

Species of the Parasitic Isopod Genera
Ceratothoa and *Glossobius*
(Crustacea: Cymothoidae) from the
Mouths of Flying Fishes and Halfbeaks
(Beloniformes)

NIEL L. BRUCE
and
THOMAS E. BOWMAN

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ABSTRACT

Bruce, Niel L., and Thomas E. Bowman. Species of the Parasitic Isopod Genera *Ceratothoa* and *Glossobius* (Crustacea: Cymothoidae) from the Mouths of Flying Fishes and Halfbeaks (Beloniformes). *Smithsonian Contributions to Zoology*, number 489, 28 pages, 17 figures, 1989.—New diagnoses are given for *Ceratothoa* and *Glossobius*. Three species of *Ceratothoa* and four species of *Glossobius* are reported from the mouths of four species of flying fishes and six species of halfbeaks, as follows: *Ceratothoa angulata* from the Philippines (no host) and Borneo (on *Hyporhamphus dussumieri* (Valenciennes, 1846)); *C. guttata* from the Philippines (on "flying fish"), the Gulf of Carpentaria, Australia, Taiwan, and Madagascar (on *Parexocoetus brachypterus* (Richardson, 1846)); *C. retusa* from Mozambique (no host), Gulf of Carpentaria, Australia (on *Hemiramphus robustus* Günther, 1866), Cobourg Peninsula, Northern Territory, Australia (on *Hemiramphus far* (Forsskål, 1775)), West Irian (on *H. far*), and Durban, South Africa (on *H. far*); *Glossobius anctus*, new species, from Western Australia, New South Wales, Hawaii, and Japan (on *Euleptorhamphus viridis* (van Hasselt, 1823)); *G. auritus* from the Bahamas and the Caribbean (on *Cypselurus comatus* (Mitchill, 1815)), tropical eastern Pacific (no host), Japan (on *Cypselurus agoo* (Temminck and Schlegel, 1854)), "Ost Indien" (no host), and Thailand (on *Cypselurus* sp.); *G. hemiramphi* from Georgia, Florida, the Bahamas, the Caribbean, the west coast of Africa from Dakar, Senegal, to Luanda, Angola (all on *Hemiramphus brasiliensis* (Linnaeus, 1758)), and Bermuda (on *Hemiramphus bermudensis* Collette, 1962); *G. impressa*, western Atlantic from New Jersey to Rio de Janeiro, Brazil, but not in the Caribbean, and eastern Atlantic from Dakar, Senegal, to off Angola at 10°48'S (host not identified except 1 record from *Hirundichthys speculiger* (Valenciennes, 1846)). All 7 isopod species are described and illustrated in detail, and a key is given to the species of *Glossobius*. *Cteatessa* and *Rhexanella* are reduced to synonyms of *Ceratothoa*. *Ceratothoa hemiramphi* and *C. venusta* are placed in synonymy with *C. retusa* and *C. guttata*, respectively. *Glossobius albinae* is considered a junior synonym of *G. auritus*.

Glossobius hemiramphi has two disjunct populations, a western Atlantic population ranging from Georgia to the Yucatan Peninsula and in the Caribbean; a west African coastal population ranging from Dakar, Senegal, to Luanda, Angola. Western Atlantic specimens are distinctly longer than those from West Africa.

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Species of the Parasitic Isopod Genera *Ceratothoa* and *Glossobius* (Crustacea: Cymothoidae) from the Mouths of Flying Fishes and Halfbeaks (Beloniformes)

Niel L. Bruce and Thomas E. Bowman

Introduction

Beloniform fishes are infested by cymothoid isopods on the body surface, in the gill chambers, and in the mouth. Only flying fishes have these isopods on the body surface: *Nerocila exocoeti* Pillai, 1954, on *Exocoetus brachypterus*, and *Nerocila trichiura* (Miers, 1877) on *Exocoetus volans*, *E. volitans*, and *Cypselurus nigricans* (see Trilles, 1975; Kurochkin, 1980; Bruce and Harrison-Nelson, 1988). The gill-infesting isopods, all members of the genus *Mothocya*, have been treated in detail by Bruce (1986) in a revision of *Mothocya* that included material from non-Beloniform host families. The mouth-infesting isopods, except for a few specimens of the taxonomically difficult genus *Cymothoa* not dealt with here, are species of *Ceratothoa* and *Glossobius*. *Glossobius* is fully revised here, and appears to be restricted to hosts in the families Exocoetidae and Hemiramphidae. Members of the genus *Ceratothoa* infest a much wider range of fish species, and only three of the more than 40 nominal species are recorded herein from hosts in the Exocoetidae and Hemiramphidae.

ABBREVIATIONS.—Abbreviations for institutions listed in the "Material" sections are given in the "Acknowledgments" section below, except for the following: AM, Australian Museum, Sydney; ANSP, Academy of Natural Sciences of Philadelphia; CSIRO, Commonwealth Scientific and Industrial Research Organization; FMNH, Field Museum of Natural History, Chicago; MCZ, Museum of Comparative Zoology, Harvard University, Cambridge; USNM, Collections of the former United States National Museum, now in the National

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Museum of Natural History, Smithsonian Institution, Washington, D.C.; UZMC, Universitets Zoologiske Museum, Copenhagen.

In the "Material" sections, isopod specimens separated by commas were collected from the same fish specimen; isopod specimens separated by semicolons were collected from different fish specimens.

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Genus *Ceratothoa* Dana, 1852

Ceratothoa Dana, 1852:303; 1853:747-752.—Schioedte and Meinert, 1883:322-323.—Bowman, 1978:217.—Brusca, 1981:177.
Codonophilus Haswell, 1881:471; 1882:283.—Hale, 1926:223.
Rhexana Schioedte and Meinert, 1883:289.
Cleatessa Schioedte and Meinert, 1883:296.
Meinertia Stebbing, 1893:354; 1900:642; 1910a:103.—Richardson, 1905:236.—Menzies, 1962:116.—Schultz, 1969:156.
Rhexanella Stebbing, 1911:179.

Not *Ceratothoa*.—Richardson, 1905:236.—Schultz, 1969:155.—Kussakin, 1979:287. [= *Glossobius* Schioedte and Meinert, 1883.]

DIAGNOSIS OF FEMALE (provisional).—Body narrow, about 2.5 to 3.5 times longer than wide, frontal margin of cephalon extended ventrally as short, blunt, triangular rostrum, not separating antennules. Pereonite 1 with anterolateral margins encompassing cephalon. Pleonite 1 much narrower than pleonites 2–5. Antennules with basal articles in contact, proximal articles broad and flattened. Pereopod 1 short, pereopods 2 and 3 longer and more slender than 1; pereopods 5–7 basis with prominent posterior expansion. Pleopods decreasing in size posteriorly, rami with pockets or depressions separated by ridge; pleopod 1 not operculate.

MALE.—The same as *Glossobius* male.

TYPE SPECIES.—As Bowman (1978) indicated, the type species, not designated by Dana (1852), must be either *Cymothoa gaudichaudii* Milne-Edwards, 1840 or *Cymothoa parallela* Otto, 1828, the two species originally assigned to *Ceratothoa* by Dana. The presumed holotype of *C. gaudichaudii* is damaged, unrecognizable, and held at the Muséum National d'Histoire Naturelle, Paris (Trilles, 1973b). We do not know where the type material of *C. parallela* is held, or indeed if it is extant. Consequently we do not designate a type species for *Ceratothoa*; this action is best deferred until a generic revision is undertaken.

REMARKS.—Since the majority of species of *Ceratothoa* are still poorly known, and since we have not studied a designated type species for the genus, the diagnosis given here is provisional.

Ceratothoa and *Glossobius* are very similar. However, the characters that separate adult females of the two genera are unambiguous, and it seems prudent to maintain their integrity.

Examination of type material of *Cteatessa retusa*, type species of the genus *Cteatessa*, reveals no characters by which *Cteatessa* can be distinguished from *Ceratothoa*. Schioedte and Meinert (1883) proposed a monotypic new genus for *C. retusa*. A comparison of their diagnoses of *Cteatessa* and *Ceratothoa* shows that they distinguished these two genera by the head size (large to moderate in *Ceratothoa*, small in *Cteatessa*), the eyes (distinctly developed in *Ceratothoa*, obscure in *Cteatessa*), antenna 1 (dilated, rarely compressed in *Ceratothoa*, compressed in *Cteatessa*), and the dactyls of the pereopods (usually short in *Ceratothoa*, very long in *Cteatessa*). These are mainly quantitative rather than qualitative differences, and we do not believe them to be significant at the generic level. Hence, we consider *Cteatessa* to be a junior synonym of *Ceratothoa*. Although we have not examined type material of *Rhexana verrucosa* Schioedte and Meinert (placed in *Rhexanella* by Stebbing, 1911), Schioedte and Meinert's (1883) diagnosis fails to distinguish their genus from *Ceratothoa*. We also place *Rhexanella* in synonymy with *Ceratothoa*.

Within the genus *Ceratothoa* species can be grouped according to their pereopod morphology. A feature of the

genus, generally considered typical, is the prominent expansion of the basis of the posterior pereopods. Most *Ceratothoa* species, including the two initially placed in the genus by Dana (1852), have this character. But *Ceratothoa gilberti* (Richardson, 1904) (see Brusca, 1981) has no trace of this basal expansion, and it is only weakly developed in *Ceratothoa steindachneri* Koelbel, 1879 (see Trilles, 1973a). Another pereopodal character that is unequally distributed within the genus is the expansion of the ischium of the posterior pereopods. This occurs in *Ceratothoa guttata* (Richardson, 1910) and *C. carinata* (Bianconi, 1870) (see Trilles, 1972).

Ceratothoa angulata (Richardson, 1910), new combination

FIGURES 1, 2

Meinertia angulata Richardson, 1910:22, fig. 21.

Codonophilus angulatus (Richardson).—Nierstrasz, 1931:132.

MATERIAL.—PACIFIC OCEAN: *Philippines*: Luzon, Port San Pio (= Port San Pio Quinto, 18°54'N, 121°51'E), near mouth of a small stream, 20 ft. seine, ovigerous ♀, 21.5 mm (holotype, USNM 41008). *Indonesia*: Borneo, ex *Hyporhamphus dussumieri* (Valenciennes) (Division of Fishes, USNM 218692), non-ovigerous ♀, 17.5 mm and ♂, 7.0 mm (USNM 240023).

TYPE.—Holotype, USNM 41008.

TYPE LOCALITY.—See "Material."

DESCRIPTION OF FEMALE.—Length/width: holotype 2.5, Borneo 3.2. Width, including coxae, greatest at pereonite 5. Cephalon triangular, rounded anteriorly, lateral margins anterior to eyes slightly concave in holotype, nearly straight in Borneo ♀. Eyes moderate-size, outlines fairly distinct. Pereonite 1 shoulders reaching level of anterior margins of eyes, anterior margins round-truncate, lateral margins shallowly sinuate, anterior one-third to one-half raised into ridge; medial to each ridge is a subcircular depression. Pereonites 2–5 subequal, about two-thirds length of pereonite 2, pereonites 6 and 7 progressively shorter; coxae rather narrow, shorter than pereonites, margins not elevated. Length of pleon as percent of total length: holotype 15.0, Borneo 13.4. All pleonites visible and subequal in length; pleonite 5 equal in width to pleotelson anterior margin. Pleotelson length/width: holotype 0.53, Borneo 0.55, widest at base; lateral margins evenly rounded, posterior margin shallowly emarginate.

Antennule composed of 7 dorsoventrally flattened articles. Antenna about as long as antennule, more slender, composed of 8 articles. Antennules and antennae extending to middle of eye, posterior to anterior margin of pereonite 1 shoulders.

Labrum crescent-shape. Mandible palp articles all distinct. Maxillule with 2 longer and 2 shorter apical spines. Maxilla with partly fused medial and lateral lobes each armed with 6 recurved spines. Maxilliped palp article 3 with 2 recurved apical spines and 2 more slender straight spines on medial margin.

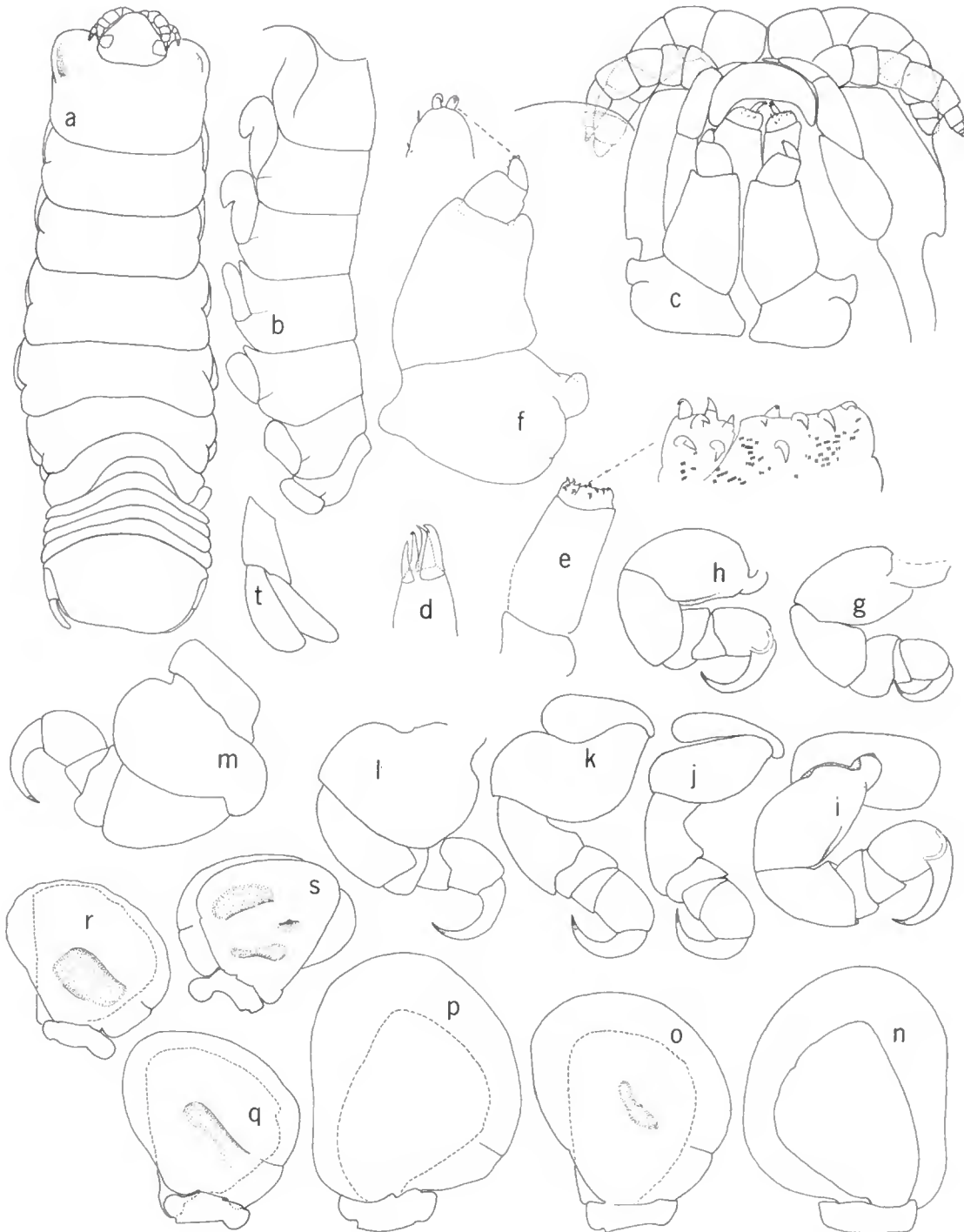


FIGURE 1.—*Ceratothoa angulata* (non-ovigerous ♀, 17.5 mm, Borneo): *a*, dorsal view; *b*, pereon, lateral view; *c*, buccal area; *d*, maxillule apex; *e*, maxilla; *f*, maxilliped; *g-m*, pereopods 1-7; *n-q*, pleopods 1-4; *r*, pleopod 5, anterior view; *s*, pleopod 5, posterior view.

