GAMMARIDEAN AMPHIPODA

FROM DEPTHS OF 400 TO 6000 METERS

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CONTENTS

INTRODUCTION

The number of gammaridean amphipods known from abyssal depths exceeds 248 (J. L. Barnard, 1961). It might have been expected that the extensive collections made by the *Galathea* would show diminishing returns of new abyssal and bathyal species, as it retraced in part the general areas of the *Challenger* and *Siboga* Expeditions, but a large part of the recoveries proved to be unique specimens of new species, as will be described herein.

This circumstance indicates the need for further extensive abyssal explorations in order to determine the distributional perimeters of abyssal amphipods, for about half of the known benthic species are based on one or two limited collections. Until this is accomplished it will be difficult to discuss the implications of the sketchy zoogeography now known.

The Gammaridea are largely benthic animals as opposed to the entirely pelagic Hyperiidea, but some gammarideans are pelagic, and it is difficult to determine their precise habitats except by indirect means. Many of the *Galathea* samples were taken with a Petersen grab, which collects only a benthic plug of sediment. None of the families collected in the grabs was unexpected, for all of them are well known as obligatorily benthic. Of course many new species were collected in these grabs. The bottom samples collected with open trawls and nets pose the major problem in habitat identification, for they collect not only in benthic sediments but in pelagic water layers. It is not satisfactory to assume that any species caught only in open trawls and not in grabs is a pelagic species, for the trawls collect much larger quantities of benthic organisms than the grabs. Many known benthic species were caught only in the trawls and because of the large area and speed of the trawling apparatus it is expected that fast moving demersal amphipods, which are facultatively benthic, would be caught more easily than in grabs. An attempt to determine the habitats of amphipods by analysis of gut contents was made by J. L. Barnard (1961). The results were not clearcut, but several species thought to be strictly pelagic were shown to feed on the bottom, the evidence pertaining to mineral particles in the gut contents. It is uncertain whether stray mineral particles might be forced into the stomach during collection and washing.

Most gammaridean amphipod families are strictly benthic in habitat but the large and abyssally important Lysianassidae are both pelagic and benthic and it is in this family that most of the habitat problems remain. In doubtful cases, and wherever unique specimens would not be totally destroyed I have examined gut contents; however, taxonomy and morphology are the prime concerns of this paper and it remains for the future worker with larger quantities of material to study the food problem. It also will be desirable to use more open-closing nets in abyssal depths especially near the bottom and to use open-closing epibenthic trawls.

To the amphipod specialist many of the *Galathea* discoveries are amazing and peculiar. A new *Parargissa* off Atlantic Africa and its subspecific counterpart off Pacific Panama have been discovered. That these giant amphipods (55 mm) have remained undiscovered to this time indicates our ignorance of bathyal and abyssal faunas. The remarkable new genus *Eucallisoma* suggests perhaps that other amphipods similar to it remain unsorted as hyperiids in various museums, for the animal superficially appears to be a vibiliid. The still cloudy taxonomic status of giant amphipods assignable to *Eurythenes gryllus* suggests a direction for future studies. The remarkable discovery of a lysianassid, *Onesimoides chelatus,* that shows sexual dimorphism must be mentioned for it is the first case in this large family of 103 genera and 650 species. This peculiar species is an abyssal "wood borer" and the materials which verified the dimorphism were collected in a sunken *Nipa*-palm fruit. Still another genus of the fascinating cyphocarid series in the family Lysianassidae was discovered and it forms a neat link in the specialization of this pelagic group. The discovery of a sixth species of *Trischizostoma* now permits an assortment of the species into two groups of 3 each. The two groups are so widely divergent that two pathways may be suggested: division into two genera each with 3 species, or into two species, each with 3 subspecies. Since the species of the complex probably inhabit salps or medusae the problem involves possible correlation of phenotypes with hosts and the fact that potentially the species are widely distributed. A study of the correlations with hosts, water masses and geography would be intensely interesting, but it remains a difficult problem to collect the animals *in situ.*

The addition of two new species to the formerly unique benthic genus *Byblisoides* provides the outline of a remarkable bathyal latitudinal distribution. The type species was collected from the Antarctic at 71°S, and the two new species from 37°S in the Tasman Sea and 4°S in the Makassar Strait. The specific differences among the 3 species are less profound than in neighbouring genera but they are qualitative in nature. They distinctly demonstrate that barriers to gene flow occur in the bathyal across great distances but it must be remembered that only 3 collections have been made. New materials from bottoms intermediate between the type areas and correlated with basin configurations will be intriguing.

A new genus of benthic haustoriid (*Carangolia*) is described from both the Pacific and Atlantic Oceans indicating the ubiquity and diversity of the genus. It is such a small and peculiar genus that it may have been mistaken for a broken rear end in the collections of earlier expeditions.

The addition of a third undoubted new abyssal species of *Leucothoe* to the literature suggests that this genus may be more widespread in the abyssal than heretofore considered and that it would be prudent for museum curators to look through collections of abyssal sponges and tunicates for what may be a wealth of amphipod material.

The rediscovery of *Alexandrella dentata,* belonging to the small and interesting family Stilipedidae suggests a problem in its habitats. The species was described from the Antarctic 71°S, 297 m, and collected by the *Galathea* in the Great Australian Bight at 37°S, 1340 m. The two Australian specimens are slightly damaged so that some systematic difference may have been destroyed but the writer believes that the collections are identical. Stilipedid amphipods lack mandibular molars, like the Pardaliscidae and Stegocephalidae. This fact plus the wide distribution of the aforementioned species may suggest a pelagic habitat, and perhaps an association with a salp or medusa.

The remarkable new pardaliscid genus *Pardisynopia,* with its inflated first and second pereopods sheds light on the relationships of an allied family, the Synopiidae, which may prove to correctly belong to the Tironidae.

The rich *Galathea* collections of Oedicerotidae and the difficulty with which they are placed generically has suggested to the writer a long overdue revision of the family. The problems revolve around the fact that most of the type species of the several genera were described from shallow waters and, as such, were oculate. The generic distinctions have been based on the eye structures, but most bathyal and abyssal species are eyeless and not readily assignable to genera. For this reason, I have constructed a new key to the family, based wherever possible on criteria other than eyes. It is sensible to believe that the loss of eyes with depth is assorted polyphyletically and is not a measure of generic distinctiveness.

Another species associated with sunken wood is *Bathyceradocus stephenseni* Pirlot, originally from the Moluccas Basin but found by the *Galathea* to range from Panama in the east to Madagascar in the west. It is strongly eurybathic. That some amphipod species have wide geographic distributions is not conclusive that the fauna of bathyal and abyssal depths is largely cosmopolitan but most certainly indicates the need for more intensive work such as that of the Galathea Expedition.

The addition of another new genus supposedly assignable to the Corophiidae emphasizes the difficulties which arise as more and more abyssal species are discovered. Trends to loss, simplification and intergradation are exhibited by some abyssal amphipods. The systematic position of the new genus *Aorcho* confounds the families Aoridae, Photidae and Corophiidae and demonstrates the weak distinctions of these assemblages as based on shallow water type-species. On the other hand, one must be cautious in abandoning convenient systems of arrangement for unique species inhabiting obviously paranormal environments.

No case can be made for a rule stating that simplification and loss are typical or even the trend for abyssal and bathyal animals. The remarkable new genus *Runanga* in the Podoceridae is just one of the several new discoveries of highly specialized animals in the *Galathea* collections. The genus *Runanga* is unique in the Gammaridea for the enlargement of a coxa which appears to serve as a brood lamella on an animal so elongated and cylindrical that the normal brood lamellae fail to retain the eggs.

The writer is indebted to Dr. ANTON BRUUN and Dr. TORBEN WOLFF of the Zoological Museum, Copenhagen, for permission to work on this valuable collection. The writer is grateful to the Beaudette Foundation for supporting him during the tenure of the study and for providing the services of Mr. LAWRENCE HAUBEN, staff artist. Mr. HAUBEN drew the figures signed by him, inked the remainder of my pencil sketches and prepared the plates for publication. I am most grateful for this valuable assistance. M. POUL WINTHER drew the amphipod for Figure 5 and I am indebted for its use. The photograph in plate I was taken by Mr. DON OLLIS of Santa Barbara, California.

