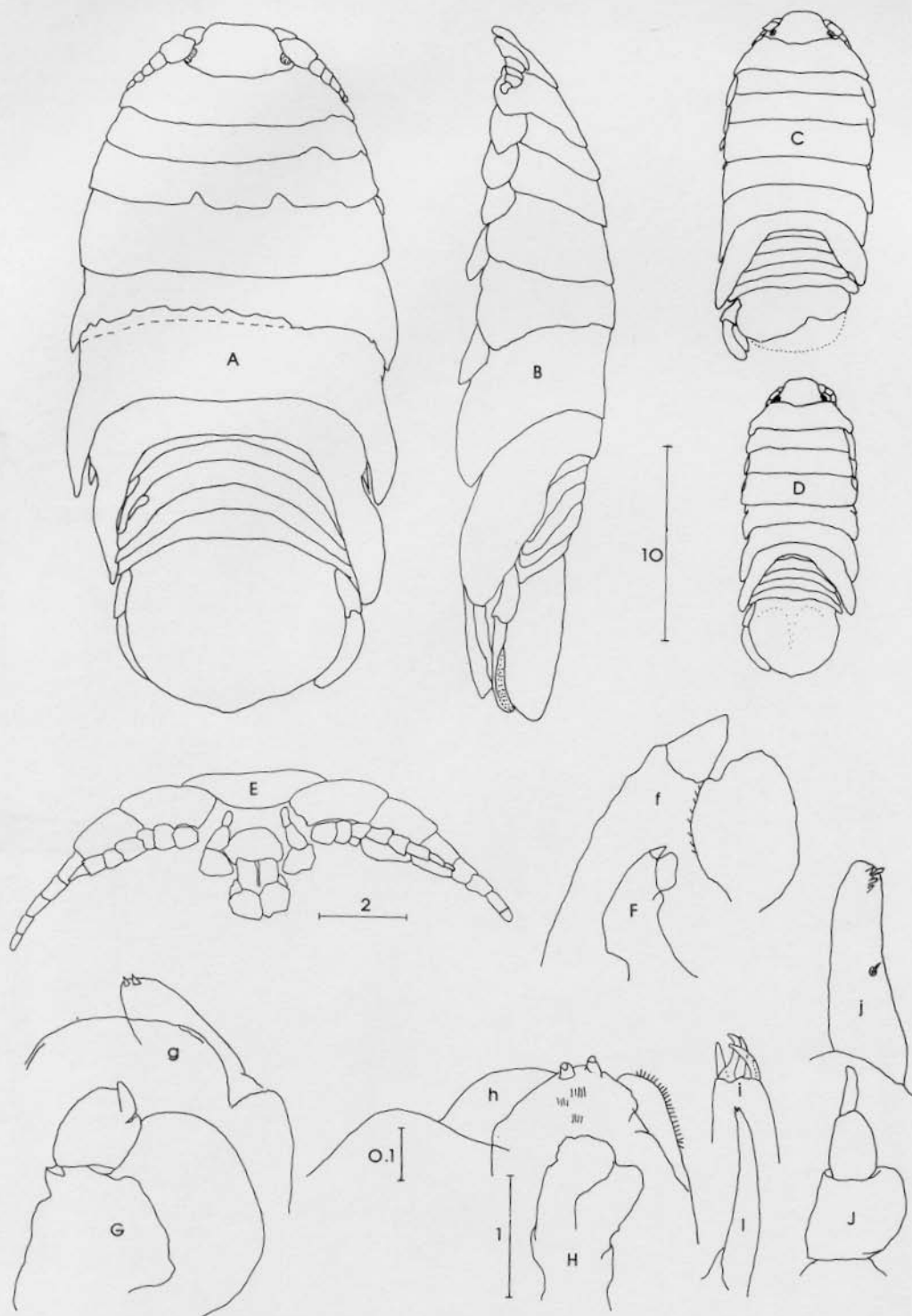


Fig. 2. A-J. *Renocila richardsonae*, new species (Scale bars in mm; scale of A-D equal; scale of f-j equal; and scale of F-J equal) (A-B, E, holotype; C, allotype; D, male paratype USNM 231174; F-J, Female paratype USNM 231174). A, Dorsal view; B, Lateral view; C, Dorsal view; D, Dorsal view; E, head, ventral view; F, Mandible; f, Incisor process of mandible; G, Maxilliped; g, Apex of maxillipedal palp; H, Maxilla 2; h, Distal lobes of maxilla 2 with semilunar pectinate scales; I, Maxilla 1; i, Apex of maxilla 1; J, Mandibular palp; j, Apex of mandibular palp.

as many species in the genus *Renocila*. *Renocila richardsonae* (32–35 mm) is the largest member of this genus ever described. It is more similar in size to members of the genus *Anilocra* than other members of its genus. Members of the genus *Renocila* could once colloquially be categorized as small isopods on small fishes, and *Anilocra* as large isopods on large to moderate-sized fishes; now exceptions exist.