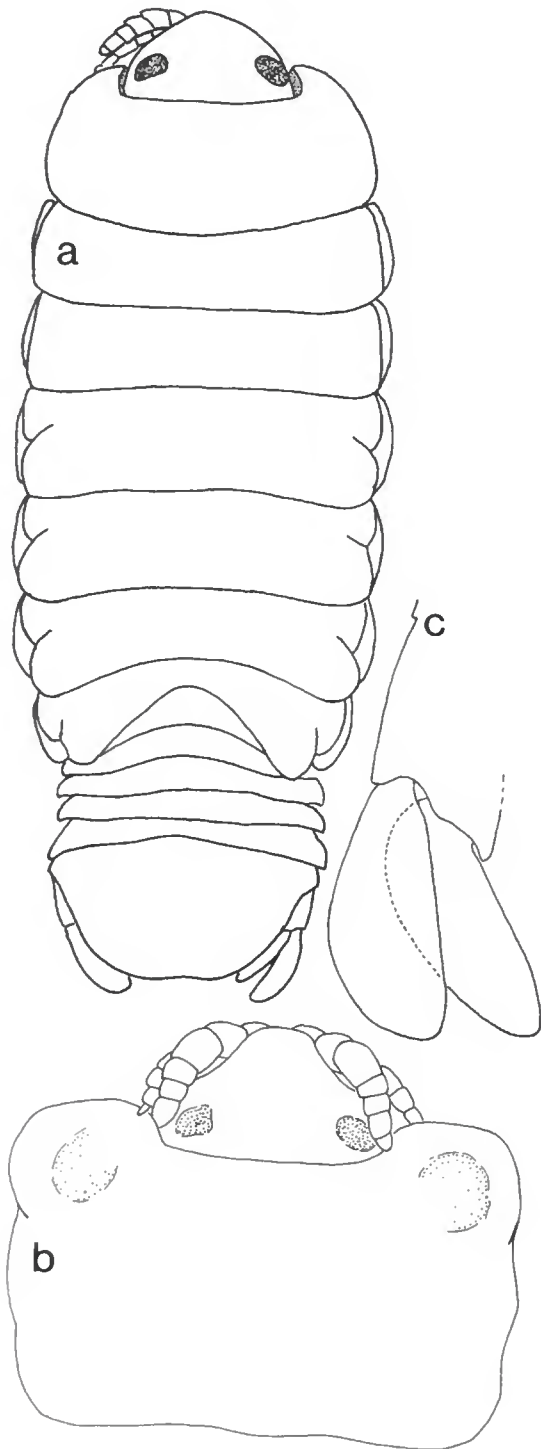


FIGURE 2.—*Ceratothoa angulata* (a, ♂, 7.0 mm, Borneo; b-c, ♀, holotype, 21.5 mm, Philippines): a, dorsal view; b, cephalon and pereonite 1, dorsal view; c, right uropod, ventral view.

Pereopod 1 robust, basis rectangular; merus about one-third length of ischium and one-third wider than carpus; carpus short, triangular; propodus half length of ischium, palm straight. Pereopod 2 similar to pereopod 1, but merus less produced. Pereopods 5-7 with basis progressively more expanded posteriorly.

Pleopods with depression on anterior surface and corresponding elevation on posterior surface of exopod; elevation fits into depression on anterior surface of endopod; posterior surface of endopod with corresponding elevation.

Uropods extending to or slightly beyond posterior margin of pleotelson; rami subequal in length, both with straight medial margin and convex lateral margin; exopod spatulate, endopod narrowing distally.

DESCRIPTION OF MALE.—Length/width: 3.0. Cephalon relatively shorter than in ♀. Eyes more densely pigmented. Pereonite 1 shoulders obtuse anteriorly. Pereonite 1 lateral margins not elevated. Pleon length 15.3% of total length. Pleotelson length/width: 0.56.

COLOR.—Cephalon, pereonites 1-3, and anterior half of pereonite 4 colored with black chromatophores. Posterior to this, body is unpigmented in holotype; Borneo ♀ is pigmented on posterior pereonites, pleon, and anterior part of pleotelson with more widely scattered chromatophores; rest of pleotelson is unpigmented. ♂ is nearly unpigmented, but has black chromatophores on antennules and very widely scattered on body.

SIZE.—See "Material."

REMARKS.—The distinguishing features of *C. angulata* are the truncate shoulders of pereonite 1, the slightly emarginate pleotelson, and the spatulate exopod of the uropod.

HOST.—Unknown for the holotype. The Borneo specimens were taken from *Hyporhamphus dussumieri* (Valenciennes).

DISTRIBUTION.—Known from the Philippines and Borneo. The host, *Hyporhamphus dussumieri*, is a "wide-spread tropical species found from Madagascar through the East Indies to the Philippines, New Guinea, Australia and Oceania" (Collette, 1974:89). It is possible that *Ceratothoa angulata* has a similar widespread distribution.

Ceratothoa guttata (Richardson, 1910), new combination

FIGURES 3, 4

Meinertia guttata Richardson, 1910:20-21, fig. 19.

Codonophilus guttatus.—Nierstrasz, 1931:132.

Meinertia venusta Avdeev, 1978:30-32, fig. 1.

Ceratothoa venusta.—Avdeev, 1981:1160, 1164, fig. 3 [part].

MATERIAL.—INDIAN OCEAN: Madagascar: Ex *Parexocoetus brachypterus* (Richardson), ovigerous ♀, 20.0 mm (USNM 216589). PACIFIC OCEAN: Taiwan: Off Keelung, ex *Parexocoetus brachypterus*, coll. H. Teng, 6 Jun 1957, ovigerous ♀, 23.0 mm and ♂, 5.8 mm (USNM 216587). Philippines: Jolo Island, from mouths of flying fish, coll. U.S. Bureau of Fisheries Albatross Philippine Expedition

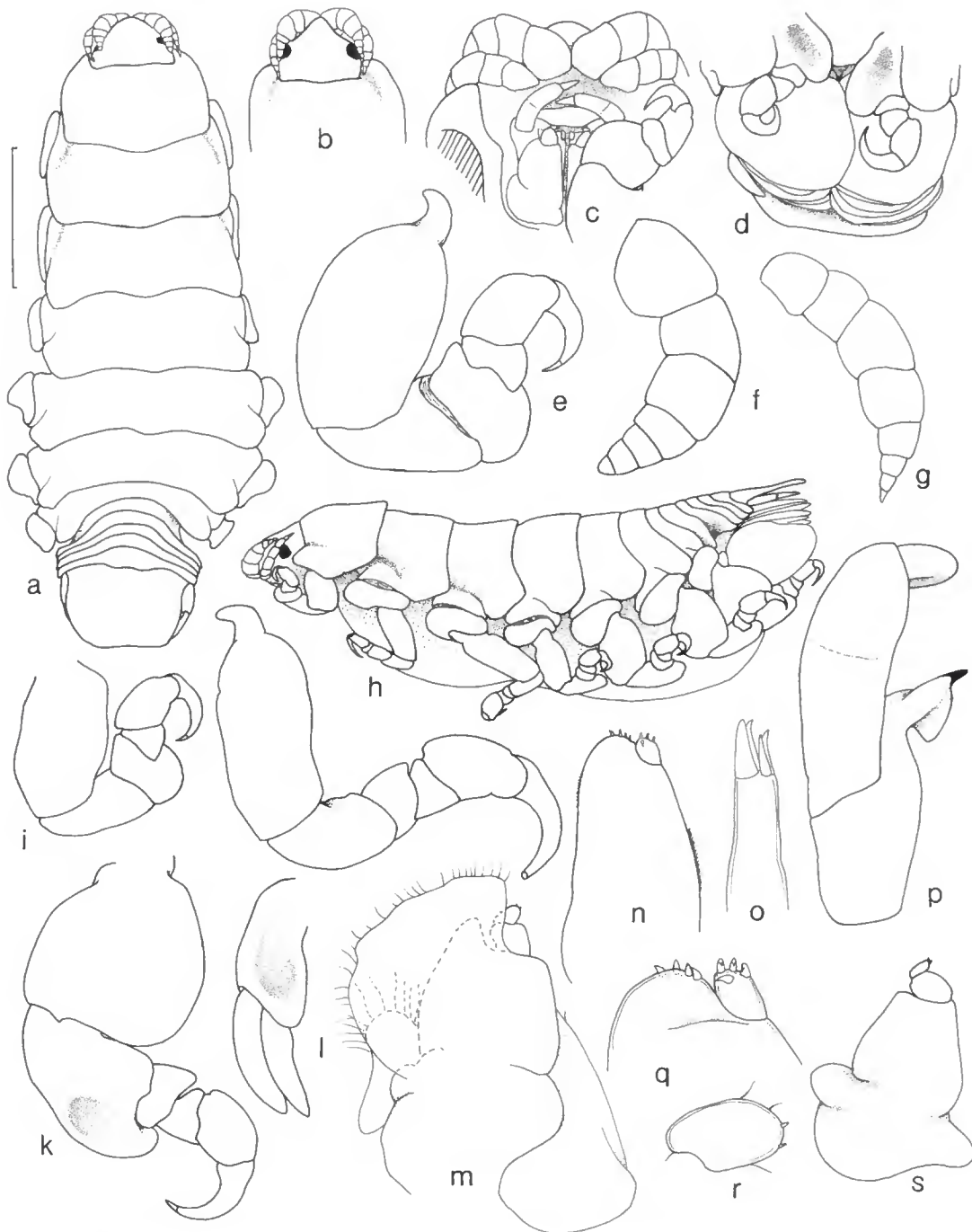


FIGURE 3.—*Ceratohoa guttata* (a–e, s, syntypes; f–r, ovigerous ♀, topotype, 17.5 mm); a, ♀, 18.6 mm, with mancas; b, non-ovigerous ♀, 15.5 mm; c, buccal area, non-ovigerous ♀, 15.5 mm; d, ventral view of pleopods, non-ovigerous ♀, 15.5 mm; e, pereopod 1, non-ovigerous ♀, 15.5 mm; f, antennule; g, antenna; h, lateral view; i, pereopod 1; j, pereopod 3; k, pereopod 7; l, uropod (broken), non-ovigerous ♀; m, maxilliped; n, maxilla; o, maxillule apex; p, mandible; q, maxilla apex; r, maxilliped article 3; s, maxilliped (broken), non-ovigerous ♀, 15.5 mm. (Scale line = 4.0 mm.)

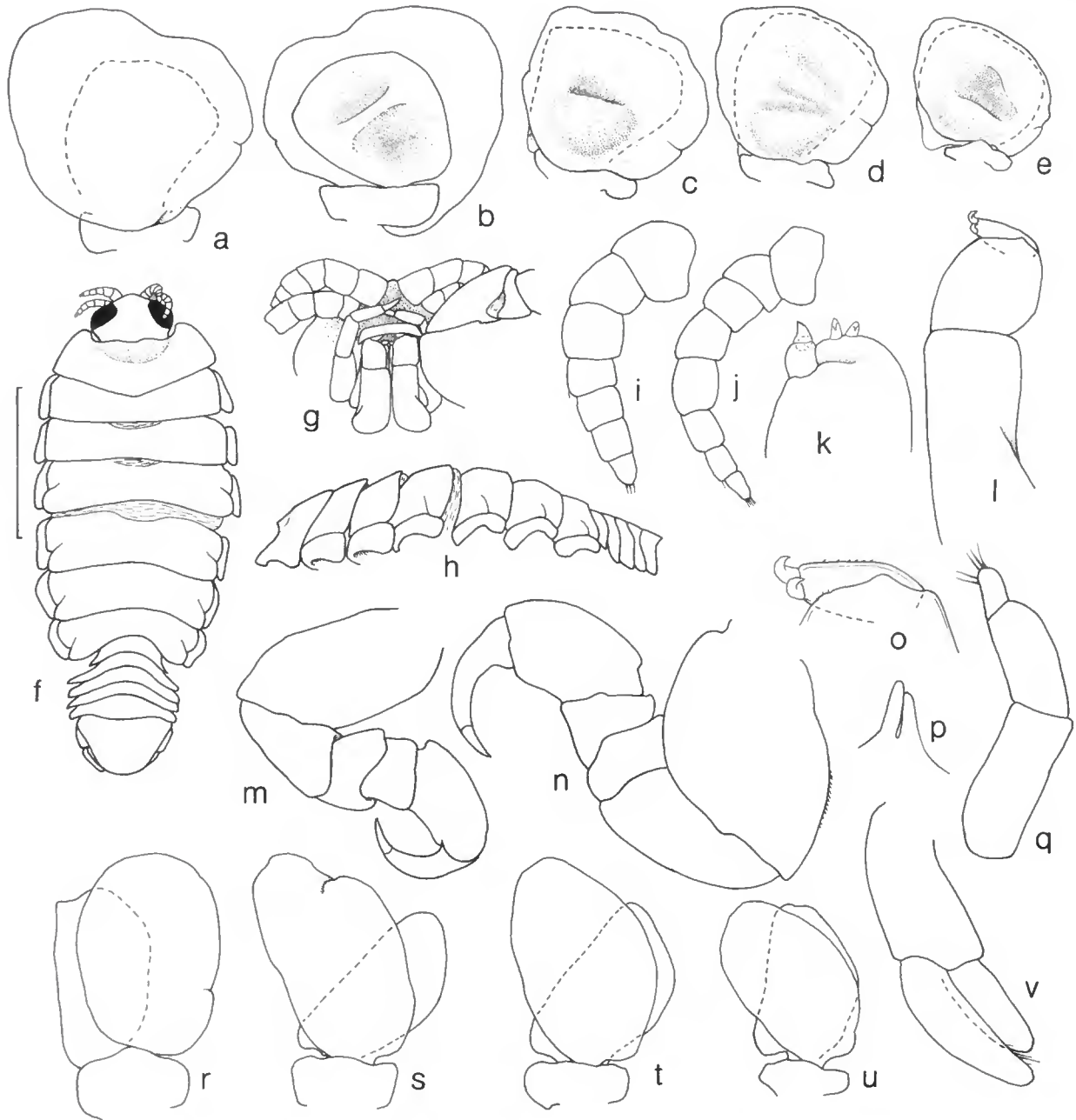


FIGURE 4.—*Ceratothoa guttata* (all topotypic; a-e, ovigerous ♀, 17.5 mm; f-v, ♂, 6.5 mm): a, pleopod 1, ventral view; b, pleopod 1, dorsal view; c-e, pleopods 2, 3, 5, respectively; f, dorsal view; g, buccal area; h, pereon and pleon, lateral view; i, antennule; j, antenna; k, maxilla apex; l, maxilliped; m, pereopod 1; n, pereopod 7; o, maxilliped article 3; p, penes; q, mandible palp; r-u, pleopods 1-3, 5, respectively; v, uropod. (Scale line = 2.0 mm.)

1907–1909, 7 Feb 1908, 4 ovigerous ♀, 14.5, 14.8, 16.4, 18.6 mm; 2 non-ovigerous ♀, 15.5 and ~16.5 mm; 3 ♂, 5.5, 6.0, 7.4 mm; 100+ manca (all syntypes, USNM 40914). Jolo Island, from mouths of *Parexocoetus brachypterus*, coll. U.S. Bureau of Fisheries Albatross Philippine Expedition 1907–1909, 7 Feb 1908, 4 ovigerous ♀, 15.0, 17.5, 18.8, 19.2 mm; 1 broken ♀; 1 broken non-ovigerous ♀; 6 ♂, 5.4, 5.5, 5.5, 5.6, 6.0, 6.5 mm (USNM 216588). *Australia*: Queensland, Gulf of Carpentaria, off Mornington Island, from mouth of *Parexocoetus brachypterus*, coll. A. Harris, 16 Mar 1983, ovigerous ♀, 14.5 mm, CSIRO (QM W11752).

TYPES.—Syntype series, USNM 40914.

TYPE LOCALITY.—Jolo Island, Philippines, ~5°58'N, 121°06'E.

