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New Abyssal Tropical Atlantic Isopods, with Observations on Their Biology¹

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INTRODUCTION AND ACKNOWLEDGMENTS

On November 12, 1955, the R/V "Vema" of the Lamont Geological Observatory completed a successful deep sea trawl over an abyssal plain on the north rim of the Puerto Rico Trench at a depth of 2700–2710 fathoms. This haul contained one ophiuroid, one bivalve mollusk, several polychaets, a few amphipods, and one of the largest collections of isopods (eight species) ever made with one trawl at such great depth. The trawl used was the Closing-Opening Epibenthic Trawl designed by Mr. Robert Bieri of this laboratory. An earlier model which was not of the opening and closing type has been figured and described (Devereux, 1954).

The trawl was made at latitude 20° 32.2' N. and longitude 60° 28.1' W. The surface mud was a brownish, finely particulate ooze, below which was a foraminiferal ooze.

Earlier Atlantic deep sea expeditions have reported on abyssal isopods, and it may be assumed that the fauna of the North Atlantic is fairly completely known. Hansen (1916) recorded 84 species from below 1000 fathoms. In all he described 121 species between latitudes 60° and 70° in the Atlantic. Richardson (1908) has described the species collected by the "Albatross." The results of the Danish "Galathea" expedition are not yet available.

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Hansen (*op. cit.*) reported seven species from his deepest sample of 1870 fathoms. Six of the species he described as new. Five new species are described in the present paper. Two of these represent the type genera of new families.

The specimens have been donated to the collections of the American Museum of Natural History (abbreviated A.M.N.H.) whose assistance in the publication of the paper is appreciated.

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ECOLOGY AND NUTRITION

Most of the deep sea isopods have spindly or paddle-shaped legs which are presumed adaptations to allow their movement on and in the surface ooze.

Examination of the "stomach" contents of three specimens of *Eurycope* showed the most abundant particles were small rod or chain-like objects of about $1.3\ \mu$ in length. These are considered to be bacteria. Next in abundance were some ovoid dark objects of $5\ \mu$ in length which may possibly be protozoans. Crystals of presumed inorganic nature were as numerous as the protozoans. Additionally present were occasional empty tests of Foraminifera (fig. 1) between 28 and $50\ \mu$ in diameter, and a few more discoidal objects, possibly coccolithophorids or diatoms between $13\ \mu$ and $30\ \mu$ in diameter. Rarely found were the loricas of what might have been tintinoid ciliate protozoans. From these data it would seem that *Eurycope* is an omnivorous detrital feeder. Its mouth parts are not specialized markedly, and a filter-feeding apparatus is lacking.

The stomach contents of *Ianirella vema*, which is described below, in contrast contained mostly particles of the size of bacteria, the ovoid objects mentioned for *Eurycope*, and some presumed siliceous crystals. Neither Foraminifera nor tintinoids were found. In each case the "stomach" was distended and full.

The possibility of bacterial nutrition and surely microbiologic nutrition is indicated from these observations which are in accord with Zobell's (1954) suspicions regarding abyssal nutrition.

ZOOGEOGRAPHY AND EVOLUTION

The assemblage of isopods from the "Vema" sample shows no greater relationship in its generic composition to the North Atlantic deep sea fauna than it shows to the South Atlantic deep sea fauna. Three of the genera are found in the North Atlantic; two, in the South Atlantic; and