List of Amphipoda by Station

Abbreviation of gear: ST 300 and ST 600: sledge (Sigsbee, Agassiz) trawl 3 m and 6 m wide; HOT: herring otter trawl; SOT: shrimp otter trawl; TOT: triangular otter trawl (pelagic); S 200 C: stramin net, diameter 2 m, coarse (pelagic); PGIO.2 and PGO.2: Petersen grab (bottom sampler), covering 0.2 sq. m. E. F. D.: estimated fishing depth.

Stations

30, Monrovia-Takoradi. 0°42′N 5°59′W, 5160 m, clay, ST 300, 18. XI. 1950.
Orchomene ? *takoradia* n. sp., ? benthic, 1.

52, San Tomé-Cameroon. 1°42′N 7°51′E, 2550 m, SOT, muddy clay, 30. XI. 1950.
Onesimoides chelatus Pirlot, benthic, 1.

66, off Gabon. 4°00′S 8°25′E, 4020 m, S 200C (5300 m wire), 5. XII. 1950.
Cyphocaris challengeri Stebbing, pelagic, 1.
Eucallisoma glandulosa n. sp., pelagic, 1.
Eurythenes obesus (Chevreux), ?demersal, 1.
Euandania gigantea (Stebbing), pelagic, 1.

101, off Angola. 8°50′S 12°32′E, 990 m, greenish mud, ST 300, 12. XII. 1950.
Stegocephaloides attingens K.H. Barnard, demersal, 1.
Harpinia cinca n. sp., benthic, 1.
Bathymedon palpalis K.H. Barnard, benthic, 3.
fragments, 3.

137, off SW Africa. 20°04′S 11°56′E, 537 m, ST 300, 23. XII. 1950.
Metaleptamphopus membrisetata n. sp., ?habitat, 2.

183, Cape Town-Durban. 33°25′S 37°20′E, 5210 m, E.F.D. 3000-3600 m, S 200C, 28. I. 1951.
Eurythenes obesus (Chevreux), ?demersal, 1.
Orchomenella musculosa (Stebbing), caught here as pelagic, 1.

194, off Durban. 34°09′S 30°45′E, 4360 m, Globigerina ooze, SOT, 7. II. 1951.
Eurythenes gryllus (Lichtenstein), demersal, 1.
Parargissa galatheae n. sp., ?pelagic, 1.
Euandania gigantea (Stebbing), pelagic, 1.

196, off Durban, 29°55′S 31°20′E, 430 m, sandy mud with stones, ST 300, 14. II. 1951.
Eurystheus afer (Stebbing), benthic, 3.
Cerapus abditus Templeton, benthic, 2.

200, off Natal. 29°39′S 37°01′E, 5110 m, HOT, 18. II. 1951.
Eurythenes gryllus (Lichtenstein), demersal, 2.
Liljeborgia mojada n. sp., benthic, 1.
eusirid fragment, 1.

203, off Natal. 25°36′S 35°21′E, 730 m, HOT, 21. II. 1951.
Trischizostoma circulare n. sp., pelagic inquilinous?, 2.

218, Mozambique Channel, 13°41′S 46°40′E, 3340 m, E.F.D. 450-650 m, TOT, 28. II. 1951.
Cyphocaris faurei K. H. Barnard, pelagic, 2.
(*Cymadusa filosa* Savigny), surface drift, 2.

232, Madagascar-Mombasa. 9°03′S 49°22′E, 4930 m, HOT, 8. III. 1951.
Bathyceradocus stephenseni Pirlot, benthic, 1.

238, off Kenya, 3°23′S 44°04′E, 3960 m, Globigerina ooze, HOT, 13. III. 1951.
Anoediceros hanseni mozambis n. subsp., benthic, 2.

241, off Kenya, 4°00′S, 41°27′E, 1510 m, pure Globigerina, HOT, 15. III. 1951.
Euonyx biscayensis Chevreux, pelagic ?inquilinous, 2.
cf. *Tmetonyx caeculus* (Sars), ?benthic, 1.
Ampelisca gusta n. sp., benthic, 1.
Oediceroides wolffi n. sp., benthic, 3.
Lepechinella monocuspidata n. sp., ?demersal, 1.
Eusirus nevandis n. sp., pelagic, 1.

279, Seychelles-Ceylon. 1°00′N 76°17′E, 4320 m, ST 300, 8. IV. 1951.
Parandania boecki (Stebbing), pelagic, 1.

281, Seychelles-Ceylon. 3°38′N 78°15′E, 3310 m, Globigerina ooze, ST 300, 10. IV. 1951.
Byblis ceylonica n. sp., benthic, 1.

318, Bay of Bengal. 9°02′N 93°07′E, 1440 m, E.F.D. 800-1100 m, TOT, 5. V. 1951.
Cyphocaris faurei K. H. Barnard, pelagic, 1.

443, Mindanao Sea, 8°48′N 124°09′E, 1500 m, mud, many fragments of plants, ST 300, 16. VIII. 1951.
Bathyceradocus stephenseni Pirlot, benthic, 2.

450, Celebes Sea. 1°50′N 119°20′E, 4940-4970 m, HOT, 21. VIII. 1951, waterlogged *Nipa*-palm fruits.
Onesimoides chelatus Pirlot, benthic, 78.

453, Makassar Strait. 3°56′S 118°26′E, 2000 m, greenish clay, ST 300, 24. VIII. 1951.
Onesimoides chelatus Pirlot, benthic, 3.
Paronesimoides lignivorus Pirlot, benthic, 2.
Byblisoides arcillis n. sp., benthic, 1.
Bathymedon candidus n. sp., benthic, 1.

471, Sunda Trench, 10°26′S 114°15′E, 2990-2810 m, clay and vulcanic tuff, ST 300, 10. IX. 1951.
Phippsiella nipoma n. sp., ?demersal, 1.
Harpinia sp., benthic, 1.

477, S. of Bali. 9°01′S 114°48′E, 780 m, sandy clay, PGI 0.2, 11. IX. 1951.
Harpinia abyssalis Pirlot, benthic, 1.
fragment, 1.

491, Makassar Strait. 4°56′S 117°39′E, 1560 m, muddy clay, ST 300, 14. IX. 1951.
Byblisoides arcillis n. sp., benthic, 1.

548, Coral Sea. 230 m, PGI 0.2, 11.XI. 1951.
Parhalimedon tropicalis n. sp., benthic, 1.

554, Great Australian Bight. 37°28′S 138°55′E, 1340-1320 m, Globigerina ooze, ST 300, 5. XII. 1951.
Eurythenes gryllus (Lichtenstein), demersal, 1.
Procyphocaris primata n. sp., pelagic, 1.
Harpinia australis n. sp., benthic, 1.
Joubinella traditor Pirlot, pelagic, 1.
Alexandrella dentata Chevreux, possibly pelagic, 2.

555, Great Australian Bight, 37°31′S 138°44′E, 875 m, clay, a little sand, PGI 0.2, 6. XII. 1951.
Uristes velia n. sp., ?benthic, 1.
Gitanopsis difficilis n. sp., benthic inquilinous, 1.
Zobracho canguro n. sp., benthic, 1.
ampeliscids, benthic, 2.

556, Great Australian Bight, 37°18′S 130°43′E, 795 m, clay, PGI 0.2, 6. XII. 1951.
Oediceroides alcaldia n. sp., benthic, 1.

557, Great Australian Bight, 37°13′S 138°42′E, 680 m, clay, PGI 0.2, 6. XII. 1951.
Anoediceros hanseni Pirlot, benthic, 1.

574, Tasman Sea. 39°45′S 159°39′E, 4670 m, ST 600, 18.XII. 1951.
Eurythenes gryllus (Lichtenstein), demersal, 1.

575, Tasman Sea. 40°11′S 163°25′E, 3710 m, pteropod ooze, SOT, 19. XII. 1951.
Orchomenella cavimanus (Stebbing), demersal, 1.
Epimeria glaucosa n. sp., ?pelagic, 2.