DESCRIPTION OF FEMALE.—Body about 2.7 times longer than wide, widest at pereonite 5; pereonite 1 longest, pereonites 2–6 about equal in length, pereonite 7 less than half (0.38) length of pereonite 6; median broad longitudinal ridge runs from pereonite 2–5 or 6. Cephalon with posterolateral margins weakly overlapped by anterolateral margins of pereonite 1; anterior margin produced to form narrowly rounded rostrum; eyes small. Pereonite 1 narrower than pereonite 2, anterolateral margins weakly produced anteriorly, weak dorsal depression at angle formed by indentation of anterior margin. Pereonites 2 and 3 with dorsolateral bosses; coxae large, all shorter than segments; coxa on one side of pereonite 7 much smaller than opposite coxa. Pleon short, about 12% of total body length; pleonite 1 narrow; all pleonites visible, subequal in length; pleonite 5 wider than pleotelson anterior margin, posterior margin with 2 ill-defined submedian lobes. Pleotelson 0.72 as long as wide, subrectangular, posterior margin with median emargination.

Antennule robust, composed of 7 articles, first 3 of which are long, expanded, and flattened. Antenna less robust, composed of 8 articles, first 4 of which are long.

Labrum small, set posterior to antennal bases; mandible palps lie anterior to labrum. Mandible incisor robust, palp prominent, greatly extending beyond incisor, articles 1 and 2 fused. Maxillule with 1 broad-based and 3 slender spines. Maxilla endopod and lateral lobe each with 4 recurved spines. Maxilliped composed of 3 articles and obscurely segmented basal article; article 1 with laminar oostegital lobe, second oostegital lobe arises from basal article; palp article 3 oval, with 2 spines.

Pereopod 1 robust, basis rectangular; merus less than half length of ischium, posterior margin dilated; carpus short, triangular; propodus about equal to combined lengths of merus and carpus, palm straight. Pereopods 2 and 3 longer than pereopod 1, all articles proportionally more slender, merus not expanded. Pereopods 4–7 basis with posterior expansion, becoming progressively larger toward posterior. Pereopods 5–7 ischium anterior margin dilated, merus set into lateral side of ischium; carpus short, triangular. Brood pouch made up of 5 pairs of alternately overlapping oostegites; those arising from sternite 1 not forming part of egg chamber but lie flat over

mouthparts; remaining oostegites arise from sternites 2, 3, 4, and 6.

Pleopods all lamellar, all rami except pleopod 1 endopod with 2 marked depressions; all peduncles without developed lobes; pleopods 3–5 endopods with weakly developed proximomedial lobe. Pleopod 1 largest, curves laterally and dorsally to partly cover lateral margins of pleon, covers other pleopods; endopod much smaller than exopod; pleopods 2–5 becoming much smaller toward posterior. Uropod short, held under posterior margin of pleotelson, rami curve medially, subequal in length, apices narrowly rounded to acute.

DESCRIPTION OF MALE.—Much smaller than female, body straight with smoothly arched dorsum. Coxae all as long as segment. Pleon very narrow, pleonite 1 distinctly narrower than others. Pereopod 1 merus not dilated, carpus proportionally longer than in female; pereopods 1–3 similar. Pereopods 5–7 similar, basis with anterior expansion, ischium not dilated. Mandible palp with 3 unfused articles, article 3 with setae. Maxilla endopod and lateral lobe each with 2 recurved spines. Maxilliped without basal article, article 3 narrow with 2 terminal stout recurved spines. Pleopods simple, without folds or depressions; peduncles longer than in female. Pleopod 2 without appendix masculina. Pleopods 1–5 progressively decreasing in size.

COLOR.—The syntypes have faded and lack color; the topotypic series and the more recent material from Madagascar and Taiwan show a dense covering of chromatophores over the anterior segments and their appendages which lessens toward the posterior. Pereonite 7, pleon, and pleotelson are virtually without chromatophores.

SIZE.—Ovigerous females between 14.5 and 23.0 mm, non-ovigerous females between 15.5 and ~16.5 mm, males between 5.4 and 7.4 mm.

VARIATION.—Non-ovigerous females lack the oostegital lobe of the maxilliped, but the maxilliped structure is the same. Not all females have the coxae of pereonites 5–7 laterally and dorsally displaced, this being restricted to females with manca near release.

REMARKS.—This species has not been recorded since it was first described, and is here placed in the genus *Ceratothoa*. *Meinertia venusta* from the mouth of *Parexocoetus brachypterus* from the Red Sea (Avdeev, 1978) appears, from Avdeev's drawings of the unique specimen (an 11 mm female), not to differ from the present material and is here placed in synonymy with *C. guttata*. Our request for the loan of Avdeev's holotype was not answered.

This species belongs to the group of *Ceratothoa* species in which pereopods 5–7 have strongly developed expansions on the basis. Within that group two species have the ischium expanded posteriorly, *Ceratothoa guttata* and *C. carinata* (see Trilles, 1973b).

HOST.—Recorded only from *Parexocoetus brachypterus* (Richardson).

DISTRIBUTION.—Red Sea; Madagascar; Taiwan; Philippines; Gulf of Carpentaria, Australia.

Ceratothoa retusa (Schioedte and Meinert, 1883), new combination

FIGURES 5-8

Cymothoa (*Ceratothoa*) *retusa* Schioedte and Meinert in Hilgendorf, 1879:847 [nomen nudum].

Cleatessa retusa Schioedte and Meinert, 1883:297-299, pl. 11, figs. 11-13.—Stebbing, 1910b:424.—Barnard, 1925:393.—Nierstrasz, 1931:131.—Kensley, 1978:80, fig. 32G, H.—Trilles, 1986:625, fig. 2a [from Schioedte and Meinert].

Codonophilus hemiramphi Pillai, 1954:14-15.

MATERIAL.—INDIAN OCEAN: *Mozambique*: Host unknown (MHUB 1 708), leg. W. Peters, ovigerous ♀, 33.8 mm (syntype). *South Africa*: Durban Bay, ex *Hemiramphus far* (Forsskål) (SAM-A6063), coll. H.W. Bell-Marley, 1919, ovigerous ♀ in 2 pieces, estimated length 31.5 mm (33 mm, Barnard, 1925) and ♂, 10.7 mm (12 mm, Barnard, 1925). **PACIFIC OCEAN:** *West Irian* (formerly Dutch New Guinea): Ex *Hemiramphus far* (AM I-1339), ♀ with empty marsupium, 27.5 mm and ♂, 9.1 mm (USNM 235308). *Australia*: Northern Territory, Coburg Peninsula, Point Danger, ex tongue *Hemiramphus far* (NTM Cr. 002318), coll. B.C. Russell and H. Larson, 30 Apr 1982, non-ovigerous ♀, 22.8 mm. Northern Territory, Gulf of Carpentaria, Groote Eylandt area, ex *Hemiramphus robustus* Günther (NTM Cr. 002319), coll. Northern Territory Fisheries, 4 Mar 1983, non-ovigerous ♀, 22.3 mm.

TYPES.—Syntypes, Stockholm Museum, 2 ♀ from Durban ("Port Natal"); Berlin Museum, 1 ♀ from Mozambique (figured by Schioedte and Meinert, 1883, pl. 11, figs. 11-13).

DESCRIPTION OF FEMALE.—Length/width: Mozambique 3.2, West Irian 2.1, Point Danger 2.3, Durban 2.9, Groote Eylandt 3.2. Width, including coxae, greatest at pereonite 6. Cephalon triangular, narrowly rounded or (in Mozambique and Durban specimens) pointed anteriorly. Eyes small, outlines vague, poorly pigmented, sometimes covered by shoulders of pereonite 1. Pereonite 1 dorsum concave on either side of cephalon, lateral margin elevated into ridge recurving medially. Pereonite 1 longest; pereonites 2-4 subequal, about half length of pereonite 1; pereonites 5-7 progressively shorter; coxae with dorsal process curved medially, better developed on posterior pereonites. Length of pleon as percent of total length: Mozambique 12.4, West Irian 15.6, Point Danger 20.2, Durban 14.3, Groote Eylandt 15.4. All pleonites visible; pleonites 1-4 subequal in length; pleonite 5 distinctly longer, wider than pleotelson anterior margin. Pleotelson length/width: Mozambique 0.54, West Irian 0.29, Point Danger 0.39, Durban 0.41, Groote Eylandt 0.47; lateral margins evenly rounded, not bulging; posterior margin shallowly emarginate.

Antennule composed of 7 articles; first 3 articles expanded, flattened; last 3 articles may be fused. Antennule of Mozambique syntype composed of 4 articles, distal articles partly fused. Antenna about as long as antennule, more slender, composed of 6-9 articles depending on extent of fusion of distal articles.

Labrum forming U-shaped arch around mouth. Articles of mandibular palp all distinct; 3rd article with 2 blunt apical spines. Maxillule with 2 longer and 2 shorter curved apical spines. Maxilla with partly fused medial and lateral lobes armed with 6 and 10 or more recurved spines respectively. Maxilliped article 3 with 2 curved apical spines and 2 small straight spines on medial margin.

Pereopod 1 robust, basis rectangular; merus about half length of ischium, somewhat expanded posteriorly; carpus short, subtriangular; propodus slightly shorter than combined lengths of merus and carpus, palm straight. Pereopods 2-4 much longer than pereopod 1; all articles proportionally more slender, merus not expanded, dactyls very long. Pereopods 5-7 with basis expanded posteriorly, expansion progressively larger posteriorly.

Pleopods decreasing in size posteriorly; rami with 2 depressions separated by oblique ridge. Uropod rami longer than peduncle, oval, narrowing slightly distally; curving slightly medially; rami subequal in length, or 1 ramus (outer or inner) slightly longer than other.

DESCRIPTION OF MALE.—Length/width: West Irian 2.5, Durban 3.0. Cephalon more rounded than in ♀. Eyes well developed, fully pigmented. Pereonite 1 shoulders narrower and shorter than in ♀. Pereonites 2-6 subequal in width, pereonite 7 slightly narrower. Length of pleon as percent total length: West Irian 17.2, Durban 15.8. Pleotelson relatively longer; length/width: West Irian 0.76, Durban 0.79.

COLOR.—Anterior part varying from tan to nearly black in alcohol. Posterior part much paler, with little or no pigment. Boundary between dark and pale part varies from posterior margin of pereonite 3 to pereonite 5.

SIZE.—Ovigerous females between 27.5 and 33.8 mm, non-ovigerous females between 22.3 and 31 mm, males between 9.1 and 10.7 mm.

VARIATION.—The cephalon is most pointed in the South African female, least in the Point Danger female. The shoulders of pereonite 1 are broadest and most elevated laterally in the West Irian female, less so in the Point Danger female, and least in the South African and Groote Eylandt females. Recurving of the coxae is most strongly developed in the West Irian female. The merus of pereopod 1 and 2 is most inflated in the South African female.

REMARKS.—Pillai's (1954) preliminary diagnosis of *Codonophilus hemiramphi* was brief, and no illustrations accompanied it. A later report (Pillai, 1964) gave full descriptions and illustrations of three of the isopods diagnosed in 1954, but did not include *C. hemiramphi*. His diagnosis (Pillai, 1954:15) of *C. hemiramphi* was based largely on pereonite 1: "The anterior half of the lateral border is very prominently ridge like and a little internal to this is another equally prominent dorsal ridge. The space in between these two ridges is flat or even slightly concave giving it the appearance of an independent facet." If his dorsal ridge is the continuation of the lateral ridge medially onto the dorsal surface of pereonite

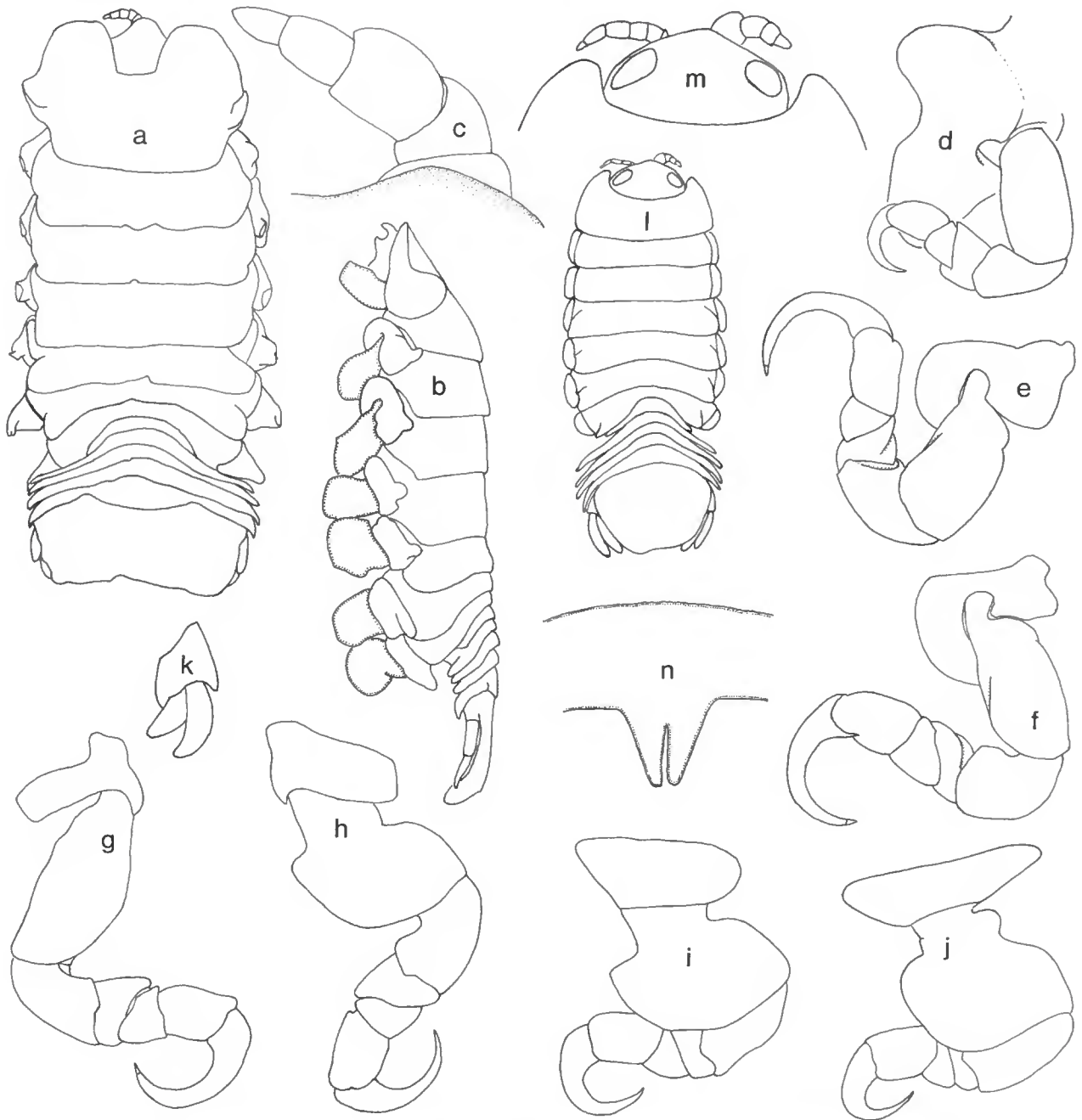


FIGURE 5.—*Ceratohoa retusa* (a-j, ♀, 27.5 mm, l-n, ♂, 9.1 mm, West Irian): a, dorsal view; b, lateral view; c, antennule; d-j, pereopods 1-7; k, uropod; l, dorsal view; m, cephalon, dorsal view; n, penes.