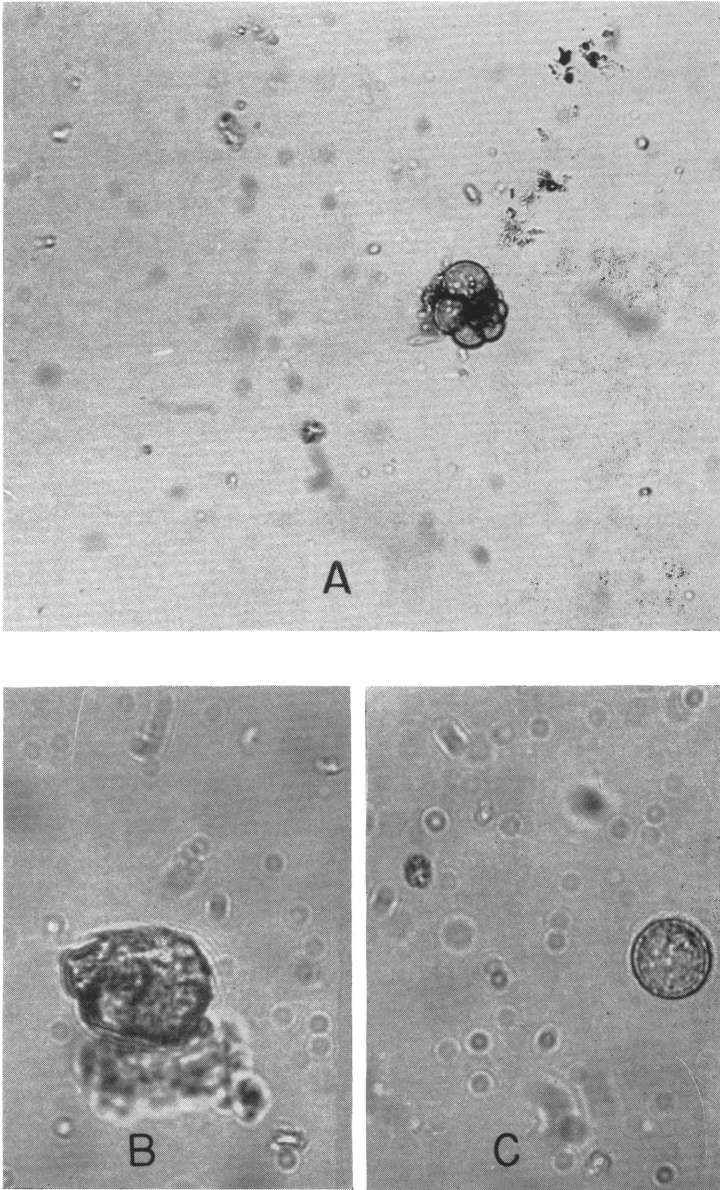


FIG. 1. Photomicrographs of "stomach" contents of *Eurycope* sp. from 2700 fathoms. A. Young foraminiferan and associated particles, presumably bacteria. B. Inorganic granule with absorbed material, presumably bacteria. C. Diatom or coccolithid and associated particles.

four have been reported for both hemispheres. Two of the genera, *Syneurycope* and *Haploniscus*, were reported by Hansen from his two deepest stations. In contrast six were not reported by Hansen from his deepest stations. Therefore, one must conclude that the tropical abyss presents a different assemblage of genera and species than the North Atlantic abyss. Were the deep sea fauna as uniform as has been suggested by others, one would expect a much higher degree of generic similarity between Hansen's samples and those of the "Vema." The species in every instance are different.

Dahl (1954, pp. 43-48) cites *Syneurycope* in a list of three supposed endemic genera of isopods. This genus is neither endemic of the deep sea, having been collected off South Africa in a depth of 700 fathoms, nor is it monotypic as suggested by Dahl, but contains three species. Both the isopods and tanaidaceans have families and genera which show an increase in the number of species with depth. This phenomenon is well known for echinoderms but less generally known for the Peracarida. Some genera of bathyl-abyssal isopods, *Nannoniscus* with its 13-plus species in particular, have more species than their intertidal analogs, e.g., a genus such as *Iais* with its three to four species. The genus *Desmosoma* has 10 species occurring between 200 and 4000 meters, but only three species, none intertidal, between 10 and 200 meters.

It is commonly believed by evolutionists and geneticists that an environment with fluctuation is more productive of species than the uniform environment. Isopods seem a particular argument against such an idea. The rates of evolution of some groups or organisms from the near shore may be even less rapid than those of the deep sea counterparts, especially if numbers of species (standing crop) is taken as an index of evolutionary rate. This may mean only that such an index (lacking a time scale) is invalid.

SYSTEMATICS

Five new families are described. At first glance, these may seem too many. However, two of them are instituted simply by considering groups established by Hansen (1916) as families. The others are entirely new discoveries.

EURYCOPIDAE, NEW FAMILY

Eurycopini, group XI of Parasellidae, HANSEN, 1916, pp. 129-130.
Munnopsidae (in part), VANHÖFFEN, 1914, p. 581.