601, Tasman Sea. 45°51′S 164°32′E, 4400 m, Globigerina ooze, HOT, 14. I. 1952.
Eurythenes gryllus (Lichtenstein), demersal, 1.
Hippomedon antitemplado n. sp., ?benthic, 1.
Hippomedon tasmanicus n. sp., ?benthic, 2.
Pseudonesimus abyssi tasmanensis n. subsp., ?pelagic, 1.
cf. *Oediceroides wolffi* n. sp., benthic, 1.
fragment, 1.

602, Tasman Sea. 43°58′S 165°24′E, 4510 m, bluish clay, ST 300, 15. I. 1952.
Eurythenes gryllus (Lichtenstein), demersal, 1.

607, Tasman Sea. 44°18′S 166°46′E, 3580 m, clay, HOT, 17. I. 1952.
Ambasiopsis robustus n. sp., ?pelagic, 1.
Aristiopsis tacitus n. sp., ?pelagic, 1.
Cyphocaris richardi Chevreux, pelagic, 1.
Eurythenes gryllus (Lichtenstein), demersal, 2.
Hippomedon concolor n. sp., ?benthic, 1.
Orchomenella cavimanus (Stebbing), demersal, 1.
Phippsiella nipoma n. sp., ?demersal, 1.
Oediceroides wolffi n. sp., benthic, 1.
Oediceroides (Lopiceros) forensia n. sp., benthic, 1.
Lepechinella sucia n. sp., ?demersal, 1.
Amathillopsis grevei n. sp., ?benthic, 1.
fragment, 1.

626, Tasman Sea. 42°10′S 170°10′E, 610 m, Globigerina ooze, 20. I. 1952.
PGI 0.2
Uristes cansada n. sp., benthic, 1.
Ampelisca chiltoni Stebbing, benthic, 2.
Haploops descansa n. sp., benthic, 1.
Harpinia palabria n. sp., benthic, 21.
Paraphoxus pyripes K. H. Barnard, benthic, 2.
Arculfia trago n. sp., benthic, 2.
Pardisynopia tambiella n. sp., benthic, 1.
Monoculodes abacus n. sp., benthic, 1.
Oediceroides apicalis K. H. Barnard, benthic, 2.
Oediceroides limpieza n. sp., benthic, 2.
Melita? solada n. sp., benthic, 1.
Aorcho delgadus n. sp., benthic, 1.
Camacho bathyplous Stebbing, benthic, 1.
Runanga coxalis n. sp., benthic, 1.
HOT
Byblisoides esferis n. sp., benthic, 2.
Harpinia nadania n. sp., benthic, 1.
Joubinella traditor Pirlot, pelagic, 2.
Carangolia puliciformis n. sp., benthic, 4.
?*Syrrhoe affinis* Chevreux, ?benthic, 3.
Rhachotropis levantis n. sp., ?demersal, 2.

629, E. of Cook Strait. 41°46′S 175°48′E, c 2000 m, E.F.D. 1100-1300 m, TOT, 24. I. 1952.
Eurythenes gryllus (Lichtenstein), demersal, 1.

638, Wellington-Auckland. 37°33′S 175°57′E, 660 m, clay with a little sand, PGI 0.2, 26 I. 1952.
Ampelisca albedo n. sp., benthic, 1.

660, Kermadec Trench. 35°35′S 178°51′E, 7800-7310 m, ST 600, 22. II. 1952.
Parandania boecki (Stebbing), pelagic, 1.

662, Kermadec Trench, 36°22′S 178°23′W, 4630 m, HOT, 23. II. 1952.
Cyphocaris richardi Chevreux, pelagic, 1.
Eurythenes gryllus (Lichtenstein), demersal, 2.
Euandania gigantea (Stebbing), pelagic, 1.

663, Kermadec Trench, 36°31′S 178°38′W, 4410 m, brown sandy clay with pumice, HOT, 24. II. 1952.
Eurythenes gryllus (Lichtenstein), demersal, 11.
cf. *Oediceroides wolffi* n. sp., benthic, 2.
stilipedid, hyperiopsid, and 2 fragments.

665, Kermadec Trench, 36°38′S 178°21′E, 2470 m, grey clay, HOT, 25. II. 1952.
Valettiopsis multidentatus n. sp., ?habitat, 1.
Epimeria bruuni n. sp., ?benthic, 1.
Camacho bathyplous Stebbing, benthic, 1.
fragment, 1.

668, Kermadec Trench, 36°23′S 177°41′E, 2640 m, clay, HOT, 29. II. 1952.
Camacho bathyplous Stebbing, benthic, 1.

716, Acapulco-Panama. 9°23′N 89°32′W, 3570 m, dark, muddish clay, HOT, 6. V. 1952.
Parargissa galatheae americana n. subsp., pelagic, 1.
Haploops lodo n. sp., benthic, 7.
Leucothoe panpulco n. sp., benthic inquilinous, 2.
Epimeria sp., 2.
Rhachotropis sp., fragments of 3-4 specimens.

726, Gulf of Panama. 5°49′N 78°52′W, 3670-3270 m, clay, HOT, 13. V. 1952.
Cyphocaris richardi Chevreux, pelagic, 2.
Bathyceradocus stephenseni Pirlot, benthic, 25.
Rhachotropis sp., fragment, 1.

729, Gulf of Panama, 7°22′N 79°33′W, 875 m, green clay, PGI 0.2, 14. V. 1952.
Paroediceroides trepadora n. sp., benthic, 1.

742, Gulf of Panama. 7°28′N 79°37′W, 500 m, green clay, PGI 0.2, 16. V. 1952.
Ampelisca hermosa n. sp., benthic, 3.

743, Gulf of Panama. 7°27′N 79°37′W, 600 m, green clay, PGI 0.2, 16. V. 1952.
Heterophoxus oculatus (Holmes), benthic, 1.

745, Gulf of Panama. 7°15′N 79°25′W, 915 m, green clay, ST 600, 16. V. 1952.
Bathymedon covilhani n. sp., benthic, 1.
Melita lignophila n. sp., benthic, 1.

SYSTEMATICS

Except where some original contribution is made the diagnoses and detailed citations of families and genera are not included, for references to such may be found in J. L. BARNARD (1958). In addition, authors' names of genera and species in keys are not included except where they have been published subsequent to BARNARD's index.

The figures were prepared with the use of a microprojector, rather than a camera lucida and this accelerated the tedious job of illustration. En toto renditions were created by mounting a sagitally dissected animal for projection; from this the shape of the head, antennae, dorsal body curvature, urosome, uropods and the larger portions of the coxae were drawn and landmarks for later construction were indicated. The legs were added to the base figure from slides of flat mounted appendages. A slight artificiality results from this technique because most amphipods in the lateral aspect have the legs turned slightly obliquely; on the other hand, the legs as drawn are fully flattened in order to show the proper proportions, which by other means would be distorted. In some cases the first or second pereopods are omitted to avoid crowding, but in cases not clearly indicated the two appendages are similar. In most cases the pleopods are omitted.

Among the members of a genus the configuration of mouthparts is relatively uniform; the useless repetition of such drawings has been avoided, but in each case they have been compared with the type species of the genus; for new genera and species departing from the type species, some or all of the mouthparts have been drawn.

Because of the extensive illustrations, the descriptions of new species are limited to diagnoses.

FAMILY LYSIANASSIDAE

Key to the Ambasiid group

All lysianassids with the lower front corner of coxa 1 hidden by coxa 2 are assembled here. DAHL (1959) discussed a number of these genera and erected *Neoambasia*. References to the remaining genera may be consulted in J. L. BARNARD (1958).