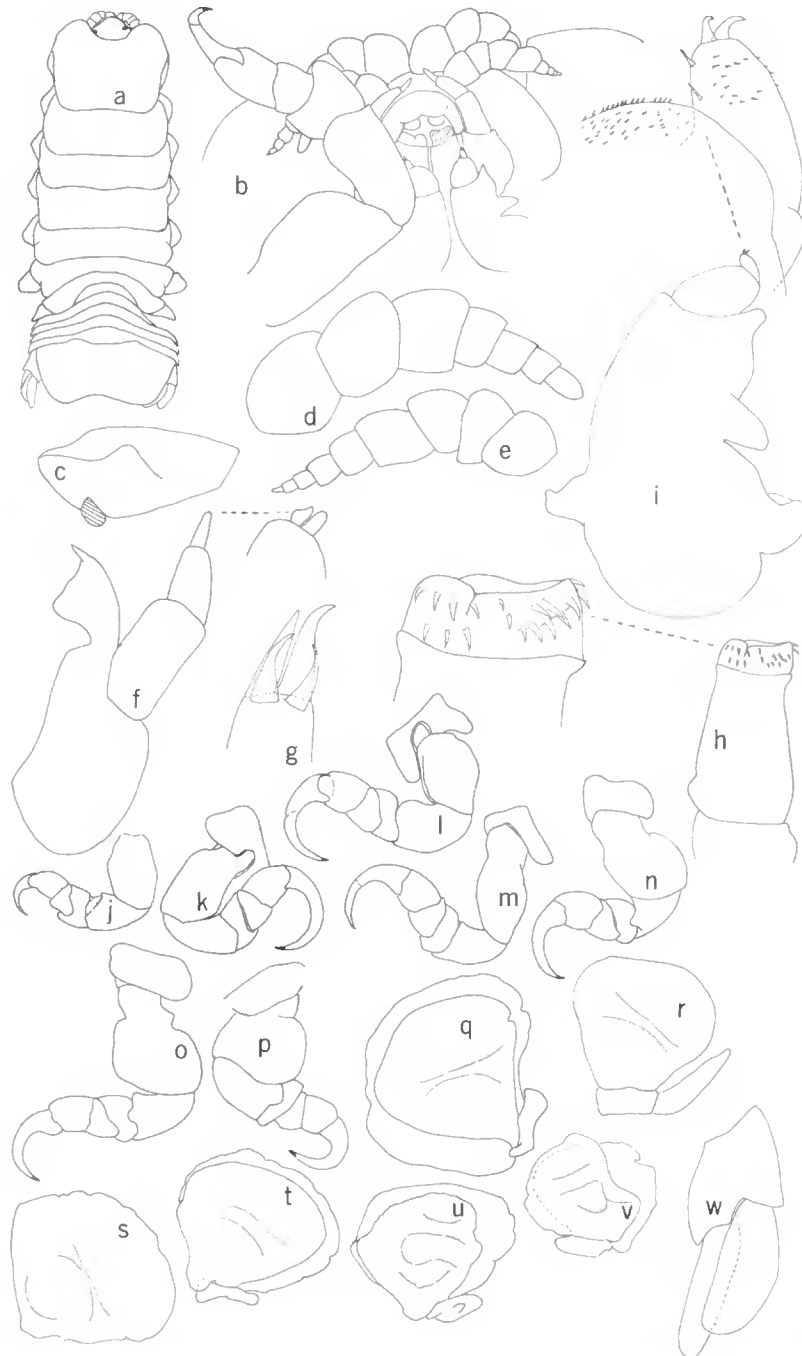


FIGURE 6.—*Ceratothoa retusa* (♀, 22.8 mm, Point Danger, Northern Territories, Australia, NTM Cr. 002318): *a*, dorsal view; *b*, buccal area; *c*, pereonite 1, lateral view; *d*, antennule; *e*, antenna; *f*, left mandible; *g*, maxillule apex; *h*, maxilla; *i*, maxilliped; *j-p*, pereopods 1-7; *q*, pleopod 1, posterior view; *r*, pleopod 2 endopod, posterior view; *s*, pleopod 2 exopod, posterior view; *t-v*, pleopods 3-5, posterior view; *w*, left uropod, ventral view.

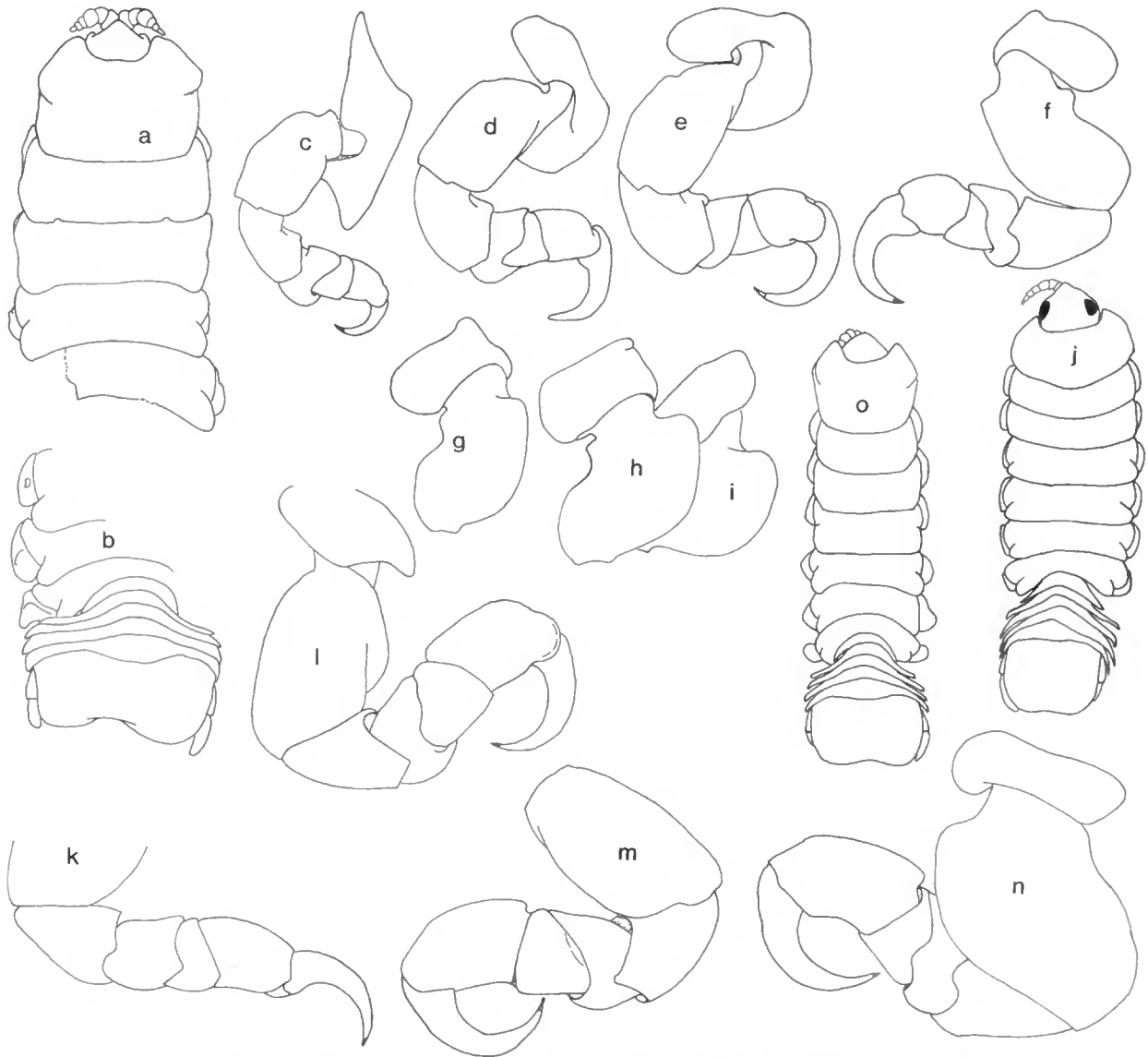


FIGURE 7.—*Ceratothoa retusa* (a-i, ♀, ~31.5 mm, j-n, ♂, 10.7 mm, from Durban, South Africa; o, ♀, 22.3 mm from Grootte Eylandt area, Gulf of Carpentaria, Australia): a, anterior body, dorsal view; b, posterior body, dorsal view; c-e, pereopods 1-3; f, pereopod 5; g-i, coxa and basis of left pereopods 5-7; j, dorsal view; k-m, pereopods 1-3; n, pereopod 6; o, dorsal view.

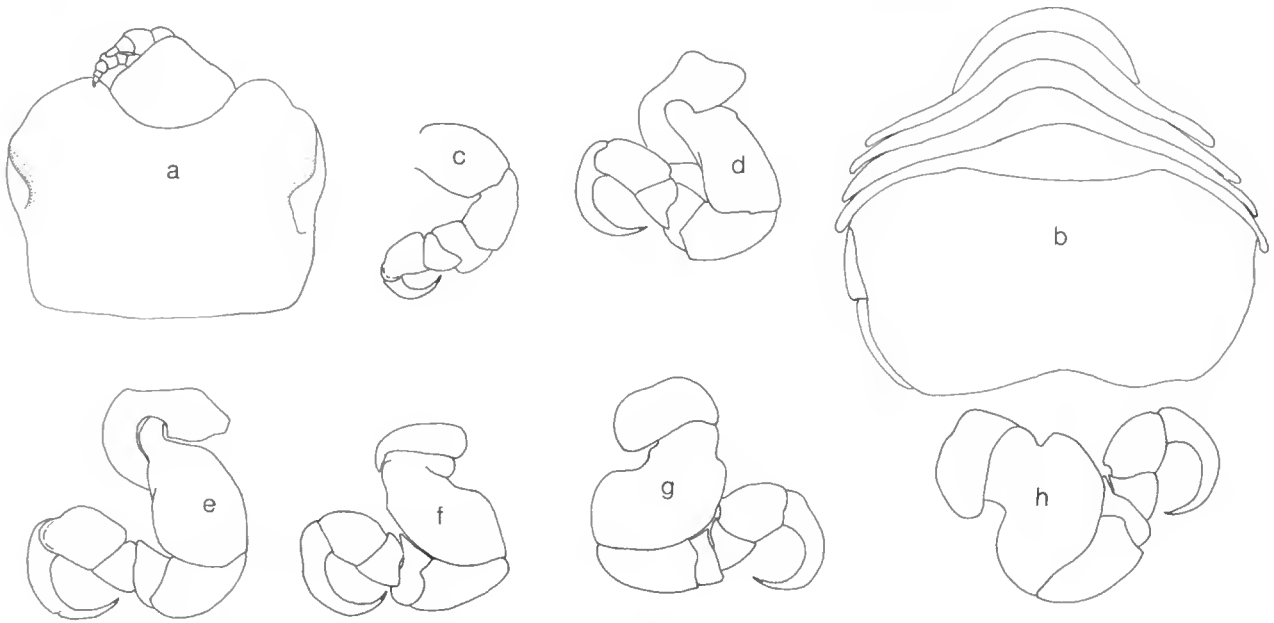


FIGURE 8.—*Ceratothoa retusa* (syntype of *Cleatessa retussa* Schioedte and Meinert from Berlin Museum): a, head and pereonite 1, dorsal view; b, pleon and pleotelson, dorsal view; c-g, pereonites 1-5; h, pereonite 7.

1, this description fits our specimens.

That the host of *C. hemiramphi* is *Hemiramphus far* strengthens the case for considering this isopod a synonym of *Ceratothoa retusa*.

HOSTS.—Not known for Schioedte and Meinert's (1883) specimens. Pillai's specimen(s) (1954) and all our specimens were taken from *Hemiramphus far* except the Groote Eylandt specimen, which came from *Hemiramphus robustus*.

DISTRIBUTION.—Northern Australia; West Irian; coast of Kerala state, southwestern India; Durban, South Africa; Mozambique.

Genus *Glossobius* Schioedte and Meinert, 1883

Glossobius Schioedte and Meinert, 1883:299.

Ceratothoa.—Richardson, 1905:283.—Schultz, 1969:155.—Kussakin, 1979:287. [Not *Ceratothoa* Dana, 1852, sensu Brusca, 1981.]

DIAGNOSIS OF FEMALE.—Body narrow, about 2.5 to 3.5 times longer than wide; cephalon rostrum as in *Ceratothoa*. Pereonite 1 lateral margins lobed, anterior margin not recessed or only weakly recessed to accommodate cephalon. Pereonites 6 and 7 shortest, 7 markedly so; pleonite 1 distinctly narrower than pleonites 2-5. Antennule basal articles in contact, proximal articles broad and flattened. Pereopod 1 short, pereopods 2 and 3 longer and more slender than 1; pereopods 5-7 basis with prominent anterior expansion. Pleopods all lamellar, decreasing in size toward posterior; pleopod 1 indurate, exopod forming operculum.

DESCRIPTION OF FEMALE.—Body straight, usually between 2.5 and 3.5 times longer than wide. Cephalon with prominent rostrum; eyes small, subtriangular, facets indistinct. Pereonite 1 lateral margins weakly or prominently lobed; anterior margin not recessed or only weakly recessed to accommodate cephalon. Pereonite 1 longest, pereonites 6 and 7 short. All coxae shorter than their segments. Pleonites subequal in length; pleonite 1 distinctly narrower than pleonites 2-5 which are subequal in width.

Basal articles of antennules in contact, antennule proximal articles broad and flattened. Mandible palp large, folding across anterior to prominent labrum. Maxillule styliiform, with 3 or 4 terminal spines. Maxilla broad with abundant spines on lateral lobe (12 to 21) and endopod (9 to 11). Maxilliped set distinctly posterior to other mouthparts, with 2 oostegital lobes. Pereopod 1 short, pereopods 2 and 3 longer and more slender than pereopod 1, pereopods 5-7 basis with flattened posterior expansion. Brood pouch with 5 pairs of oostegites arising from sternites 1-4 and 6, anterior pair overlying maxillipeds. Pleopods all lamellar, decreasing in size toward posterior; pleopod 1 indurate, covering all other pleopods; pleopod rami with depressions which may form pockets or folds.

DESCRIPTION OF MALE.—Body approximately rectangular in shape; pleonite 1 much narrower than pleonites 2-5. Appendages similar to female but antennule and antenna less robust, maxilla with fewer spines, pereopods 1-3 similar to each other, and pereopods 5-7 expansions of basis less developed. Penes prominent, apices lie between pleopod

peduncles. Pleopod rami all lamellar; pleopod 2 without appendix masculina.

TYPE SPECIES.—*Ceratothoa linearis* Dana, 1853. Schioedte and Meinert (1883) included two of Dana's (1853) species, *Ceratothoa crassa* and *C. linearis*, when they established *Glossobius*. To our knowledge, a type species for the genus has not been designated previously, and we select *Glossobius linearis* as type species. *Glossobius lineatus* is generally considered to be a junior synonym of *G. impressus*.

REMARKS.—The major problem in diagnosing and discriminating *Glossobius*, *Ceratothoa*, and related genera is the lack of modern descriptions for species or diagnoses to genera. The only recent generic treatment is that of Brusca (1981) diagnosing *Ceratothoa* and *Cymothoa*. Bowman (1978) re-

solved the nomenclatural problems but was not concerned with how to distinguish the genera. At present, differences between *Glossobius* and *Ceratothoa* seem only to be that *Ceratothoa* has the anterolateral margins of pereonite 1 projecting forward, the anterior margin of pereonite 1 recessed, and pereonite 6 longer than in *Glossobius*.

Another similar genus is *Lobothorax* Bleeker, 1857. *Lobothorax* is said to differ from *Glossobius* in having large eyes, a broad flat rostrum, pereonite 1 produced into spoonlike shoulders, a median dorsal carina in some species, pereonites 5-7 very short, and antennule bases that are set apart.

Species currently included in *Glossobius* are *G. impressus*, *G. auritus*, *G. hemiramphi*, and *Glossobius anctus*, new species.

Key to the Species of *Glossobius*

- 1. Pereonite 1 with large bulbous lateral lobe *G. impressus*
 Pereonite 1 without bulbous lobe 2
- 2. Rostrum acute *G. hemiramphi*
 Rostrum rounded or blunt 3
- 3. Labrum small, coxae moderate in size *G. auritus*
 Labrum large, coxae very large *G. anctus*, new species

***Glossobius anctus*, new species**

FIGURES 9, 10

MATERIAL.—All from *Euleptorhamphus viridis* (van Hasselt). PACIFIC OCEAN: *Australia*: Western Australia, North West Shelf, 18°25'S, 118°52'E, 150 m depth, coll. F.R.V. *Soela*, 17 May 1979, ovigerous ♀, 28.0 mm (holotype, AM P35743) and ♂, 9.5 mm (paratype, AM P35744). New South Wales, Bryon Bay, 28°38'S, 153°37'E, 26 Jun 1910, ♂, 8.0 mm (AM P35745). *Japan*: Iozu Sea, non-ovigerous ♀, 26.0 mm (paratype, USNM 227113). Wahasa Bay, Yoro, 1929, ovigerous ♀, 30.0 mm and immature, 4.0 mm (paratypes, USNM 227110). *Hawaii*: Honolulu, ovigerous ♀, 25.5 mm and ♂, 8.2 mm (paratypes, USNM 227112). Honolulu, coll. *Albatross*, ovigerous ♀, approximately 34 mm, head missing, (USNM 227111).