DIAGNOSIS: Paraselloidea with free head. Mandibles normal, molar process expanded and truncated at apex. Second antennae as long as or longer than body. First antennae shorter than body. Peraeopods 1 to 4 inclusive, simple walking legs; peraeopods 5 to 7 inclusive, paddle-like, modified for swimming, dactyls with at least one apical claw. Coxal plates present on some peraeonal somites. Uropoda ventral, with peduncle, biramous. Maxillipedal palp with first three articles expanded, as wide as endite.

COMPOSITION: This family contains four genera: *Syneurycope* Hansen, *Storothyngura* Vanhöffen, *Munnopsurus* Richardson, and *Eurycope* G. O. Sars. The genus *Ilychthonos* Barnard (1920) is doubtless a synonym of *Syneurycope*. The mandibular structure (see key) indicates the distinctness of *Munnopsurus* from *Eurycope*.

AFFINITIES: The Eurycopidae differ from their nearest relatives, the Munnopsidae, in having dactyls on peraeopods 5 to 7 inclusive, and in having a well-developed chewing type of mandibular molar process.

KEY TO THE GENERA OF EURYCOPIDAE

1. Pleon consisting of only one somite, the pleotelson 2
 Pleon consisting of one somite with at least lateral incisions marking the
 fusion of two additional somites *Syneurycope* Hansen
2. Pleon and dorsum of peraeon provided with spine-like projections
 *Storothyngura* Vanhöffen
- Pleon smooth, dorsum of peraeon without spine-like projections . . . 3
3. Mandibular incisor with two to five teeth, lacinia present on left mandible
 *Eurycope*, G. O. Sars
- Mandibular incisor with one tooth only, lacinia lacking
 *Munnopsurus* Richardson

GENUS SYNEURYCOPE HANSEN, 1916

Syneurycope HANSEN, 1916, pp. 130-131.

Ilychthonos BARNARD, 1920, pp. 414-415.

TYPE SPECIES: *Syneurycope parallela* Hansen, 1916 (pp. 131-132).

DIAGNOSIS: Pleon consisting of one somite, with lateral incisions of two partly fused somites. Uropod with peduncle, biramous. Coxal plates visible in dorsal view on peraeonal somites 3, 4, and 5. Third article of maxillipedal palp with characteristic denticles on inner margin; endite with large, flattened, scale-like setae at apex. Dactyls of peraeopods with at least one apical claw. Lateral borders of pleon lacking spine-like extensions.

COMPOSITION: This genus has three species, including the new one described here; one is from the North Atlantic, one is from the South

Atlantic, and the one presently described is from the abyss of the tropical Atlantic.

KEY TO THE SPECIES OF *Syneurycope*

1. Mandibular palp small, unarmed, last article with only one seta
 *capensis* Barnard, 1920
 Mandibular palp well developed, three to four setae on apical article . . . 2
2. Maxilliped with three coupling hooks, inner margin of second article of
 palp with 16 denticles *parallela* Hansen, 1916
 Maxilliped with no coupling hooks, inner margin of second article of palp
 with 19 denticles *hanseni*, new species

Syneurycope hanseni, new species

Figure 2

DIAGNOSIS: *Syneurycope* with a well-developed mandibular palp. Maxillipedal palp with 16 denticles along inner margin of second article. Each apex of male first pleopods with a total of six setae. Flagellum of first antenna with 10 articles, terminal article smallest. Exopod and endopod of uropod with two stout setae at apex. Seventh peraeonal somite only partly separated from peraeon.

TYPE: The type and only specimen (A.M.N.H. No. 11758) is a male, 3.75 mm. long and 0.65 mm. wide at second peraeonal somite.

AFFINITIES: Of the known species this resembles the North Atlantic *S. parallela* the most. It differs from it in having fewer articulations to the flagellum of the second antenna and in having a differing pleonal and peraeonal segmentation. In *S. parallela* the pleon is distinct from the seventh peraeonal somite, whereas it is not in *S. hanseni*. All known species are bathyal to abyssal in habitat, being found at 700 or more fathoms depth.

HAPLONISCIDAE, NEW FAMILY

Haploniscinae, group II of Parasellidae, HANSEN, 1916, p. 28.

DIAGNOSIS: Paraselloidea with free head. Eyes lacking. Mandibles normal. Antennae shorter than body, slightly longer than cephalon. All peraeopods simple walking legs; dactyl with at least one terminal claw but never with three. Uropoda (when present) ventral and with peduncle. All peraeonal somites of similar length, wider than long. First three articles of maxillipedal palp narrow, less than one-half of the width of endite.