1. Pereopods 1-5 with long dactyls folded back on an inflated article 6 to form a nearly subchelate condition . . . . *Metacyclocaris*
1. Pereopods 1-5 with normal short dactyls and unexpanded sixth articles 2
2. Mandibular palp attached level with molar 3
2. Mandibular palp attached behind molar 8
3. Upper lip projecting in front of epistome 4
3. Upper lip not projecting in front of epistome, the latter usually large and either projecting or dominating the upper lip 7
4. Coxa 1 half as long as its second article 5
4. Coxa 1 as long or longer than its second article 6
5. Gnathopod 1 subchelate . . . . *Schisturella*
5. Gnathopod 1 simple . . . . *Metambasia*
6. Outer plates of maxilliped lacking spines . . . . *Ambasiopsis*
6. Outer plates of maxilliped spinose . . . . *Neoambasia*[1]
7. Article 5 of gnathopod 1 shorter than article 6 . . . . *Eurythenes*
7. Article 5 of gnathopod 1 longer than article 6 . . . . *Valettiopsis*
8. Lobes of maxilla 2 broadly separated, the inner one pointing medially and of different shape than outer . . . . *Aristias*
8. Lobes of maxilla 2 appressed and similar in shape 9
9. Article 2 of maxillipedal palp much broader than outer plate . . . . *Ambasiella*
9. Article 2 of maxillipedal palp less than half as broad as outer plate 10
10. Palp article 4 of maxilliped vestigial, gnathopod 1 simple, mandible lacking molar . . . . . *Ambasia*
10. Palp article 4 of maxilliped well developed, claw-like, gnathopod 1 nearly chelate, mandible bearing large triturating mandible . . . . *Aristiopsis* n. gen.

1. Dahl, 1959.

Ambasiopsis K. H. Barnard, 1931

Ambasiopsis K. H. Barnard, 1931: 425; K. H. BARNARD, 1932: 44.

Revised diagnosis:

Upper lip linguiform, produced strongly in front of epistome; mandibular palp attached on level with molar; articles 5 and 6 of gnathopod 1 subequal, subchelate; coxa 1 small, largely hidden by coxa 2; telson cleft half to three fourths its length.

Remarks:

The following new species differs from K. H. BARNARD's original diagnosis by the constricted inner ramus of uropod 2, by the strongly, not weakly subchelate first gnathopod, the long pereopods 3-5, and the less deeply cleft telson.

Ambasiopsis robustus n. sp.
(Fig. 1)

Material:

St. 607, Tasman Sea, 44°18'S 166°46'E, 3580 m, clay, HOT, 17. I. 1952. Holotype, male, 10 mm. Unique.

Diagnosis:

Gnathopod 1 strongly subchelate, palm nearly transverse; pereopods 3-5 long; third pleonal epimeron with rounded lower corner; pleon segment 4 only slightly convex dorsally; inner ramus of uropod 2 constricted; telson cleft halfway.

Relationship:

Differing from *A. georgiensis* K. H. Barnard and *A. uncinata* K. H. Barnard (see K. H. BARNARD 1932: 44-46 for both) especially by the lack of a process on pleon segment 4, among numerous other characters.

The species is more closely related to *A. tumicornis* Nicholls (1938: 21) which is a species intermediate in its oblique palm on the first gnathopod but similar in its third and fourth pleonal segments. *Ambasiopsis robustus* differs from *A. tumicornis* by the palmar configuration of gnathopod 2 (for which figures should be compared), the constriction of the inner ramus on uropod 2, and the contrasting armature on the outer plate of maxilla 1.

The gills of pereopods 3 and 4 bear 4 or 5 pleats and one accessory lobe.

Aristiopsis n. gen.

Diagnosis:

Mouthparts not projecting and not styliform; epistome bearing a short conical anterior projection, below which it is straight; upper lip forming a small lobe which projects in front of the straight

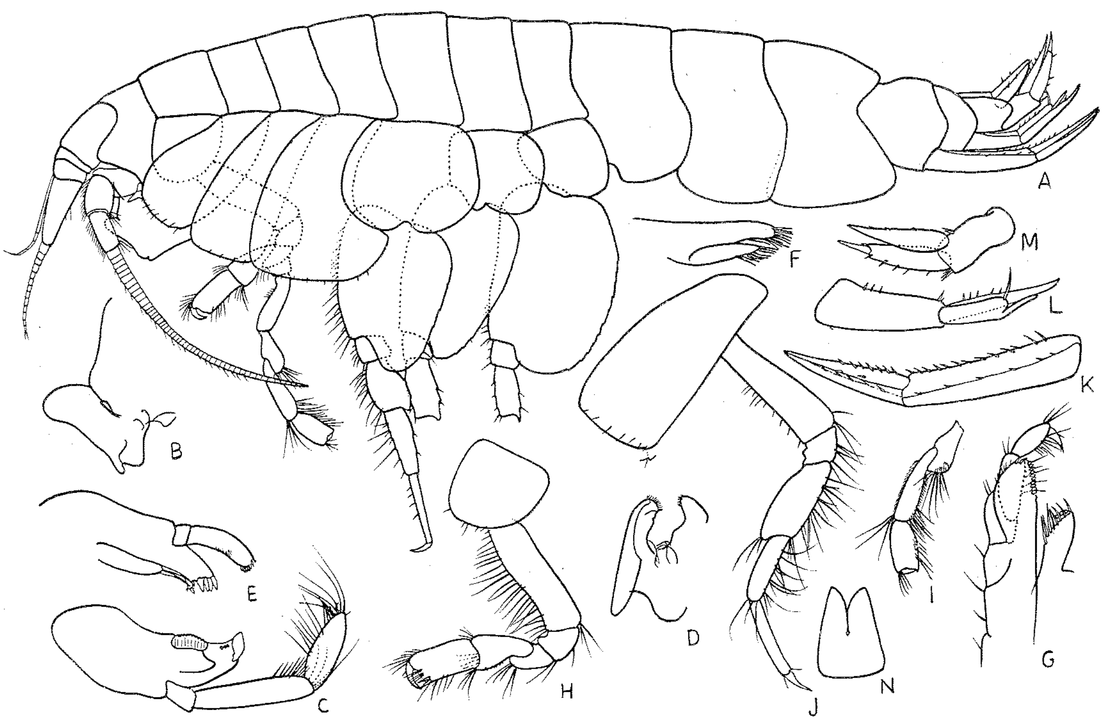


Fig. 1. *Ambasiopsis robustus* n. sp. Male, holotype, 10 mm, St. 607. A, lateral view; B, upper lip and epistome; C, mandible; D, lower lip; E, F, maxillae 1, 2; G, maxilliped; H, I, gnathopods 1, 2; J, pereopod 1; K, L, M, uropods 1, 2, 3; N, telson.

margin of the epistome; coxa 1 half as long as coxa 2 and largely concealed by it; mandible with well developed triturating molar, palp attached behind molar; primary cutting edge of mandible not toothed; maxilla 1 with 2-articulate palp; lobes of maxilla 2 similar in size and orientation; maxilliped with 4-articulate, slender palp, fourth article claw-like, outer plate spinose on inner edge; telson cleft less than half its length; gnathopod 1 with sixth article much longer than fifth, the palm protruding into a slightly chelate condition.

Type species: *Aristiopsis tacitus*, n. sp.

Relationship:

This genus represents still another assortment of criteria characterizing the ambasiid group of lysianassids. It is distinguished from *Schisturella, Metambasia, Ambasiopsis* and *Neoambasia* by having the mandibular palp attached behind the molar and thus is more related to the genera *Aristias, Ambasiella* and *Ambasia*. The first four genera mentioned have a strong triturating molar, similar to the new genus, while the last three genera mentioned either lack a molar or bear a weak and evanescent one, which lacks triturating ridges. In this way *Aristiopsis* assorts a strong molar with the palp attached behind it.

In the preceding key this genus seems to stand closest to *Ambasia* but as seen in the distinguishing couplet there is little resemblance. Actually it approaches *Aristias* more closely because of its epistomal configuration but differs by maxilla 2, as seen in the key, the ridged molar of the mandible, the inner plate of the first maxilla and other features.

The writer has attempted to minimize the importance of the first gnathopod and its nearly chelate condition, as well as the fact that article 6 is so much longer than article 5. The reason for this is that future discoveries may show it to be of little importance in the ambasiid group, where already other carcinologists have assigned species with subchelate and nearly simple gnathopods to the same genera. BARNARD (1961) already has shown the problems involved in the first gnathopods of the uristid complex, where he fused four genera. DAHL (1959) has tabulated the characteristics of some of the ambasiid group which is a helpful scheme for identification. He has questioned the condition of the mandibular palp and molar for *Ambasiopsis tumicornis* Nicholls, 1938, which he removed to a new genus, *Neoambasia*, but the writer believes reliance should be made on NICHOLLS' statement that the mandible of that species is similar to that of *Ambasiopsis georgiensis* (see K.H. BARNARD 1932) where the molar is well developed and the mandibular palp is attached over it. I have assumed this to be true and have based the preceding key on such.