TYPES.—Holotype, AM P35743; paratypes, AM P35744, USNM 227110, 227112, 227113.

TYPE LOCALITY.—North West Shelf of Western Australia, 18°25'S, 118°52'E.

ETYMOLOGY.—From the Latin *anctus*, meaning choke, alluding to the buccal-filling size of this species.

DESCRIPTION OF FEMALE.—Body straight, about 4 times as long as wide, sides subparallel; dorsum strongly vaulted. Rostrum anterior margin bluntly rounded; eyes very small, triangular, facets indistinct. Pereonite 1 anterolateral angles scarcely produced. Pereonites 1-3 subequal in length; pereonites 4-6 progressively decreasing in length, pereonite 7

distinctly shorter than pereonite 6, about 25% length of pereonite 1. Coxae all shorter than pereonites; widest anteriorly, between half and two-thirds as wide as long. Pleonites 1 and 5 subequal in length, longer than pleonites 2-4; posterior margin of pleonite 5 not lobed. Pleotelson lateral margins converging slightly; posterior margin truncate, with medial emargination.

Antennule extending to posterior of cephalon, composed of 7 articles. Antenna extending to posterior of cephalon, composed of 9 articles.

Labrum prominent, fleshy, anterior margin rounded, posterolateral margins produced. Mandible palp article 3 with 6 terminal setae, medial margins with microtrichs. Maxillule with 4 terminal spines. Maxilla with 14 spines on lateral lobe, 10 on endopod. Maxilliped article 3 with 2 terminal spines.

Pereopods 1 and 2 of similar proportions, but pereopods 2 and 3 longer than pereopod 1 and pereopod 3 less robust than 1 and 2.

Pleopods same as *G. impressus*. Uropod rami both bluntly rounded, extending just beyond posterior of pleotelson.

DESCRIPTION OF MALE.—About one-third length of female. Antennule with 6 or 7 articles, antenna with 7 or 8. Maxilla lateral lobe with 4 spines, endopod with 3. Mandible palp article 2 with about 6 stout setae at mediobasal angle; article 3 medially constricted, with 8 stiff setae on mediobasal margin. Maxillule with 4 terminal spines. Maxilliped article 3 with 4 terminal hooked spines; medial margins with fine serrate scales. Pereopods less robust than in female; pereopods 5-7

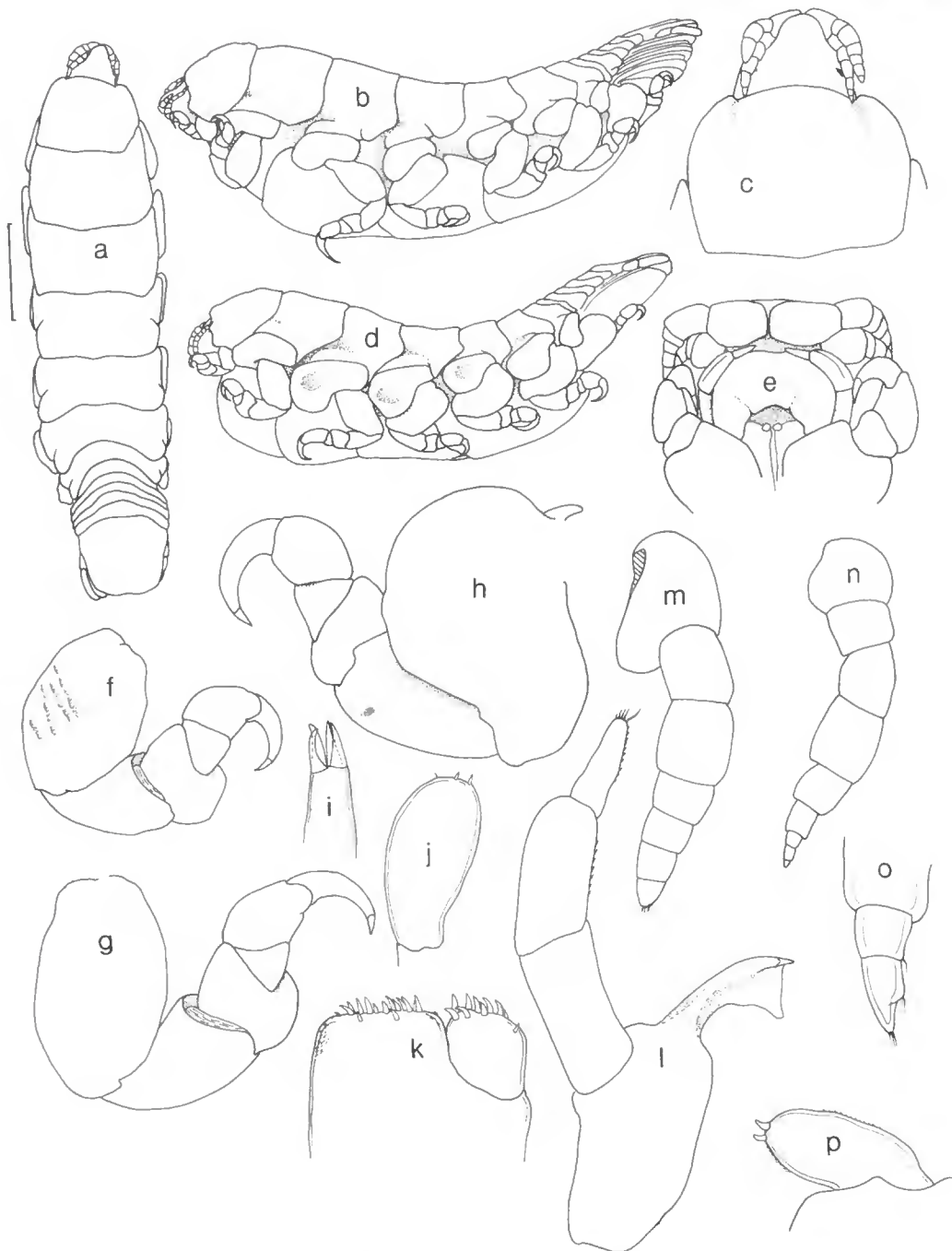


FIGURE 9.—*Glossobius anctus* (a-c, e, ovigerous ♀, 28.0 mm, Western Australia, holotype, AM P35743; d, ovigerous ♀, 25.0 mm, Hawaii, ANSP 91844; f-o, ovigerous ♀, 30.0 mm, Japan, paratype, USNM 227110; p, non-ovigerous ♀, 26 mm, Japan, paratype, USNM 227113): a, dorsal view; b, lateral view; c, cephalon and pereonite 1, dorsal view; d, lateral view; e, cephalon, ventral view; f, pereopod 1; g, pereopod 2; h, pereopod 7; i, maxillule apex; j, maxilliped article 3; k, maxilla apex; l, mandible; m, antennule; n, antenna; o, antenna, terminal articles; p, maxilliped. (Scale line = 5.0 mm.)

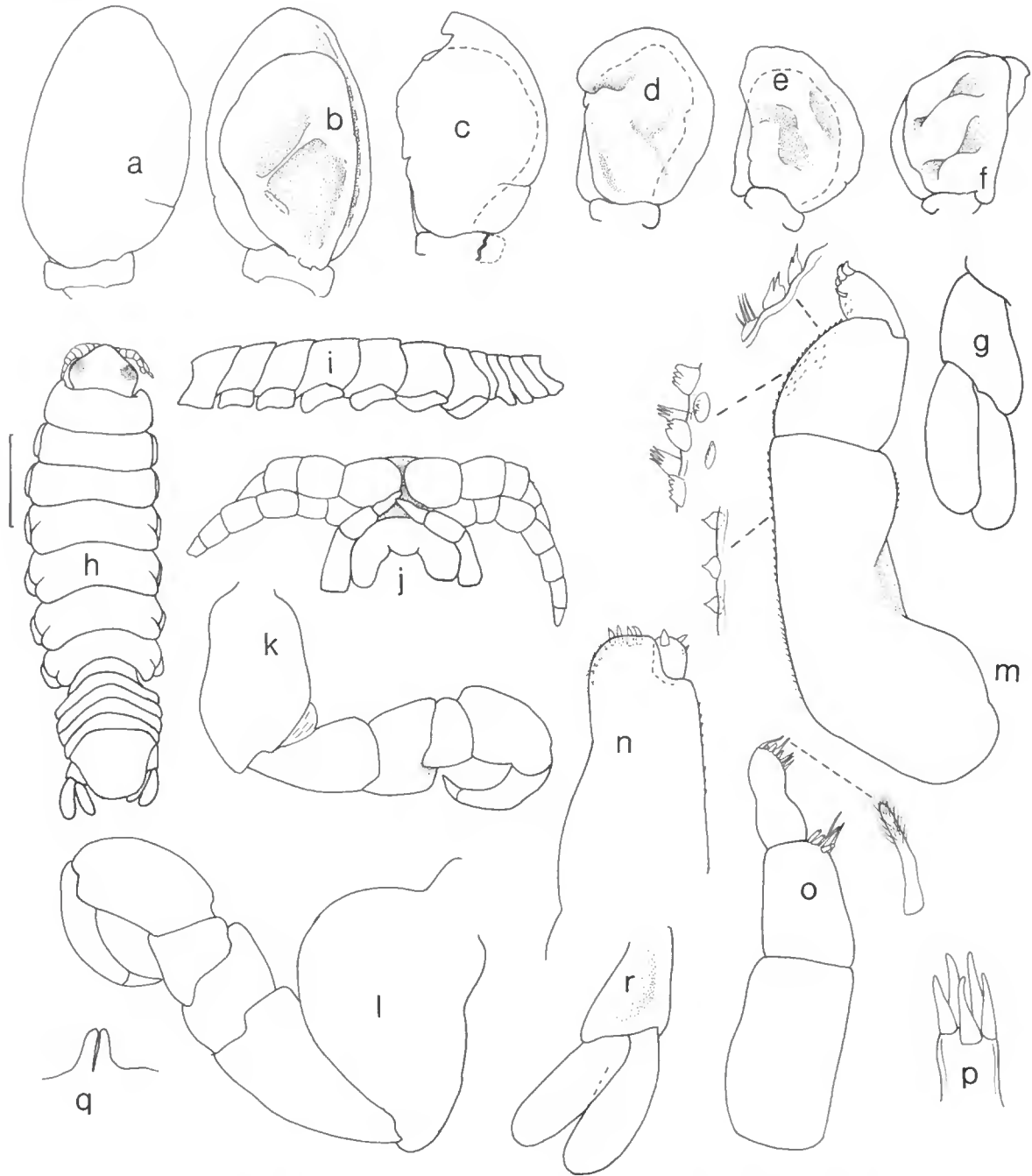


FIGURE 10.—*Glossobius anctus* (a-g, ♀, 30.0 mm, Japan, paratype, USNM 227110; h-q, ♂, 9.5 mm, Western Australia, paratype, AM P35744): a, pleopod 1, exopod; b, pleopod 1, posterior view; c, pleopod 2; d, pleopod 3; e, pleopod 5, anterior view; f, pleopod 5, posterior view; g, uropod, in situ; h, habitus, dorsal view; i, pereon and pleon, lateral view; j, cephalon, ventral view; k, pereopod 1; l, pereopod 7; m, maxilliped; n, maxilla; o, mandible palp; p, maxillule apex; q, penes; r, uropod. (Scale line = 2.0 mm.)

basis with moderately developed expansions. Penes elongate.

COLOR.—Pale to tan in alcohol.

SIZE.—Ovigerous females between 25.5 and 34.0 mm, one non-ovigerous female was 26.0 mm, males between 8.0 and 9.5 mm.

REMARKS.—This species is readily identified by the large coxal plates, large labrum, and uropods with both rami bluntly rounded and of approximately equal length.

HOST.—Recorded only from *Euleptorhamphus viridis*.

DISTRIBUTION.—Tropical and subtropical Pacific and Indian Ocean, with records from Hawaii, Japan, and eastern and western Australia.

Glossobius auritus Bovallius, 1885

FIGURES 11, 12

Glossobius auritus Bovallius, 1885:12-17, pl. 3: figs. 24-33.—Stebbing, 1893:354, pl. 15.

Ceratothoa laticauda.—Gerstaecker, 1882:258.—Richardson, 1904:23.—Trilles, 1973b:1252, pl. 2: figs. 12, 13.—Kurochkin, 1980:289.

Glossobius laticauda.—Stebbing, 1893:354.—Van Name, 1936:490.—Brian and Darteville, 1949:181.—Trilles, 1979:258.

Codonophilus laticauda.—Nierstrasz, 1931:131.

Codonophilus auritus.—Nierstrasz, 1931:132.

Glossobius laticaudus.—Avdeev, 1982b:66.

Glossobius albinae Kononenko, 1986:331.

Not *Cymothoa laticauda* Milne-Edwards, 1840:274 [nomen dubium].

Not *Ceratothoa crassa* Dana, 1853:753-754, pl. 50: figs. 2a,b,b',c.

MATERIAL.—PACIFIC OCEAN: *Thailand*: Gulf of Thailand, off Paknam, mouth of flying fish *Cypselurus* sp., coll. H.M. Smith, 6 Aug 1953, ovigerous ♀, 21.9 mm and ♂, 8.4 mm (USNM 216605). *Japan*: Off Honshu Island, ex *Cypselurus agoo* (Temminck and Schlegel), coll. Jordan and Snyder, Stanford University Expedition, ca. 1900, ovigerous ♀, 26.0 mm (AM P35746). *Mexico*: Off Mexico, 15°36'N, 98°33'W, from stomach of *Coryphaena hippurus* Linnaeus, coll. W.L. Klaw, 31 Mar 1957, ovigerous ♀, 26.0 mm (USNM 104866). ATLANTIC OCEAN: *Bahamas*: 3 miles west of Bimini, ex *Cypselurus comatus* (Mitchill), 23-24 Jul 1963, ovigerous ♀, 29.5 mm and ♂, 12.2 mm (USNM 216576). Atlantic, 23°35'N, 68°18'W, Shell Canada Tanker *Pinnacles*, coll. G.F. Burgess, 20 May 1955, non-ovigerous ♀, 24.5 mm (USNM 98987). *Lesser Antilles*: Saba Bank, 1/2 mile north of 17°27'N, 63°13'W, Smithsonian Bredin sta 108-56, ex *Cypselurus comatus*, coll. D.V. Nicholson, 1956, ovigerous ♀, 26.5 mm and ♂, 10.5 mm (USNM 216580). 15°27'N, 45°00'W, mouth of flying fish on board Swedish vessel *Monarch*, coll. Capt. George von Scheile, ovigerous ♀, 32.8 mm and ♂, 10.5 mm (syntypes, RMS Isopod 4971). "Ost Indien," bought from Carl Wessel at Hamburg, ovigerous ♀, 28.5 mm (syntype, RMS Isopod 3475); several manca (syntypes, RMS Isopod 3476). Southwest of Barbados, 12°35'N, 59°54'W, *Geronimo* sta 7-23, ex *Cypselurus comatus*, 6 Feb 1966, ovigerous ♀, 26.0 mm and ♂, 10.2 mm (USNM 216579). *Honduras*: Off Honduras, 17°35'N,

82°12'W, *Geronimo* sta 6-218, ex *Cypselurus comatus*, 23 Oct 1965, ovigerous ♀, 27.5 mm and ♂, 9.4 mm (USNM 216578). North of Cabo Falso, ex flying fish at 100 fathom line, 15 Jun 1972, ovigerous ♀, 26.8 mm (USNM 216577).

TYPES.—Syntypes, Naturhistoriska Riksmuseet, Stockholm, Isopod nos. 4971, 3475, and 3476.

TYPE LOCALITY.—North Atlantic Ocean at 15°26'N, 45°00'W.