COMPOSITION: The family contains only two genera, *Haploniscus* Richardson and *Hydroniscus* Hansen.



FIG. 2. *Syneurycope hanseni*, new species, holotype male. A. Whole specimen, dorsolateral view. B. Left mandible. C. First pleopods. D. Fifth pereopod. E. Flagellar articles, first antenna. F. First pereopod. G. Uropod. H. Maxilliped. I. Second pleopod.

KEY TO THE GENERA OF HAPLONISCIDAE

- Peraeon with only five free somites; sixth and seventh fused with pleon . . . *Hydroniscus*
 Peraeon with six or seven free somites . . . *Haploniscus*

GENUS *HAPLONISCUS* RICHARDSON

Haploniscus RICHARDSON, 1908, p. 75.

TYPE SPECIES: *Nannoniscus bicuspis* G. O. Sars (*vide* Richardson, 1908, p. 75).

DIAGNOSIS: Haploniscidae with uniramous uropoda. Peraeon with only six to seven articulated somites. Epimera (coxal plates) not visible in dorsal view.

COMPOSITION: The genus contains nine species, including the new species described here. Three species are known from the Antarctic and South Atlantic. Five are known from the North Atlantic. The new one described here is from the abyss of the tropics, establishing a generic connection between the poles. All species are abyssal.

KEY TO THE SPECIES OF *Haploniscus*

1. Peraeon with seven complete somites 2
 Peraeon with six complete somites, seventh partly fused with pleon . . . 5
2. Frontal margin cephalon straight *spinifera* Hansen
 Frontal margin cephalon convex 3
3. Frontal margin cephalon with minute medial projection 4
 Frontal margin cephalon with large projection . . . *unicornis*, new species
4. Process lacking from third article of antennal peduncle
 *retrospinis* Richardson
 Angular process present on third article of antennal peduncle
 *bicuspis* G. O. Sars
5. Frontal margin cephalon concave *excisus* Richardson
 Frontal margin cephalon convex 6
6. Pleotelson lacking distinct tooth-like posterolateral angles
 *armadilloides* Hansen
 Pleotelson with distinct tooth-like posterolateral angles 7
7. Front of cephalon with medial horn *curvirostris* Vanhöffen
 Front of cephalon at most with a minute medial knob 8
8. Lateral borders cephalon concave *dimeroceras* Barnard
 Lateral borders cephalon convex *antarcticus* Vanhöffen

Haploniscus unicornis, new species

Figure 3

DIAGNOSIS: Frontal margin cephalon convex, with long, upcurved medial horn. Pleon with six free somites; seventh partly coalesced with

completely fused pleotelson. First antenna with seven articles; last two flagellar articles subequal in length. Cephalon covered with minute reticulations. Second antenna with minute squama and a pronounced process on third article of peduncle. Maxilliped with two coupling hooks. Left mandibular incisor with four teeth, lacinia with four teeth, molar process expanded at apex, palp with three articles.

TYPE: The type and only specimen (A.M.N.H. No. 11759) is a small female 1.45 mm. long and 0.60 mm. wide at second peraeonal somite.

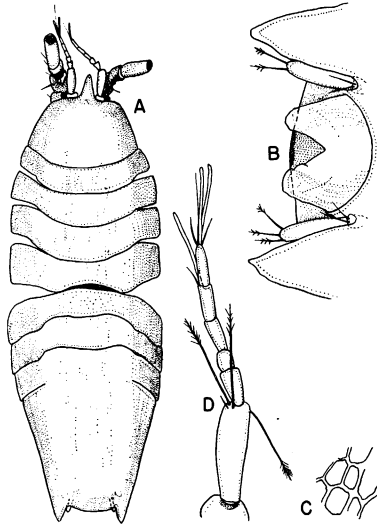


FIG. 3. *Haploniscus unicornis*, new species, holotype female. A. Whole specimen. B. Pleotelson, ventral view, showing uropoda. C. Sculpturing on cephalon. D. First antenna.

AFFINITIES: Morphologically the species is most closely related to two North Atlantic species, *retrospinis* and *bicuspis*. From both of these it differs markedly in having a pronounced horn at the frontal margin of the cephalon.