Aristiopsis tacitus n. sp.
(Fig. 2)

Material:

St. 607, Tasman Sea, 44°18'S 166°46'E, 3580 m, clay, HOT, 17. I. 1952. Holotype, female with young, 7 mm. Unique.

Diagnosis:

With the characters of the genus.

Eyes absent; lower corner of head acutely produced; lateral lobes conical, but apices not sharp; basal unsegmented part of flagellum on antenna 1 longer than peduncle, basal part of accessory flagellum similar; third pleonal epimeron straight behind, rounded-quadrate at lower posterior corner; pleon segment 4 produced dorsally into a tent-shaped process, which is massive and not a keel; outer ramus of uropod 2 with a dorsal incision armed with a spine.

Cyphocaris challengeri Stebbing, 1888

Cyphocaris challengeri Stebbing, BIRSTEIN and VINOGRADOV 1955:212 (with references).

Material:

St. 66, off Gabon, 4°00'S 8°25'E, 4020 m, S 200C (5300 m wire) 5. XII. 1950. Male, 12 mm.

Distribution:

Cosmopolitan pelagic between the polar circles, known to occur between depths of 25 and 2200 meters, possibly deeper.

Cyphocaris faurei K. H. Barnard, 1916

Cyphocaris faurei K.H. Barnard, 1916: 117-120, pl. 26, fig. 4; SCHELLENBERG 1926: 215-216, figs. 2e, 11, 12, pl. 5, fig. 4; SCHELLENBERG 1929a: 195; K.H. BARNARD 1932: 36-37; PIRLOT 1933: 128; K.H. BARNARD 1937: 141-142.

Material:

St. 218, Mozambique Channel, 13°41'S 46°40'E, 3340 m, E.F.D. 450-650 m, TOT, 28. II. 1951. Two specimens, 28 and 27 mm.

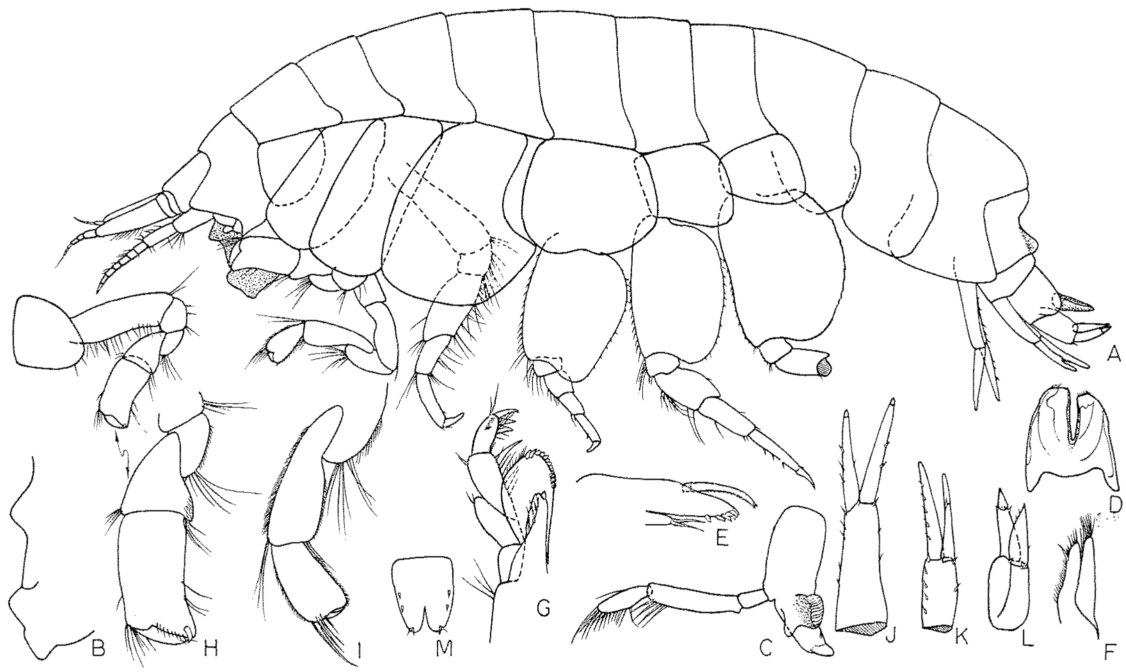


Fig. 2. *Aristiopsis tacitus* n. sp. Female, holotype, 7 mm, St. 607. A, lateral view; B, epistome and upper lip; C, mandible; D, lower lip; E, F, maxillae 1, 2; G, maxilliped; H, I, gnathopods 1, 2; J, K, L, uropods 1, 2, 3; M, telson.

St. 318, Bay of Bengal, 9°02′N 93°07′E, 1440 m, E.F.D. 800-1100 m, TOT, 5. V. 1951. Female, 20 mm.

Distribution:

Cosmopolitan bathypelagic, 175 to 2800 m.

Cyphocaris richardi Chevreux, 1905

Cyphocaris richardi Chevreux, J. L. BARNARD 1954a: 53, pls. 2, 3 (with references); BIRSTEIN and VINOGRADOV 1955: 212-213, figs. 2, 3; BIRSTEIN and VINOGRADOV 1958: 221.

Material:

St. 607, Tasman Sea, 44°18′S 166°46′E, 3580 m, clay, HOT, 17. I. 1952. Male, 23 mm.
St. 662, Kermadec Trench, 36°22′S 178°23′W, 4630 m, HOT, 23. II. 1952. Female, 20 mm.
St. 726, Gulf of Panama, 5°49′N 78°52′W, 3670-3270 m, clay, HOT, 13. V. 1952. One specimen, 20 mm; one fragment.

Distribution:

Cosmopolitan bathypelagic. Known to exist below 4200 m in a haul reported by BIRSTEIN and VINOGRADOV as 7800-4200 m. Shallowest haul 76 m.

Eucallisoma n. gen.

Diagnosis:

Head very small, lacking lateral lobes but not deformed; antenna 1 immense, conical, first article almost 3 times as long as articles 2 and 3 combined, flagellum composed of one large basal article tipped with two smaller ones, accessory flagellum appressed to primary flagellum on inner face, composed of a large basal article and a minute apical one armed with a brush of sensory setae; antenna 2 small, slender; epistome produced forward into a bulbous keel, below which the upper lip is produced forward also, lower part of upper lip not formed into a flat plate guarding the mandibles but simply terminating in a small apically rounded cone; mandible with triarticulate palp attached over a small conical unridged molar; lower lip apparently lacking inner lobes (damaged in dissection); maxilla 1 with biarticulate palp, inner lobe densely setose on inner edge; palp of maxilliped 4-articulate; coxae all visible laterally; gnathopod 1 simple, article 7 vestigial, formed of a microscopic claw-like remnant shrouded by several cirri and bearing one or two anterior spinules; gnathopod 2 of the normal lysianassid structure; article 2 of gnathopod 1 sac-like, filled with a dense gland-like tissue formed of globular cells; rami of uropod 3 subequal in size; telson split about two thirds of its length.

Type species: *Eucallisoma glandulosa,* n. sp.

Relationship:

This is a remarkable genus of lysianassid, especially for its first gnathopod. The second article is sac-like and filled with globular cells but the connective tissues are solid and firm so that when incised the internal contents remain in place. Because both first gnathopods reflect this condition it is not an aberrancy. The genus is related to others which are believed to be semiparasites on salps or medusae and the peculiar first gnathopods may function as special secretory organs for paralysis, or digestion or for excretion of toxic waste products. It might be suggested that the peculiar tissues represent effects of parasitization by a gregarine or other protozoan.