The Apogonidae commonly act as hosts for members of this genus. *Renocila colini* occurs on Caribbean, *R. thresherorum* Williams & Williams on eastern Pacific, *R. plesiopi* Bruce on Australian, *R. loriae* on Papua New Guinean, and *R. ovata* Miers on Indonesian cardinalfishes (Williams & Williams 1980, Bruce 1987a). The change in species of *Renocila* on cardinalfishes at either end of the Great Barrier Reef, while the *Anilocra* on the same hosts remained the same, supports the restricted geographic range of many species of *Renocila* discussed by Williams & Williams (1987). Bruce (1987a) suggests that *R. ovata* has a wide geographic distribution. More field work is necessary to resolve host specificity and geographic ranges of most species in this genus.

Since our key (Williams & Williams 1987) to the known species of *Renocila*, six species have been added, two new combinations created, and one species eliminated (Bruce 1987b, 1991, & present paper). Bruce & Harrison-Nelson (1988) also pointed out shortcomings in our 1987 key. Therefore, a new key is provided.

Key to the Species of *Renocila* Based on Female Specimens (Females are not known for *R. limbata*, *R. periophthalma*, and *R. recta*):

- 1a. Exopod of uropod approximately twice as long as endopod . . . . . 2
- 1b. Exopod of uropod much less than twice as long . . . . . 5
- 2a. Posterolateral projections on pereonites 6–7  
Parasites of damselfishes . . . . . 3
- 2b. Pereonites 6–7 not projected  
Parasites of cardinalfishes or scorpionfishes . . . . . 4
- 3a. Posterolateral projection of pereonite 7 extends to pleonite 2  
Posterolateral projection on pereonite 4 . . . . . *R. yamazatoi*
- 3b. Posterolateral projection of pereonite 7 extends to pleotelson  
Pereonite 4 without posterolateral projection . . . . . *R. heterozota*
- 4a. Exopod of uropod much more than twice as long as endopod  
Uropod rami posteriorly acute  
Pleonites with acute dorsomedial processes . . . . . *R. loriae*
- 4b. Exopod of uropod less than twice as long as endopod  
Uropod rami posteriorly blunt  
Pleonites lack acute dorsomedial processes . . . . . *R. curtippinna*
- 5a. Posterolateral projection on pereonite 4 . . . . . 6
- 5b. Pereonite 4 without posterolateral projection . . . . . 9
- 6a. No nodules on dactyls of pereopods  
No carinate process on posterodistal margin of pereopods  
Posterolateral projection of pereonite 4 prominent . . . . . 6
- 6b. Nodules on dactyls of pereopods 1–3 or 4  
Carinate process on posterodistal margin of pereopods 1–3  
Posterolateral projection of pereonite 4 moderate . . . . . 7
- 7a. Midposterior projections of all segments  
Pleon broad  
Antennae 2 with 3 articles . . . . . *R. bollandi*
- 7b. No midposterior projections of segments  
Pleon narrow, tapering posteriorly  
Antennae 2 with 9 articles . . . . . *R. plesiopi*