ECHINOTHAMBEMIDAE, NEW FAMILY

DIAGNOSIS: Paraselloidea with free head, eyes lacking. Mandibles normal, molar process well developed and expanded at truncated apex. Antennae shorter than body, about twice the length of cephalon. All peraeopods simple, two to seven simple walking legs; dactyl with two terminal claws. Uropoda terminal, with peduncle. Last two peraeonal somites and all pleonal somites fused with pleon. First three articles of

maxillipedal palp expanded, as wide as endite. Coxal plates lacking. First peduncular article of first antenna much expanded.

COMPOSITION: Contains the new genus *Echinothambema* with the characteristics of the family. This family differs from its nearest relative, Thambemidae Stebbing, in lacking coxal plates and in having the last two paraeonal somites fused with the pleon.

ECHINOTHAMBEMA, NEW GENUS

DIAGNOSIS: As for the family.

COMPOSITION: Contains only one species, the description of which follows.

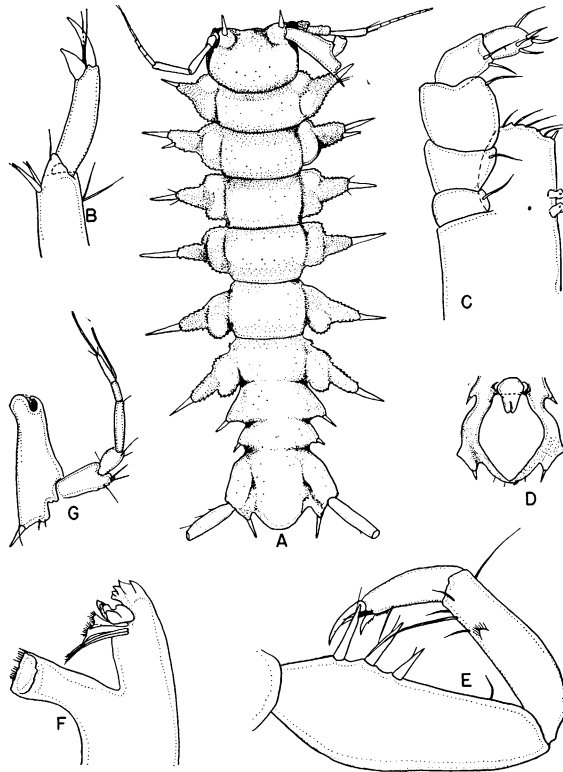


FIG. 4. *Echinothambema ophiuroides*, new species, ambisexual holotype. A. Whole specimen. B. Fifth pereopod. C. Maxilliped. D. Pleotelson, ventral view. E. First pereopod. F. Left mandible. G. First antenna.

Echinothambema ophiuroides, new species

Figure 4

DIAGNOSIS: First antenna with six articles, last article one-third larger than penultimate article. Lateral borders of peraeonal somites each with expanded and pronounced margin bearing a single stout seta. Body sharply granulate. Maxilliped with two coupling hooks. Cephalon at anterolateral margin with a pair of swellings, each bearing a stout seta. Squama of second antenna not observed. Mandible without a palp.

TYPE: The type and only specimen (A.M.N.H. No. 11760) is an immature ambisexual individual 5.0 mm. long and 1.5 mm. wide at second peraeonal somite.

REMARKS: Superficially this animal resembles the cast-off ray of a brittle star; hence the specific name. The presence of a male sympod (first pleopod) and an opercular (second pleopod) plate of the female supports the contention of Hansen (1916, pp. 10–11) that the female of the Parasellidae has lost the first pleopod. The first pleopod in this species appears to be degenerating. The specimen is probably more feminine than masculine. It is clearly immature, because the seventh pair of peraeopods are underdeveloped, lacking setae and claws.

IANIRELLIDAE, NEW FAMILY

Ianirini, group I of Parasellidae, HANSEN, 1916 (in part), p. 12.

DIAGNOSIS: Paraselloidea with free head, eyes lacking, mandibles normal, molar process well developed, expanded at truncated apex. Antennae shorter than body. First antenna much shorter than second antenna. All peraeopods simple, last six being walking legs. Dactyl of last six peraeopods with two claws, never three. Pleon consisting of one somite only. Uropoda uniramous, peduncle present. Maxillipedal palp with first three articles expanded, as wide as endite.