Eucallisoma is a member of the scopelocheirid group of lysianassids, represented by the genera *Scopelocheirus, Scopelocheiropsis, Paracallisoma, Bathycallisoma* and *Aroui,* where the finger of the first gnathopod is vestigial. The distinctions among these 5 genera are rather minor and the new genus differs from them mainly by a combination of characters having quantitative value but certainly recognizable as distinctions. The immense first antenna and its peculiar accessory flagellum, the sac-like basos of the first gnathopod (if normal), the much more vestigial finger of gnathopod 1 and the lack of long shrouding setae all are characters unique to *Eucallisoma.*

Eucallisoma glandulosa n. sp.

(Fig. 3)

Material:

St. 66, off Gabon, 4°00'S 8°25'E, 4020 m, S 200C (5300 m wire), 5. XII. 1950. Holotype, ?male, 10 mm. Unique.

Diagnosis:

With the characters of the genus.

Third pleonal epimeron straight behind, slightly produced at lower corner; gland cone of second antenna well developed; eyes absent; anterior edge of article 2 on pereopod 3 densely spinose, but pereopods 4 and 5 poorly spinose; pereopods 1 and 2 similar in size and structure.

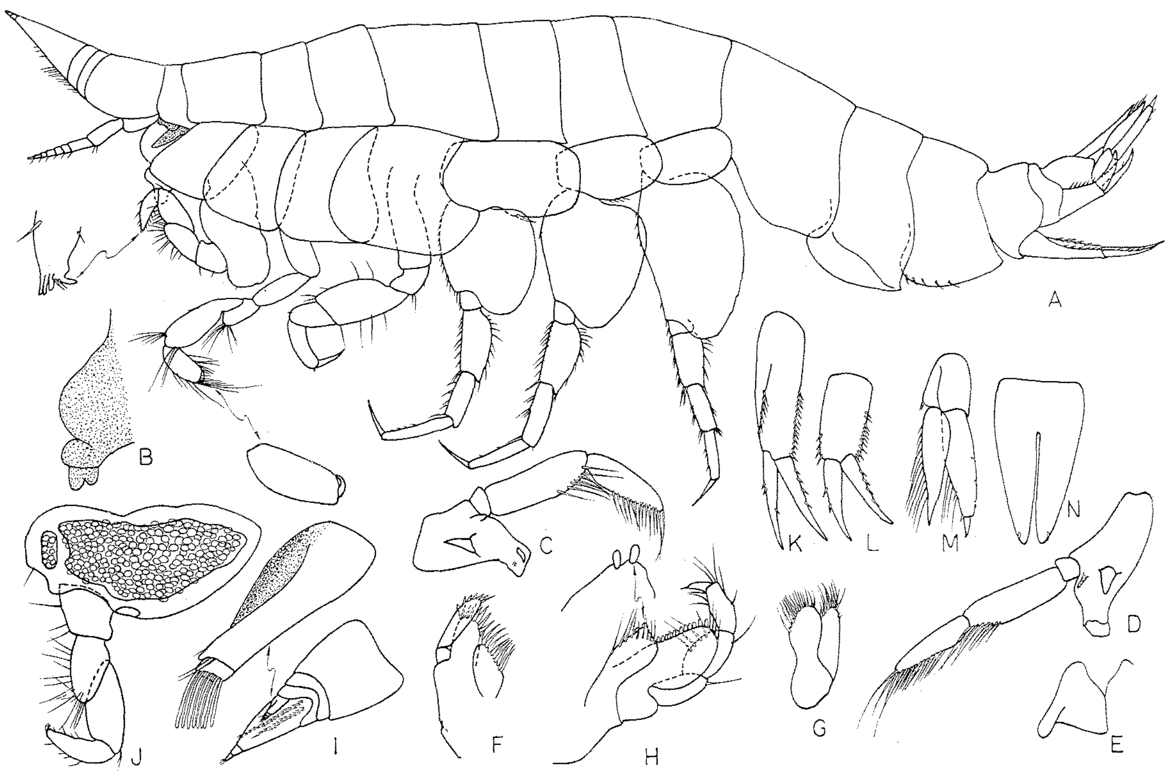


Fig. 3. *Eucallisoma glandulosa* n. sp. ?Male, holotype, 10 mm, St. 66. A, lateral view; B, epistome and upper lip; C, D, mandibles; E, lower lip, half; F, G, maxillae 1, 2; H, maxilliped; I, antenna 1; J, gnathopod 1, right side; K, L, M, uropods 1, 2, 3; N, telson.

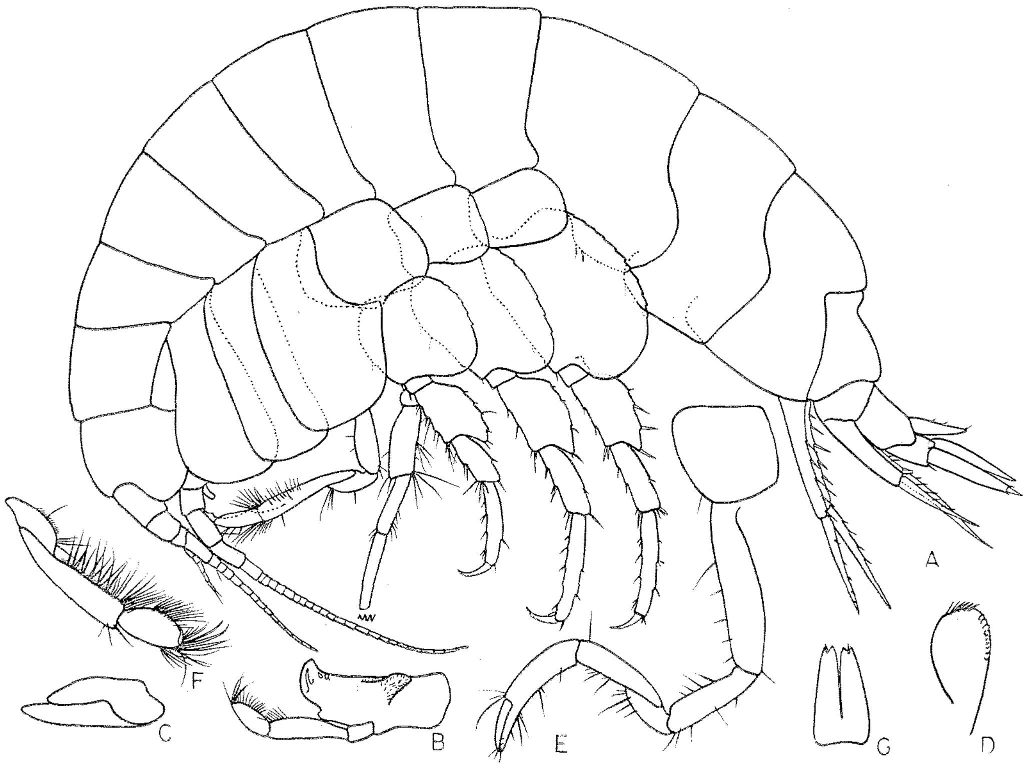


Fig. 4. *Euonyx biscayensis* Chevreux. Male, 8 mm, St. 241. A, lateral view; B, mandible; C, maxilla 2; D, outer plate ofm axilliped; E, F, gnathopods 1, 2; G, telson.

Euonyx biscayensis Chevrcux, 1908
(Fig. 4)

Euonyx biscayensis Chevreux, 1908: 1-3, fig. 1; K. H. BARNARD 1916: 110-112; STEPHENSEN 1923: 42; SCHELLENBERG 1926: 200-202; CHEVREUX 1927: 47; CHEVREUX 1935: 7-8, pl. 5, fig. 2.

Material:

St. 241, off Kenya, 4°00'S 41°27'E, 1510 m, pure Globigerina, HOT, 15. III. 1951. Male, 8 mm, figured; male, 15 mm.

Total: 2 specimens.

Remarks:

Several slight differences exist in the present material when compared with CHEVREUX' original figures; all of these appear to be differences in mounting and drawing techniques. On the present specimen the mandibular molar is more pointed and hairy, and lacks a triturating surface; the outer plates of the maxilliped have apical spines; the telson has an apical notch on each lobe; the third palp article of the mandible is slightly stouter; and the inner plate of maxilla 2 is slightly stouter. The eyes are scarcely visible.