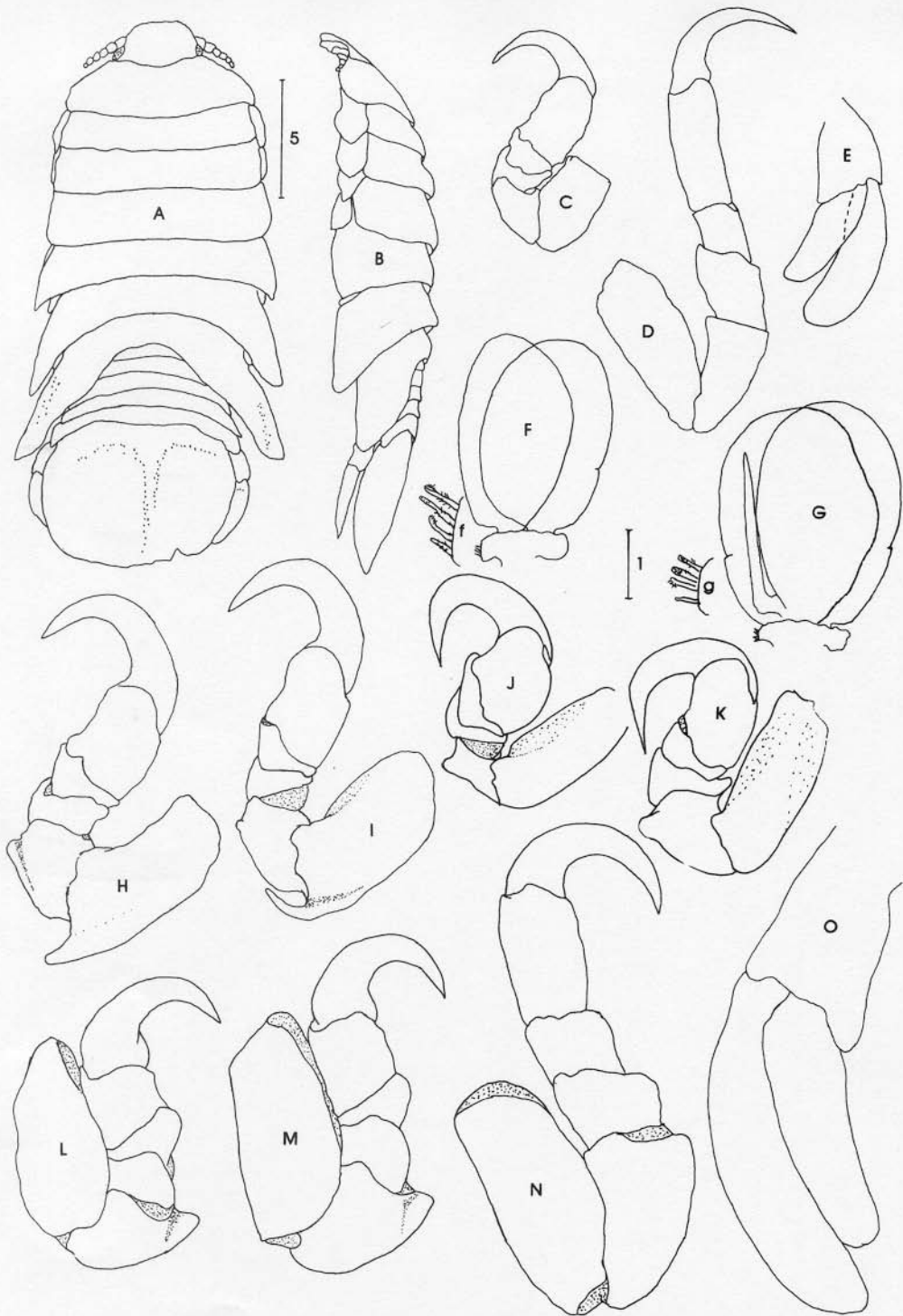


Fig. 3. A–O. *Renocila richardsonae*, new species (Scale bars in mm; scale of A–B equal; and scale of C–O equal) (A–B, male or male-female transitional paratype USNM 40949; C–G, male paratype USNM 231174; H–O, holotype). A, Dorsal view; B, Lateral view; C, Pereopod 1; D, Pereopod 7; E, Uropod; F, Pleopod 1; f, Coupling seta of base of pleopod 1; G, Pleopod 2; g, Coupling seta of base of pleopod 2; H, Pereopod 1; I, Pereopod 2; J, Pereopod 3; K, Pereopod 4; L, Pereopod 5; M, Pereopod 6; N, Pereopod 7; O, Uropod.