COMPOSITION: This family contains only one genus, *Ianirella*, with the characteristics of the family. It is known only from the North Atlantic and by the species described herein from the tropical abyssal Atlantic. The uniramous uropoda, uniarticulate pleon, and biunguiculate dactyls distinguish this family from the Ianiridae.

GENUS *IANIRELLA* BONNIER

Ianirella Bonnier, 1896, p. 587.

TYPE SPECIES: *Ianirella nanseni* Bonnier, 1896 (p. 587, pl. 33).

DIAGNOSIS: Same as for the family.

COMPOSITION: The genus, known only from the Atlantic Ocean, contains nine species, including the new one described here. All species are from deep water excepting *I. pusilla* Sayce (1900) which is from fresh water in Victoria, Africa.

KEY TO THE SPECIES OF *Ianirella*

(Modified from Stephensen, 1915, p. 21.)

1. Fresh water *pusilla* Sayce
Marine 2
2. Lateral processes rounded *lobata* Richardson
Lateral processes pointed 3
3. With dorsal spines *nanseni* Bonnier
Without dorsal spines 4
4. Pleon with five pairs of lateral processes *abyssicola* Hansen
Pleon with less than five pairs of lateral processes 5
5. Pleon with three pairs of lateral processes 5
6. Rostrum lacking, no apical spines *vemae*, new species
Rostrum present, with apical spines *glabra* Richardson and *laevis* Hansen

Ianirella vemae, new species

Figure 5

DIAGNOSIS: Cephalon lacks rostrum (possibly broken off), each lateral process with four apical spines, that of first peraeonal somite with three spines. Anterior lateral process of peraeonal somites 2 to 4 with one apical spine, posterior ones with two to three. Lateral process of peraeonal somites 5 and 6 with three apical spines; peraeonal somite 7 with one only. Pleotelson with three spines on each lateral border, apex with denticles. A few bristles occur on dorsum of head, body, and pleotelson. First antenna with seven articles, last two subequal in length.

TYPE: The type and only specimen (A.M.N.H. No. 11761) is ambisexual, having the sympod of the male first pleopod and the typical female operculum. It is probably sexually immature. The specimen measures 3.3 mm. long and 1.8 mm. wide at the second peraeonal somite.

AFFINITIES: This species differs from the others in the lack of a rostrum, the arrangement of setae (spines) at the lateral projections, and in the small number of articles (7) comprising the first antenna. Further, it lacks dorsal spines on the body.

ABYSSIANIRIDAE, NEW FAMILY

DIAGNOSIS: Paraselloidea with head free. Mandibles normal, molar process expanded and truncated at apex. First antenna shorter than body. Peraeonal somites all of similar length, none fused. Peraeopods 2 to 7

simple walking legs, two claws on dactyls, not three, no legs modified for swimming. First peraeopod prehensile. Coxal plates rounded, not spini-form, visible in dorsal view on all somites. Pleon with two somites. Uropoda biramous, with peduncle. Maxillipedal palp with first three articles as wide as endite.