Distribution:

Eastern Atlantic from the Faeroes to South Africa and in the Mediterranean, a species caught in pelagic equipment, maximum tow depths recorded from 564 to 1455 m.

Eurythenes Smith

Diagnosis:

Mandible with palp attached over molar; mandible bearing emargination accessory to cutting edge; lower lip with moderately thick mandibular lobes; maxilla 1 with biarticulate palp; inner plate setose only apically; maxilla 2 with inner plate conspicuously shorter than outer plate; antenna 2 with conspicuously curved and pointed gland cone; coxa 1 partly hidden and much smaller than coxa 2; coxa 5 rather large; gills probably pleated on both sides; gnathopod 1, article 6 nearly twice as long as article 5; article 6 of gnathopod 2 moderately slender but shorter than article 5; fourth article of pereopods 3-5 stout; telson deeply cleft.

Discussion:

This genus has been the source of considerable discussion in past literature and the systematic problems it poses are not yet solved. The type species *E. gryllus* (Lichtenstein) is very clear cut and well figured by SARS (1895: pl. 30). Another species which was assigned to *Eurythenes* was *Lysianassa magellanicus* Milne Edwards, 1848, collected at Cape Horn but later fused to the North Atlantic *E. gryllus* (see STEBBING 1906: 73). In 1905 CHEVREUX established *Katius obesus* n. gen., n. sp. which was transferred to *Eurythenes* by STEPHENSEN (1933). K. H. BARNARD (1932) discussed both *Katius obesus* and the genus *Eurythenes* extensively, pointing out the need to fuse the two genera. In 1933 STEPHENSEN fused *Katius obesus* with *Eurythenes gryllus* on the basis that *E. gryllus* represented the female and *K. obesus* represented males and juveniles. SHOEMAKER (1956) recorded the first definite large male of *E. gryllus,* which discovery refuted STEPHENSEN's position. In 1955 BIRSTEIN and VINOGRADOV erected *Eurythenes fusiformis* for a North Pacific species and in 1958 *E. microps*. In my 1958 Index to the Gammaridea I listed the four species of *Eurythenes* as *gryllus, magellanicus, fusiformis* and *obesus*.

In attempting to identify a large lysianassid represented by four medium sized specimens in Kermadec Trench it became apparent that the genus *Eurythenes* still has not been adequately discussed, nor that its composition is correct.

In the first place *E. fusiformis* Birstein and Vinogradov decidedly is not a *Eurythenes* but the writer is unable to suggest an existing genus to which it should be transferred. It is quite distinct from the type species *E. gryllus* on the following generic points: the lack of a marginal excavation on the mandible; the lack of a pointed gland cone on antenna 2; the long slender mandibular lobes of the lower lip; the elongated sixth article of gnathopod 2 which is longer than article 5; the subequal lobes of maxilla 2; the setosity of the inner edge of the inner plate of maxilla 1; the small fifth coxa; and the slender fourth articles of pereopods 3-5. From its comparative description it is apparent that *E. microps* is also of this type.

Secondly, it has not been pointed out that if one were to use STEBBING's key (1906:9) to the genera of the Lysianassidae the species *Katius obesus* would be placed in the genus *Tmetonyx* Stebbing because the third uropodal rami are lanceolate, not foliaceous as in *E. gryllus*. Thus, it must be determined whether *E. obesus* belongs with *Eurythenes* despite its third uropods and if so the diagnosis of *Eurythenes* must be emended. *E. obesus* differs from *Tmetonyx cicada,* the type species of *Tmetonyx,* in a number of features, which it also has in common with *Eurythenes* and thus should be retained with *Eurytheses*. These features are: the presence of a sharp gland cone on antenna 2; the sixth article of gnathopod 1 which is distinctly longer than article 5; the stout fourth articles of pereopods 3-5; and the small first coxa. These are features that should be used to distinguish *Eurythenes* from *Tmetonyx*.

Thirdly, the Kermadec specimens which I have identified with *E. gryllus* below must be determined generically. Like *E. gryllus* and *E. obesus* these specimens share the features noted above, the gland cone, second gnathopod, and fourth articles of pereopods 3-5. Unlike *E. gryllus* the third uropodal rami are lanceolate, not foliaceous, but the writer believes that *Eurythenes* should be emended in this respect, and that lanceolate rami may be characteristic of young specimens.

In summary the composition of *Eurythenes* should be emended as follows:

Eurythenes Smith S:
- *gryllus* (Lichtenstein) S, Gurj 51
- *obesus* (Chev), Schell 1955, was *Katius*
- *fusiformis* Birstein and Vinogradov, 1955 → removed to undetermined genus
- *magellanicus* (Milne Edwards) → *E. gryllus*
- *microps* Birstein and Vinogradov, 1958 → removed to undetermined genus.

Eurythenes gryllus (Lichtenstein, 1822)
(Figs. 5, 6, 7)

Eurythenes gryllus (Lcht.), STEBBING 1906: 73 (with references); STEPHENSEN 1933: 12-20, figs. 4-7 (in part); SHOEMAKER 1945: 186-187; STEPHENSEN 1949: 3-5; GURJANOVA 1951: 265-266, fig. 134; BIRSTEIN and VINOGRADOV 1955: 225; HURLEY 1957: 2; BIRSTEIN and VINOGRADOV 1958: 228.
Euryporeia gryllus, SARS 1895: 86-87, pl. 39.
not *Katius obesus* Chevreux, 1905: 1-5, figs. 1-3.

Diagnosis:

Dactyls of pereopods 3-5 short, about one third as long as article 6; combined length of articles 3-7 on the third pereopod twice as long as article 2.

Remarks:

The material will be discussed in units, rather than by listing it together.

St. 200, off Natal, 29°39'S 37°01'E, 5090-4880 m, HOT, gear not at bottom, 17. II. 1951. ?Female, 75 mm; male, 50 mm.

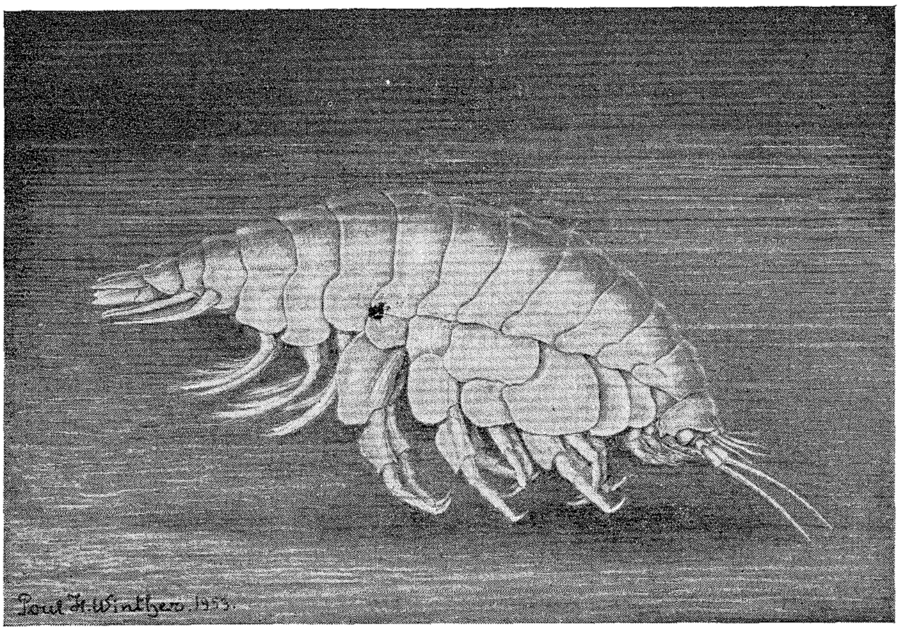


Fig. 5. *Eurythenes gryllus* (Lichtenstein). ?Female, 75 mm, St. 200. (POUL H. WINTHER del.)

Field color notes: male with legs, antennae, dorsal keel and lower edge of pleura very pink, the rest faintly pink; female with body white; eyes in both specimens yellow with faintly reddish tinge.