DESCRIPTION OF FEMALE.—Body straight, between 2.06 and 2.41 times longer than maximum width, widest at pereonite 5; pereon with ill-defined longitudinal mediodorsal ridge. Cephalon lateral margins converge abruptly in front of eyes to form rostrum which appears truncate in dorsal view; eyes small, subtriangular, facets indistinct. Pereonite 1 longest, anterior margin convex, not recessed to accommodate cephalon; anterolateral margins form into 2 bosses which do not project anteriorly. Pereonites 2-4 subequal in length, pereonite 5 slightly shorter than 4; pereonites 6 and 7 markedly shorter than other pereonites, pereonite 7 about 15-18% length of pereonite 1. Coxae all shorter than pereonites; coxae of pereonites 6 and 7 smaller on one side than other, each with distinct acute dorsal ridge. Pleonites 1-4 subequal in length; pleonite 5 slightly longer, posterior margin with 2 low submedian lobes. Pleotelson nearly as long as wide, lateral margins converging slightly; posterior margin truncate, with median emargination.

Antennule extending to posterior of cephalon, composed of 8 articles, first 3 of which are broad and flattened. Antenna extends to pereonite 1, composed of 9 articles, first 4 of which are broad.

Mandible palp large, folding across anterior to labrum. Maxillule styliform, with 4 terminal spines. Maxilla lateral lobe with about 17 spines, endopod with 8. Maxilliped as in *G. impressus*, but article 3 with 2-4 spines.

Pereopod 1 short, merus posterior margin not dilated, dactylus extending to middle of carpus; pereopods 2 and 3 longer and less robust than pereopod 1. Pereopods 5-7 basis with posterior expansion well developed, anterior expansion weakly developed; merus with weak anterior expansion.

Pleopods as in *G. impressus*. Uropod curving medially, endopod slightly longer than exopod, both rami with apices narrowly rounded or acute.

DESCRIPTION OF MALE.—Much shorter than female (38% on average), body approximately rectangular in shape. Antennule with 6 or 7 articles, antenna with 8 or 9. Maxilla lateral lobe with 9 spines, endopod with 6. Maxilliped with 3 stout recurved terminal spines on article 3. Pereopods less robust than in female, pereopods 5-7 basis with weakly developed expansions. Penes elongate, apices lie between pleopod peduncles. Pleopods all simple; appendix masculina absent. Uropods similar to female, exopod slightly longer than endopod.

COLOR.—Anterior of animal and anterior appendages dark brown to nearly black, becoming lighter toward posterior; pleon, pleotelson, and pereopods 6 and 7 virtually without chromatophores.

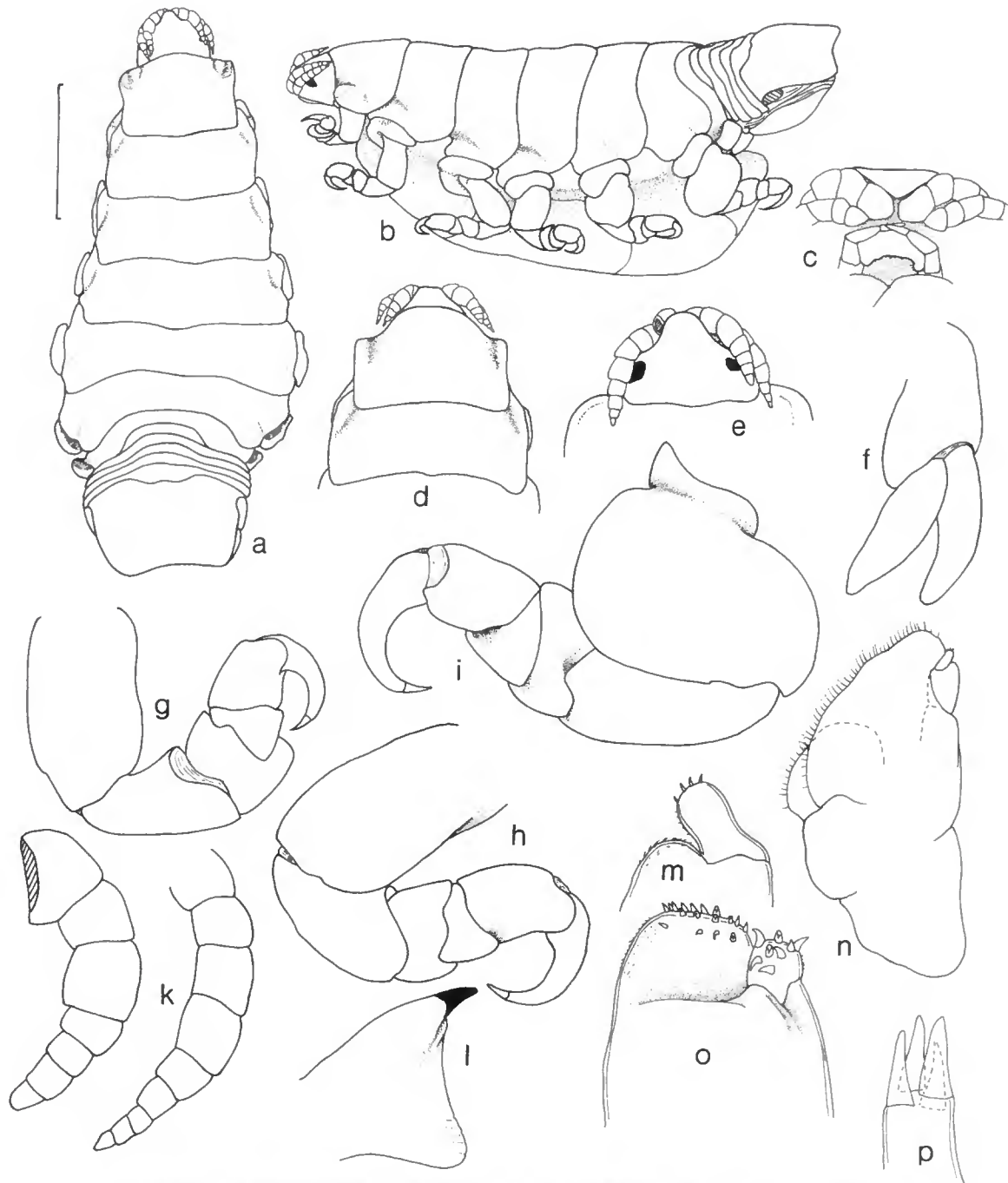


FIGURE 11.—*Glossobius auritus* (a, b, ovigerous ♀, 32.8 mm, syntype, RMS Isopod 4971; c, d, ovigerous ♀, 27.5 mm, Geronimo sta 6-218, USNM 216578; e-p, ovigerous ♀, 26.5 mm, Saba Bank, Lesser Antilles, USNM 216580): a, dorsal view; b, lateral view; c, buccal area; d, anterior pereonites; e, cephalon, dorsal view; f, uropod; g, pereopod 1; h, pereopod 2; i, pereopod 7; j, antennule; k, antenna; l, mandible apex; m, maxilliped article 3; n, maxilla apex; o, maxillule apex; p, maxillule apex. (Scale line = 8.0 mm.)

FIGURE 12.—*Glossobius auritus* (*a-f*, ovigerous ♀, 26.5 mm, Saba Bank, Lesser Antilles, USNM 216580; *g-t*, ♂, 10.5 mm, Saba Bank, Lesser Antilles, USNM 216580): *a*, pleopod 1, ventral view; *b*, pleopod 1, dorsal view; *c-e*, pleopods 2, 4, 5, respectively; *f*, pleopod 5, dorsal view; *g*, antennule; *h*, antenna; *i*, dorsal view; *j*, pereon and pleon, lateral view; *k*, maxilliped; *l*, maxilliped article 3; *m*, maxilla apex; *n*, penes; *o*, pereopod 1; *p*, pereopod 7; *q-s*, pleopods 1, 2, 5, respectively; *t*, uropod. (Scale line = 3.0 mm.)

SIZE.—Ovigerous females between 21.9 and 32.8 mm, one non-ovigerous female was 24.5 mm, males between 8.4 and 12.2 mm.

REMARKS.—Identification of *Glossobius auritus* is not problematic. *Glossobius impressus* is far more elongate and has large bulbous lateral lobes on pereonites 1 and 2. *Glossobius hemiramphi*, so far found only on hemiramphid fishes, is also more elongate and has an acute rostrum, while *G. anctus* has exceedingly large coxae and a pleotelson nearly as long as wide.

There is a problem in deciding which name to use for this species. In the past this species has been referred to (in various genera) as *Glossobius laticauda* (Milne-Edwards, 1840), *Glossobius crassa* (Dana, 1853) and *Glossobius auritus* were placed in synonymy with *C. laticauda*. Milne-Edwards' (1840) description lacked figures, he gave no host, no locality, and there are apparently no types. Trilles (1973b) did not list any type material in the Paris Museum. Furthermore, the description of *G. laticauda* specifically disagrees with the material subsequently figured under that name and with the present material. Milne-Edwards (1840:274) stated, and we paraphrase, "First segment ... with large lamellar elongations which advance on either side of the head." This agrees more with certain species of *Ceratothoa* or *Lobothorax* than with *Glossobius*. As there is little chance of the identity of *G. laticauda* being resolved we here regard it as a nomen dubium.

Glossobius crassa was described by Dana (1853) from a single dry specimen about 28 mm in length, from the "Southwestern Pacific." Dana illustrated the body in dorsal view, pereopod 6, and the uropod. The very short uropodal rami and the proportions of pereonite 1 and the pleotelson clearly distinguish it from *G. auritus*.

We have examined the type material of *Glossobius auritus* and can positively identify the present material as belonging to that species.

We have not seen the recently described *Glossobius albinæ* Kononenko, 1986, but Kononenko's figure agrees completely with the material examined here, and we have no hesitation in placing his species in synonymy with *G. auritus*.

HOSTS.—In most records the host was not identified; in our material, where the host has been identified, it is *Cypselurus comatus* in the Atlantic and *Cypselurus agoon* in Japan. Kononenko (1986) recorded the host as *Cheilopogon heterurus* (= *Cypselurus heterurus* (Rafinesque)).

DISTRIBUTION.—Present material is from the Caribbean, tropical East Pacific, Japan, and Thailand. Trilles (1973b) summarizes previous records from the Pacific, Indian, and Atlantic Oceans. Kononenko's specimen was collected in the central South Atlantic (4°35'S, 22°30'W).

Glossobius hemiramphi Williams and Williams, 1985

FIGURES 13, 14

Glossobius hemiramphi Williams and Williams, 1985:147–152, figs. 1–26.

Ceratothoa impressa (Say).—Berkeley and Houde, 1978:636 [misidentification].

MATERIAL.—With one exception, all from *Hemiramphus brasiliensis* (Linnaeus).

WESTERN ATLANTIC: *Georgia*: Off Georgia, M/V *Theodore N. Gill* cruise 3, sta 36, 31°40'N, 80°37'W, non-ovigerous ♀, 11.8 mm and postmanca, 3.7 mm; non-ovigerous ♀, 9.7 mm; juvenile, 4.9 mm; non-ovigerous ♀, 10.4 mm and postmanca, 3.2 mm. Off Georgia, *Gill* cruise 7, sta 34, 31°00'N, 80°58'W, non-ovigerous ♀, 17.4 mm. *Florida*: Off Florida, *Gill* cruise 7, sta 17, 29°38'N, 79°36'W, ovigerous ♀, 15.5 mm and ♂, 5.4 mm. New Smyrna Beach, ex USNM 57124, ♂, 7.3 mm. Dade Co., coll. Steve Berkeley, non-ovigerous ♀, 29.6 mm and ♂, 9.7 mm; ♀ with mancas, 36.9 mm; ♀ with mancas, 25.5 mm, ovigerous ♀, 27.8 mm, ♂, 9.4 mm, ♂, 9.6 mm (4 specimens in 1 vial); non-ovigerous ♀, 26.8 mm and ♂, 8.4 mm. Key West, ex USNM 30948, ♀ with mancas, 28.2 mm and ♂, 7.9 mm; ex USNM 35044, non-ovigerous ♀, 24.9 mm and ♂, 9.1 mm; ex USNM 120519, ovigerous ♀, 27.4 mm and ♂, 8.4 mm. Dry Tortugas, ex MCZ 5203, ovigerous ♀, 27.2 mm and ♂, 6.9 mm. *Bahamas*: Grand Bahama Island, West End, ex Univ. Miami Marine Lab no. 11667, manca, 3.3 mm. Green Cay, non-ovigerous ♀, 5.2 mm and ♂, 3.7 mm. *Mexico*: Quintana Roo, Puerto Morelos, ex USNM 50476, ovigerous ♀, 32.2 mm. *West Indies*: Haiti, ex USNM 164798, ovigerous ♀, 23.4 mm and ♂, 9.4 mm. Puerto Rico, off Guanica Bay, ♀ (holotype, USNM 212532), ♂ (allotype, USNM 213533), 3 ♀ and 5 ♂ (paratypes, USNM 213534–213541). St. Thomas, ex MCZ 5203 no. 8, ovigerous ♀, 29.2 mm and ♂, 8.9 mm; ex MCZ 5203 no. 11, ovigerous ♀, 28.6 mm and ♂, 9.9 mm. St. Croix, ex BM(NH) 1863.8.7.20, ovigerous ♀, 30.2 mm. *Bermuda*: Ex *Hemiramphus bermudensis* Collette, 1962, non-ovigerous ♀, 22.1 mm and ♂, 6.8 mm.

EASTERN ATLANTIC: *Senegal*: Dakar, *Galathea* sta 10, ex UZMC P-34190, ovigerous ♀, 21.0 mm and ♂, 3.6 mm; non-ovigerous ♀, 20.3 mm and ♂, 5.3 mm; ovigerous ♀, 17.4 mm and ♂, 5.1 mm; non-ovigerous ♀, 19.0 mm and ♂, 5.2 mm. *Guinea*: Off Guinea, 10°44'–11°46'N, 17°06'–16°58'W, non-ovigerous ♀, 10.3 mm and manca 2.8 mm. *Sierra Leone*: Freetown, ovigerous ♀, 23.7 mm and ♂, 6.1 mm; non-ovigerous ♀, 18.7 mm and manca, 2.9 mm; ♀ with mancas, 19.7 mm and ♂, 5.5 mm; non-ovigerous ♀, 16.4 mm and ♂, 6.2 mm; ovigerous ♀, 17.3 mm and ♂, 5.4 mm; ♀ with empty marsupium, 15.1 mm, ♂, 5.6 mm, and manca, 2.9 mm; non-ovigerous ♀, 17.7 mm and ♂, 4.7 mm; ♀ with mancas, 16.2 mm and ♂, 6.0 mm; non-ovigerous ♀, 18.6 mm and postmanca, 2.8 mm; ovigerous ♀, 16.3 mm and ♂, 5.3 mm; ♀ with mancas, 16.3 mm and ♂, 5.1 mm; non-ovigerous ♀, 13.3 mm and ♂, 3.8 mm. *Liberia*: Off Monrovia, non-ovigerous ♀, 13.3 mm and ♂, 4.6 mm; *Atlantide* sta 52, immature ♀, 7.8 mm; immature ♀, 7.3 mm; postmanca, 4.3 mm; postmanca, 3.0 mm. Off Port Marshall, *Atlantide* sta 53; non-ovigerous ♀, 13.0 mm; ♂, 7.4 mm; non-ovigerous ♀, 8.2 mm. *Ghana*:

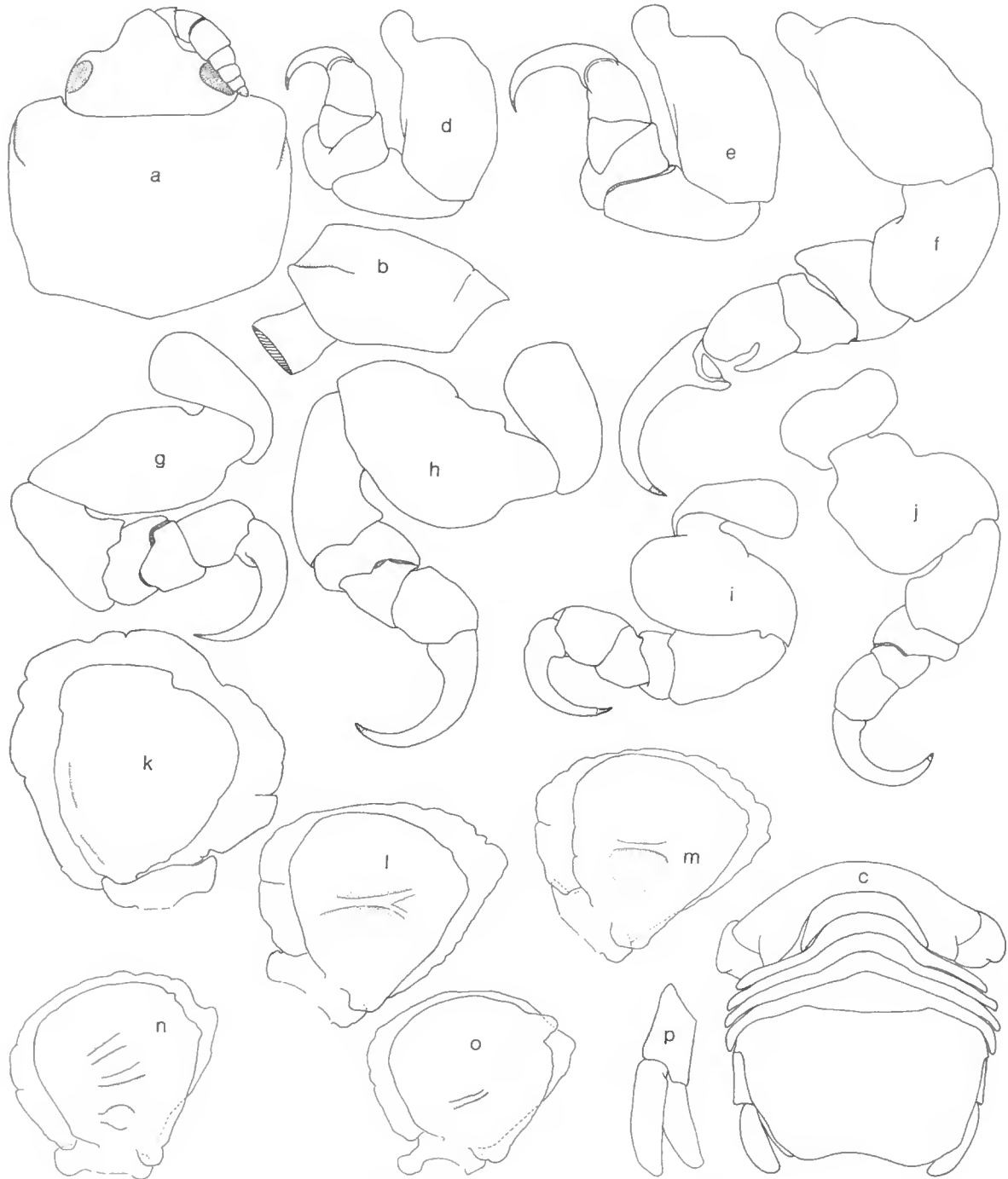


FIGURE 13.—*Glossobius hemiramphi* (♀, a-c, Haiti; d-h, St. Thomas; i-j, Liberia; k-p, Accra): a, head and peronite 1, dorsal view; b, peronite 1, lateral view; c, pleon and pleotelson, dorsal view; d-j, pereopods 1-7; k-o, pleopods 1-5; p, uropod.

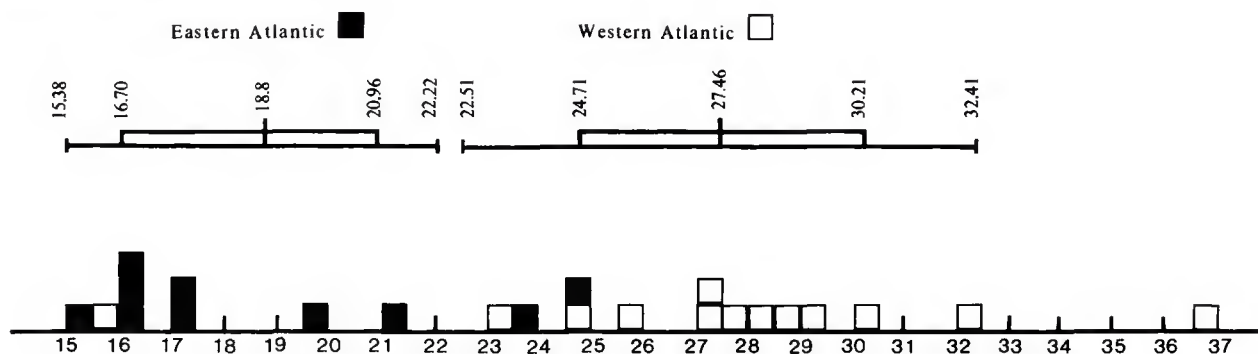


FIGURE 14.—*Glossobius hemiramphi*: body lengths of ♀ with oostegites and graphical comparison of Eastern Atlantic (solid squares) and Western Atlantic (open squares) populations. Graphs show mean (vertical line), 2 standard errors of the mean (rectangles), and standard deviation (horizontal lines).

Sekondi-Takoradi, ex UZMC P-341915, ♂, 4.8 mm. Accra, *Atlantide* sta 77, ex UZMC P-341934, non-ovigerous ♀, 15.3 mm and ♂, 5.1 mm; ex UZMC P-341933, non-ovigerous ♀, 13.1 mm and ♂, 4.8 mm; ex UZMC P-341936, ♀ with mancas, 25.0 mm. *Angola*: Luanda, *Atlantide* sta 137, non-ovigerous ♀, 11.8 mm; non-ovigerous ♀, 9.6 mm.

TYPES.—Holotype, USNM 213532; allotype, USNM 213533; 8 paratypes (3 ♀, 5 ♂), USNM 213534–213541, 23 paratypes in Williams and Williams collection. For measurements of type material see Williams and Williams (1985).

TYPE LOCALITY.—One mile offshore of Guanica Bay, La Maruca Reef, Puerto Rico, 17°56.5'N, 66°54.5'W.

DESCRIPTION OF FEMALE.—Length/width of ♀ with oostegites 2.8–3.6, of ♀ without oostegites 3.0–3.8. Width greatest at pereonite 6. Cephalon abruptly narrowed anterior to eyes into narrowly rounded triangular rostrum. Eyes small, oval. Pereonite 1 longest, anterior one-third to one-half of lateral margin elevated dorsally into ridge. Lengths of pereonites 2–6 gradually decreasing; pereonite 7 abruptly shorter (relative lengths in percent of pereonites 1–7 of 27.8 mm ♀ from Dade County, Florida: 25.5, 16.0, 15.2, 14.8, 13.2, 10.3, 5.0). Coxae shorter than their pereonites; coxa 7 may have concave dorsal surface and lateral margin elevated into ridge. Pereonite 7 not overlapping any pleonites. Pleonites 1–4 subequal in length; pleonite 5 about twice as long, wider than pleotelson. Pleotelson length/width 0.56–0.71, narrowing slightly posteriorly, lateral margins slightly convex, posterior margin slightly concave.

Antennule composed of 7 articles, article 3 longest. Antenna composed of 7–8 articles, slightly longer than antennule, article 4 longest. Mouthparts as described by Williams and Williams (1985).

Pereopods similar to those of *Glossobius impressus*; pereopod 3 with longest dactyl.

Pleopods 2–5 with depressions separated by ridges (shown only for endopods in Figure 131–o). Uropods reaching slightly beyond posterior margin of pleotelson; rami subequal in length

or exopod slightly longer.

DESCRIPTION OF MALE.—As described by Williams and Williams (1985).

COLOR.—Head and pereonites 1–4 covered with black chromatophores, sparser on pereonite 4. Pereonites 5–7, pleon, and pleotelson unpigmented.

SIZE.—Females with oostegites ranged in length from 15.1 to 36.9 mm (Figure 14). Western Atlantic specimens are distinctly longer than the Eastern Atlantic specimens. There is a slight overlap between 23 and 25.5 mm, and the second smallest specimen is a 15.5 mm female from Florida.

REMARKS.—The distinguishing features of *G. hemiramphi* are the obtusely pointed rostrum, pereonite 7 not overlapping any pleonites, pleon wider than pleotelson, and uropods extending beyond posterior margin of pleotelson.

Hemiramphus brasiliensis is limited to coastal waters, but has pelagic larvae that could be carried between the two populations by ocean currents. However, Collette (1965) found differences between the populations in numbers of gill rakers on the first and second arches and in dorsal and anal fin ray counts suggesting some restriction of gene flow. *Glossobius hemiramphi* is not known to infest larval halfbeaks, and the free-swimming juvenile stage of the isopod is probably too short-lived and vulnerable to predators to allow transport by ocean currents between the two host populations. It seems probable that the two populations are effectively isolated from each other, with little possibility of gene exchange between them.

HOSTS.—*Hemiramphus brasiliensis* (Linnaeus) and *H. bermudensis* Collette.

DISTRIBUTION.—Western Atlantic: Georgia, Florida, Bermuda, Bahamas, Haiti, Puerto Rico, Virgin Islands, Yucatan Peninsula, Mexico. Eastern Atlantic: From Dakar, Senegal, south to Luanda, Angola. The host, *H. brasiliensis*, has a wider known distribution, extending north to the Cape Verde Islands in the Eastern Atlantic, and from Woods Hole, Massachusetts, to Rio de Janeiro in the Western Atlantic (Collette, 1965).

Glossobius impressus (Say, 1818)

FIGURES 15-17

- Cymothoa impressa* Say, 1818:397.—De Kay, 1844:48.
Ceratothoa linearis Dana, 1853:752, pl. 50: figs 1a-1d.—Gerstaecker, 1882:260.—Stebbing, 1893:354.—Richardson, 1900:221; 1901:529.
Ceratothoa exocoeti Cunningham, 1871:499, pl. 59: fig. 5.—Gerstaecker, 1882:260.
Glossobius linearis.—Schioedte and Meinert, 1883:301, pl. 12: figs. 1-9.—Hansen, 1895:18, pl 2: figs. 2-2d.—Brian and Darteville, 1949:176.
Ceratothoa impressa.—Richardson, 1905:234-236, figs. 236-240; 1913:2, 6.—Fowler, 1912:292-293, pl. 83.—Tattersall, 1921:214.—Stephensen, 1948:43-44, fig. 9.—Schultz, 1969:155-156, fig. 233.—Anonymous, 1971:16-17.—Lincoln, 1971a:103-104, photograph facing p. 90; 1971b:184.—Trilles, 1972:7-9, figs. 3-24, photographs 5, 6; 1973b:1253-1255, pl. 2: figs. 14-16.—Bowman, 1978:217.—Kussakin, 1979:287, fig. 153.—Kurochkin, 1980:289.
Meinertia impressa.—Nierstrasz, 1915:89-90; 1918:119.
Codonophilus impressus.—Nierstrasz, 1931:131.
Glossobius impressa.—Avdeev, 1981:1160, 1164; 1982a:70.
Glossobius impressus.—Avdeev, 1982b:65-67, fig. 2, no. 4; 1985:89.
 Not *Ceratothoa impressa*.—Berkeley and Houde, 1978:636 [= *Glossobius hemiramphi* Williams and Williams, 1985].

MATERIAL.—ATLANTIC OCEAN: 60°42'N, 70°00'W, from (stomach ?) *Thunnus albacares* (Bonnaterre), R/V *Delaware*, 3 Oct 1957, non-ovigerous ♀, 29.9 mm (USNM 216583). *New Jersey*: Off Cape May, ovigerous ♀, 24.5 mm (holotype, ANSP 1608). 33°20'N, 59°50'W, from mouth of flying fish, coll. Dr. R.P. Campbell, 1954, ovigerous ♀, approximately 28 mm, cephalon missing, and ♂, 11.0 mm. *West Indies*: Anguilla, Bat Caves, electric light off Crocus Bay, sta 58-56, from *T. albacares*, 13 Apr 1958, immature ♀, 19.8 mm (USNM 216582). *North Atlantic*: No other data, fish catalog no. 7272 and 6296, ovigerous ♀, 34.5 mm (USNM 216584). 6°1'N, 41°31'W, 77 m depth, 2020-2355 hrs, Isaacs-Kidd midwater trawl, field no. RHB 961, *Chain Cruise* No. 35, ex *Hirundichthys speculiger* (Valenciennes) (MCZ 250414), coll. Dr. G.W. Mead, 12 Feb 1963, non-ovigerous ♀, 36.0 mm (USNM 216581). *Brazil*: North of São Luis (= Maranhão), 2°23'N, 39°38'W, ex flying fish on board S.S. *Vasari*, coll. S.G. Davis, no date, non-ovigerous ♀, 38.5 mm (USNM 46107). Off Rio de Janeiro, from mouth of flying fish *Exocoetus* sp., fish catalog no. 49090, coll. J.B. Hatcher, 1897, ovigerous ♀, 33.5 mm and ♂, 8.3 mm (USNM 22797). *West Africa*: Senegal, Dakar Harbor, no host, *Geronimo* sta 4-123, 5 Sep 1964, non-ovigerous ♀, 27.9 mm (USNM 119491). 7°20'N, 25°20'W, catalogued 1884, don. W. Hower, ovigerous ♀, 40.0 mm (BM(NH)). 5°0'S, 27°15'W, *Terra Nova* Expedition, ovigerous ♀, approximately 40.0 mm, pleotelson detached (BM(NH) 1921.11.29.150). 10°48'S, 2°07'W, during voyage of *Northumberland* from Durban to Tenerife, ovigerous ♀, 35.0 mm and ♂, 8.5 mm (BM(NH)). No data except "from flying fish," don. A.M. Norman, non-ovigerous ♀, 34.0 mm (BM(NH)).

TYPES.—Holotype, Academy of Natural Sciences, Philadelphia, Pennsylvania, USA, ANSP 1608.

TYPE LOCALITY.—Cape May, New Jersey.

DESCRIPTION OF FEMALE.—Body from 3.0 to 3.5 times longer than wide, sides subparallel. Cephalon lateral margin converging slightly toward anterior, abruptly narrowed in front of eyes to form broad rostrum, appearing rounded or truncate in dorsal view, more acute in anterior perspective; eyes lateral, small, narrow, subtriangular, facets indistinct. Pereonite 1 longest, pereonites 2-4 subequal in length, slightly shorter than 1, pereonite 5 shorter than 4; pereonites 6 and 7 markedly shorter than other pereonites; pereonite 7 about 20% length of pereonite 1. Pereonite 1 not encompassing cephalon, anterior margin straight, not sinuate or lobed; lateral margins produced laterally to form bulbous lobe with lateral laminar flange; pereonite 2 with similar flanged lobe formed from coxae. Coxae of pereonites 2-5 far shorter than segment, coxae of pereonites 6 and 7 nearly as long as segment, those of pereonite 7 shorter on one side than on other. Pleonites of about equal length, pleonite 1 very narrow, pleonites 2-5 subequal in width. Pleotelson approximately rectangular, lateral margins nearly straight; posterior margin with median emargination, dorsal surface with median longitudinal depression.

Antennule composed of 7 articles, 1-3 broad, flattened, tending to fuse on dorsal surfaces. Antenna with 8 articles, 1-5 broad and flattened. Mandible palp large, 3-articled, folding across anterior to labrum. Maxillule slender, styliform, with 3-4 terminal spines. Maxilla broad, folded (Figure 16d) or simple (Figure 16m); lateral lobe with 12 (Figure 16d) or 20 (Figure 16m) spines, endopod with 9-11 spines. Maxilliped set distinctly posterior to other buccal appendages, with 2 large laminar oostegital lobes, proximal part of basal article fleshy, swollen; article 3 rounded, with 2 small spines.

Pereopod 1 short, merus weakly expanded posteriorly, dactylus extending to middle of carpus, pereopods 2 and 3 longer than 1, less robust, articles proportionally longer, dactylus much longer than in pereopod 1, extending to posterior of merus, pereopods 5-7 with merus anterior margin slightly dilated.

Pleopods all laminar, surfaces formed into fine nodular ridges except pleopod 1 endopod anterior surface which is smooth; peduncles narrow, without prominent lobes. Pleopod 1 largest, covering all other pleopods; pleopods becoming progressively smaller toward posterior; all rami (except pleopod 1 endopod) with depressions, in some cases forming folds or pockets. Pleopods 3-5 endopods with weakly developed proximomedial lobe. Uropods short, usually held under pleotelson posterior margin; exopod distinctly shorter than endopod.