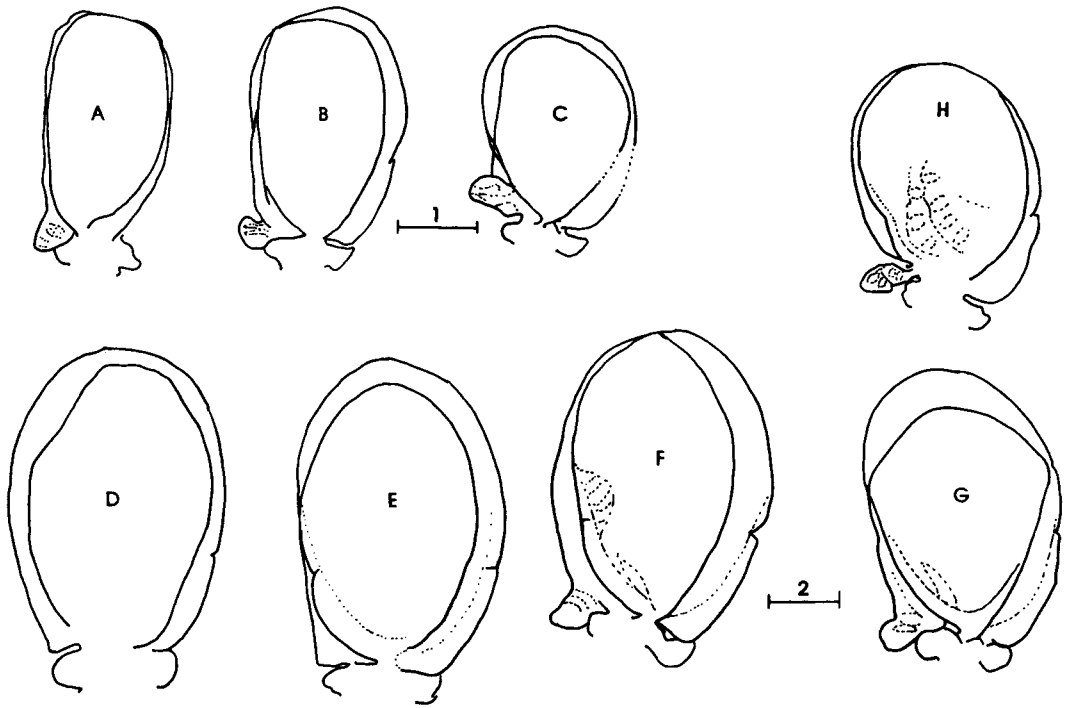


Fig. 4. A-G. *Renocila richardsonae*, new species (Scale bars in mm; scale of A-C equal; and scale of D-H equal) (A-C male paratype USNM 231174; D-H female paratype USNM 231174). A, pleopod 3; B, Pleopod 4; C, Pleopod 5; D, Pleopod 1; E, Pleopod 2; F, Pleopod 3; G, Pleopod 4; H, Pleopod 5.

- |  |   |
|--|---|
| <p>8a. Uropods do not extend to end of pleotelson<br/>Posterolateral projections rounded<br/>Nodules on pereopods 1-3 . <i>R. ovata</i></p> <p>8b. Uropods almost always extend beyond end of pleotelson<br/>Posterolateral projections acutely pointed<br/>Nodules on pereopods 1-4 . . . .<br/>. . . . . <i>R. kohnoi</i></p> <p>9a. Carinate process on posterodistal margin of pereopods 1-3<br/>Nodules on dactyls of pereopods 1-3 . . . . . 10</p> <p>9b. No carinate process on pereopods<br/>No nodules on dactyls of pereopods . . . . . 11</p> <p>10a. Dactyls as long as propodus<br/>Antennae 1-2 approximately equal in length</p> | <p>Anterior margin of head rounded<br/>. . . . . <i>R. alko</i></p> <p>10b. Dactyls longer than propodus<br/>Antennae 1 much longer than 2<br/>Anterior margin of cephalon truncated . . . . . <i>R. indica</i></p> <p>11a. Pereonite 7 posterolateral projection to pleonite 5 or pleotelson<br/>Anterior of cephalon straight<br/>Antennae 1 much longer than 2<br/>. . . . . 12</p> <p>11b. Pereonite 7 posterodistal projection reaches pleonite 1-3<br/>Anterior of cephalon rounded<br/>Antennae 1-2 similar in length 14</p> <p>12a. No rostral point<br/>Pleotelson wider than pleon<br/>No carina on ischium of pereopods . . . . . <i>R. richardsonae</i></p> <p>12b. Triangular rostral point between bases of antenna 1<br/>Pleon wider than pleotelson</p> |
|--|---|

- Prominent curved carina on pereopods 1–3 ischium . . . *R. quadrata*
- 13a. Coxae of pereonite 7 projects laterally  
Coxae of pereonites 6–7 acutely pointed  
Body robust . . . . . *R. thresherorum*
- 13b. Coxae not projecting laterally  
Coxae of pereonites 6–7 bluntly rounded  
Body elongate oval . . . . . 12
- 14a. Posterolateral projection of pereonite 7 reaching pleonite 1  
Posterolateral angle of pereonite 5 produced  
Antennae 2 longer than 1 . . . *R. colini*
- 14b. Posterolateral projection of 7 reaching pleonite 2 or beyond  
Posterolateral angle of pereonite 5 not produced  
Antennae 1 longer than or equal to 2 . . . . . 15
- 15a. Lateral margin of pereonites 4–7 notched  
Posterolateral projection of pereonite 6 covers coxae of 7  
Black . . . . . *R. bowmani*
- 15b. Lateral margin of pereonites 4–5 not notched  
Posterolateral projection of 6 does not cover coxae of 7  
Brown . . . . . *R. Waldneri*

#### Acknowledgments

Dr. Patrick L. and Lori Colin, Motupore Island Research Station, University of Papua New Guinea, collected the infected cardinalfish and provided biological information; Mrs. Lucy Bunkley and Judge Irene Scott provided partial support for this research; Drs. Thomas E. Bowman and Bruce B. Collette, Smithsonian Institution, National Museum of Natural History (USA), loaned the specimens of *R. richardsonae*, deposited isopod and fish specimens, and provided information about possible hosts in the Ichthyology collection. Dr. Bowman

and Dr. Niel L. Bruce, Invertebrate Zoology, Melbourne, Australia, made useful suggestions on the manuscript.

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