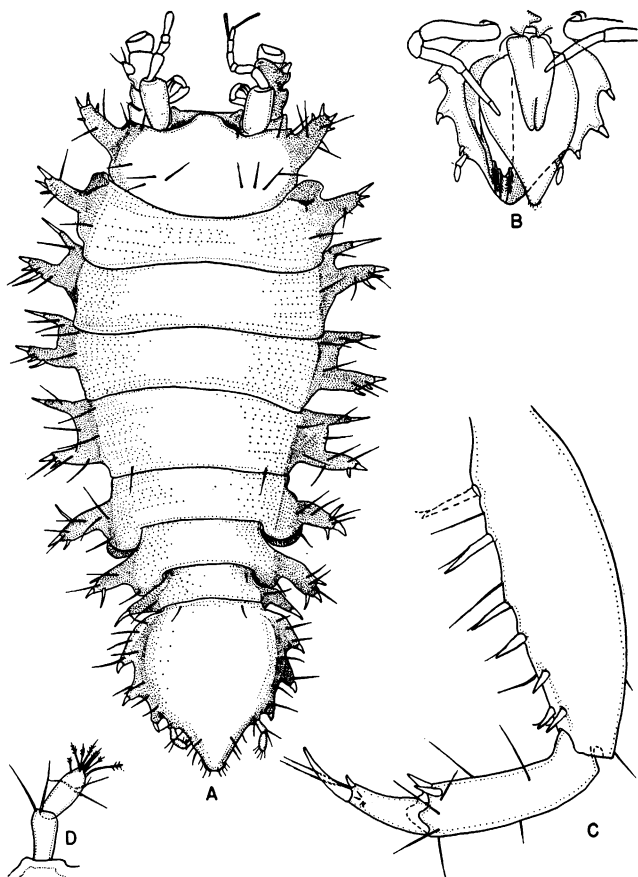


FIG. 5. *Ianirella vema*, new species, ambisexual holotype. A. Whole specimen. B. Pleotelson, ventral view. C. First peraeopod. D. Uropod.

COMPOSITION AND AFFINITIES: Contains only the type genus *Abyssianira*. This family is midway between the Schistosomidae and the Thambemidae. From the former it differs in having rounded, not spini-form coxal plates and biramous and not uniramous uropoda. From the latter it differs in having an ovoid rather than a vermiform body, with

laterally expanded peraeonites and the last three somites set off from the first four, much as in the Munnidae and Schistosomidae.

ABYSSIANIRA, NEW GENUS

TYPE SPECIES: *Abyssianira dentifrons*, new species.

DIAGNOSIS: See diagnosis of the family.

COMPOSITION: Monotypic.

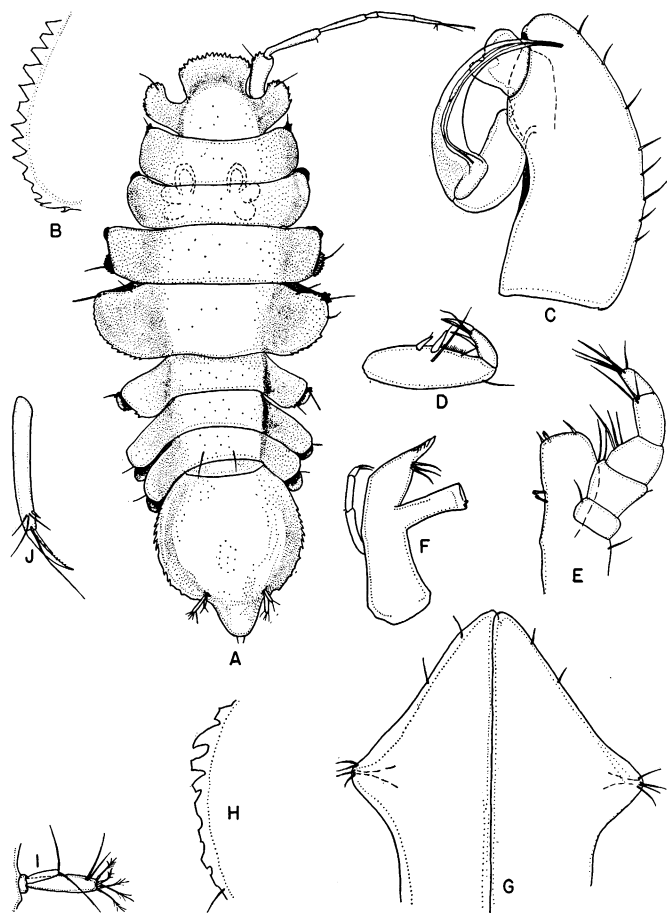


FIG. 6. *Abyssianira dentifrons*, new species, holotype male. A. Whole specimen. B. Margin of rostrum. C. Second pleopod. D. Gnathopod. E. Maxilliped. F. Right mandible. G. First pleopods. H. Lateral border of pleotelson. I. Uropods. J. Fourth peraeopod.

Abyssianira dentifrons, new species

Figure 6

DIAGNOSIS: *Abyssianira* with denticulate body margins. Cephalon with expanded, flattened rostrum and lateral horns. Pleotelson lateral border denticulate, apex rounded. First antenna with six articles, last about one-third shorter than penultimate article. Male first pleopod with six setae on either side of sympod. Maxilliped with two coupling hooks. Mandible with triarticulate palp, last article with two apical setae.

TYPES: The type and only specimen (A.M.N.H. No. 11762) is a male 2.75 mm. long and 0.85 mm. wide at second pereopodal somite.

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