DESCRIPTION OF MALE.—Very much smaller than female, body rectangular in shape, lacking distinctive pereonal morphology of female. Antennule with 7 articles, antenna with 9, neither with flattened articles. Mandible palp with setae; maxilla lateral lobe with 4 spines, endopod with 2. Maxilliped article 3 narrow, with 2 recurved terminal spines.

Pereopods similar to female but pereopod 1 not as robust, posterior pereopods with expansions of basis less developed.

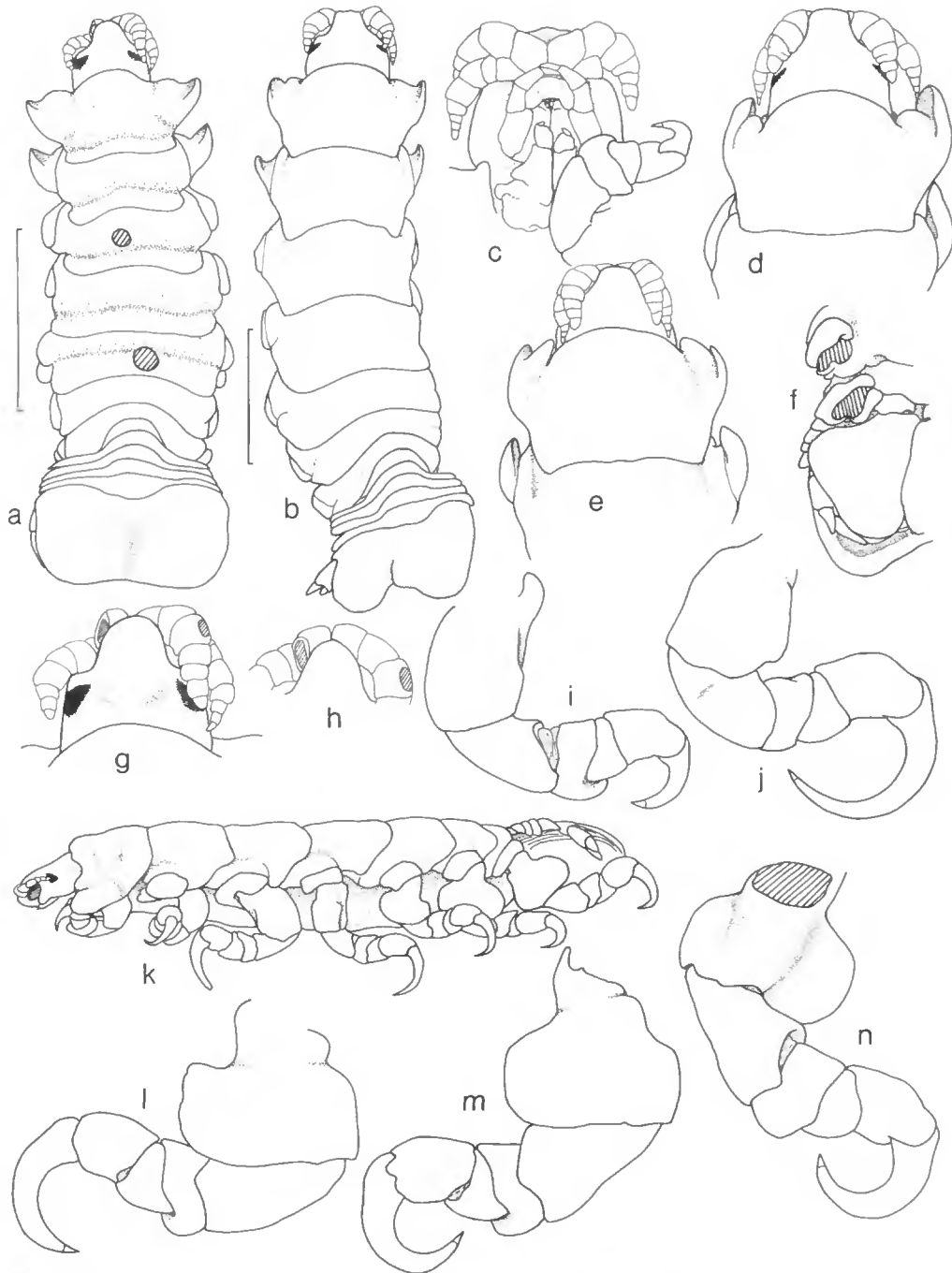


FIGURE 15.—*Glossobius impressus* (a, g, h, ovigerous ♀, 24.5 mm, Cape May, New Jersey, holotype, ANSP 1608; b, c, f-n, non-ovigerous ♀, 36.0 mm, Chain sta. 35; d, ovigerous ♀, 40.0 mm, Terra Nova Expedition; e, non-ovigerous ♀, 38.5 mm, Maranhão, Brazil): a, dorsal view; b, dorsal view; c, cephalon, ventral view; d, cephalon and pereonite 1, dorsal view; e, cephalon and pereonite 1, dorsal view; f, pleon, ventral view of right side; g, cephalon, dorsal view; h, rostrum, dorsal view; i, pereopod 1; j, pereopod 3; k, lateral view; l, pereopod 6; m, pereopod 7, lateral view; n, pereopod 7, medial view. (Scale line = 8.0 mm.)

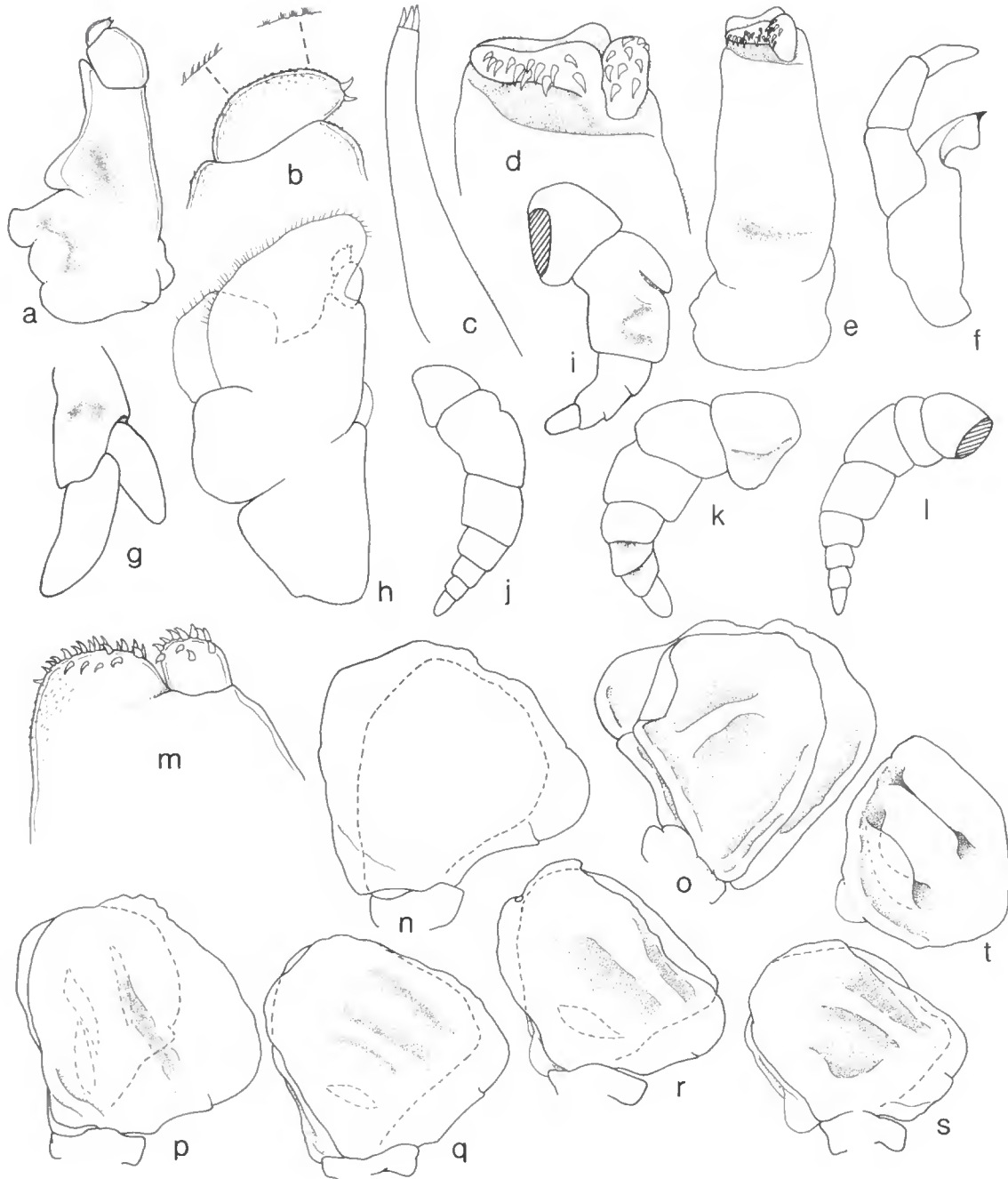


FIGURE 16.—*Glossobius impressus* (a-g, i-l, n-t, non-ovigerous ♀, 36.0 mm, *Chain* sta 35; h, m, ovigerous ♀, 34.5 mm, USNM 216584): a, maxilliped; b, maxilliped article 3; c, maxillule; d, maxilla apex; e, maxilla; f, mandible; g, uropod; h, maxilliped; i, antennule, dorsal view; j, antenna, dorsal view; k, antennule, dorsal view; l, antenna, dorsal view; m, maxilla apex; n, pleopod 1; o, pleopod 1, dorsal view; p, pleopod 2; q, pleopod 3; r, pleopod 4; s, pleopod 5; t, pleopod 5 endopod, posterior view.

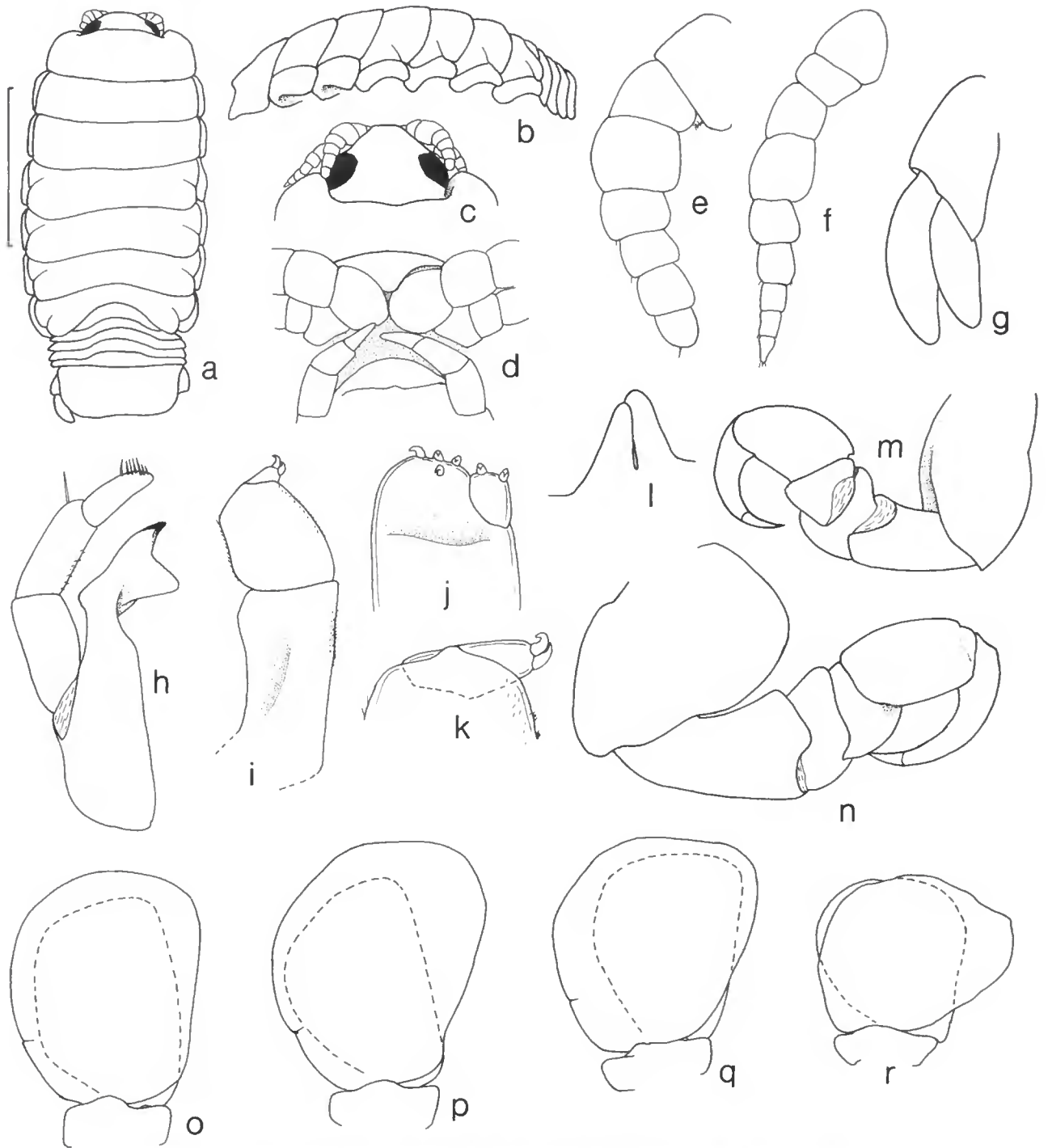


FIGURE 17.—*Glossobius impressus* (σ^8 , 8.3 mm, Rio de Janeiro, USNM 22797): a, dorsal view; b, pereon and pleon, lateral view; c, cephalon, dorsal view; d, buccal region; e, antennule; f, antenna; g, uropod; h, mandible; i, maxilliped; j, maxilla apex; k, maxilliped article 3, l, penes; m, pereopod 1; n, pereopod 7; o-r, pleopods 1-3, 5, respectively. (Scale line = 3.0 mm.)

Penes elongate, apices lie between pleopod peduncles. Pleopods all simple, appendix masculina absent. Uropod exopod slightly longer than endopod.

COLOR.—Specimens all with cephalon, pereonites 1-3 and appendages appearing dark brown to nearly black, sometimes gradually lightening toward posterior; pleon, pleotelson, and pereopods 6 and 7 virtually without chromatophores.

SIZE.—Ovigerous females range from 24.5-40.0 mm, non-ovigerous females from 27.9-38.5 mm, males between 8.3 and 11.0 mm.

VARIATION.—There is considerable variation present in the detailed shape of the lateral extensions of pereonites 1 and 2, the blade like flanges varying from a large scoop to a weakly developed ridge. There is a substantial change in the appearance of the maxilliped between ovigerous and non-ovigerous females, that of the non-ovigerous female being far more heavily covered with scales and spinules and having the 2 spines on article 3 more prominent. The maxilla of some non-ovigerous females was folded and lobed (Figure 16d) and had fewer spines on the lateral lobe (12) than did ovigerous females (20).

REMARKS.—No figure has ever been published of the holotype, a dried specimen; a dorsal view of it is given here (Figure 15a). This species can be easily identified by the prominent lateral lobes on pereonites 1 and 2.

HOSTS.—Of the material examined only one is from an identified host, *Hirundichthys speculiger*. Other records from "Espadon" (swordfish, *Xiphius gladius* Linnaeus) (Trilles, 1972) or *Thunnus albacares* (present material) are almost surely from exocoetid fishes eaten by those fishes. One immature pair of specimens (USNM 216585) that we could not identify was taken from a specimen of *Hirundichthys affinis* (Günther) collected in the Philippines.

DISTRIBUTION.—Tropical to subtropical Atlantic, but not yet recorded from the Caribbean. Trilles (1972) recorded this species from New Caledonia, and Nierstrasz (1915) reported it from Makassar Strait. Two records from higher latitudes need to be confirmed by more collections before they can be accepted: Køge Bugt, just south of Copenhagen (Stephensen, 1948); south of the Cape of Good Hope, 52°58'S, 22°58'E (Nierstrasz, 1918). Cymothoids probably do not occur in such cold waters.

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