These giant specimens are in perfect condition, perhaps among the few ever so collected. The largest 75 mm lacks any evidence of genital papillae on the seventh pereon sternites and also lacks any evidence of brood plates so that it may be a gerontic female. The 50 mm specimen is definitely a male, bearing genital papillae on the seventh pereon sternites.

Both specimens correspond with SARS' (1895) drawings of the species, with the exception of two features: the epistome is not a large rounded plate in front, but a somewhat smaller bulbous piece bearing a frontal indentation above which the epistome is slightly folded into a lip; and the dorsal segmental carinae are much better developed. Instead of commencing on the last pereon segment the carinae begin on the first; they are low but distinct on segments 1 through 4, high on segments 5-7 and on pleon segments 1-4, low and slight on pleon segment 5 (absent in the male on pleon segment 5) and exist as a low bump on pleon segment 6. The carinae occupy the posterior surfaces of each segment: on pereon segment 1 the carina is one third as long as the segment, on segments 2-5 the carina is one half, on pereon 6 and 7, the carina is two thirds and on pleon segments 1-4 it is three fourths as long as its respective segment. The third uropodal rami are not quite as foliaceous as drawn by Sars. Despite these differences I have little doubt that the specimens are a variant population of *E. gryllus*.

This discovery of another unconfuted male *E. gryllus* (see SHOEMAKER 1956) with the pereopodal structure typical of SARS' drawings seems to contradict the studies of STEPHENSEN (1933), who reached the conclusion that all *E.gryllus* types were females and that males and young were represented by the form originally described as *Katius obesus* Chevreux 1905. Further indications that this conclusion was fallacious will be seen in the juvenile materials which are probably young *E.gryllus* and are decidedly not *E.obesus*.

With the exception of the last material to be cited, all remaining specimens were collected in stations made in the south Pacific Ocean. None of the specimens approach the great size of the first two and several minor differences occur in the material from normal adult structures.

Stations

554, Great Australian Bight, 37°28'S 138°55'E, 1340-1320 m, Globigerina ooze, ST 300, 5. XII. 1951. Female, ovigerous, 23 mm.

574, Tasman Sea, 39°45'S 159°39'E, 4670 m, ST 600, 18. XII. 1951. Female, 22 mm.

601, Tasman Sea, 45°51'S 164°32'E, 4400 m, Globigerina ooze, HOT, 14. I. 1952. Specimen, 21 mm.

602, Tasman Sea, 43°58'S 165°24'E, 4510 m, bluish clay, ST 300, 15. I. 1952. ?Male, 8 mm.

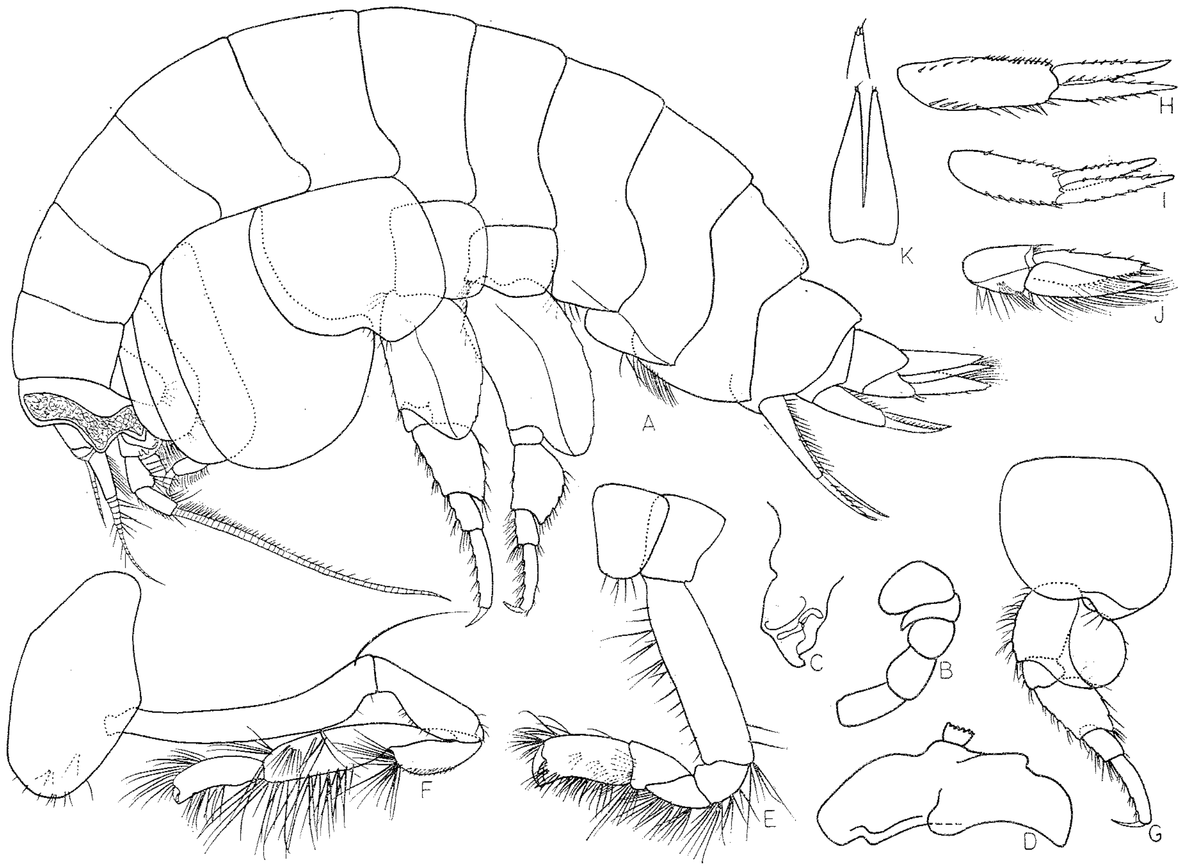


Fig. 6. *Eurythenes gryllus* (Lichtenstein). Female, 23 mm, St. 663. A, lateral view; B, antenna 2, stippling is article 2; C, epistome and upper lip; D, body of mandible; E, F, gnathopods 1, 2; G, pereopod 3; H, I, J, uropods 1, 2, 3; K, telson.

Stations

607, Tasman Sea, 44°18′S 166°46′E, 3580 m, clay, HOT, 17. I. 1952. Male, 18 mm; female, 17 mm.

629, E. of Cook Strait, 41°46′S 175°48′E, c. 2000 m, TOT + DR, 24. I. 1952. Female, ovigerous, 20 mm; field color note: body orange, eyes yellow.

662, Kermadec Trench, 36°22′S 178°23′W, 4630 m, HOT, 23. II. 1952. Female, ovigerous, 17 mm; female, 15 mm.

663, Kermadec Trench, 36°31′S 178°38′W, 4410 m, brown sandy clay with pumice, HOT, 24. II. 1952. Female, 23 mm; female, 29 mm; male 21 mm; specimen 13 mm; seven juveniles about 5 mm in length.

These young specimens, some of them obviously at sexual maturity most certainly represent the genus *Eurythenes*. The dactyls of the pereopods are short, like adult *E. gryllus,* and the dorsal notches of pleon segments 3 and 4 are beginning to develop on some of them. The principal difference of these young is the slightly chelate condition of both pairs of gnathopods. Young specimens of *E. gryllus* in the Atlantic Ocean have not been described, except by STEPHENSEN (1933) who described them as types similar to *Katius obesus* Chevreux, which he fused with *E. gryllus*. The writer is unconvinced that this is the proper analysis, because of the discovery in the present material from the south Atlantic Ocean of true males of the *E. gryllus* type, cited above. Until true juveniles of *E. gryllus,* bearing short pereopodal dactyls have been analyzed for gnathopodal structure in the Atlantic Ocean the writer believes that the present south Pacific material should be assigned to *E. gryllus*.

The distal spine on article 6 of pereopods 1 and 2 is proportionally large in the young material, 8 to 30 mm, but smaller in the 50 and 75 mm specimens. However, it is of the same linear dimensions in material of both sizes, indicating that it does not increase in size with age. The basal article of antenna 2 is considerably smaller in young animals but quite large and slightly bulbous in the large animals. The third pleonal epimeron is quadrate in the juveniles but rounded in large adults.

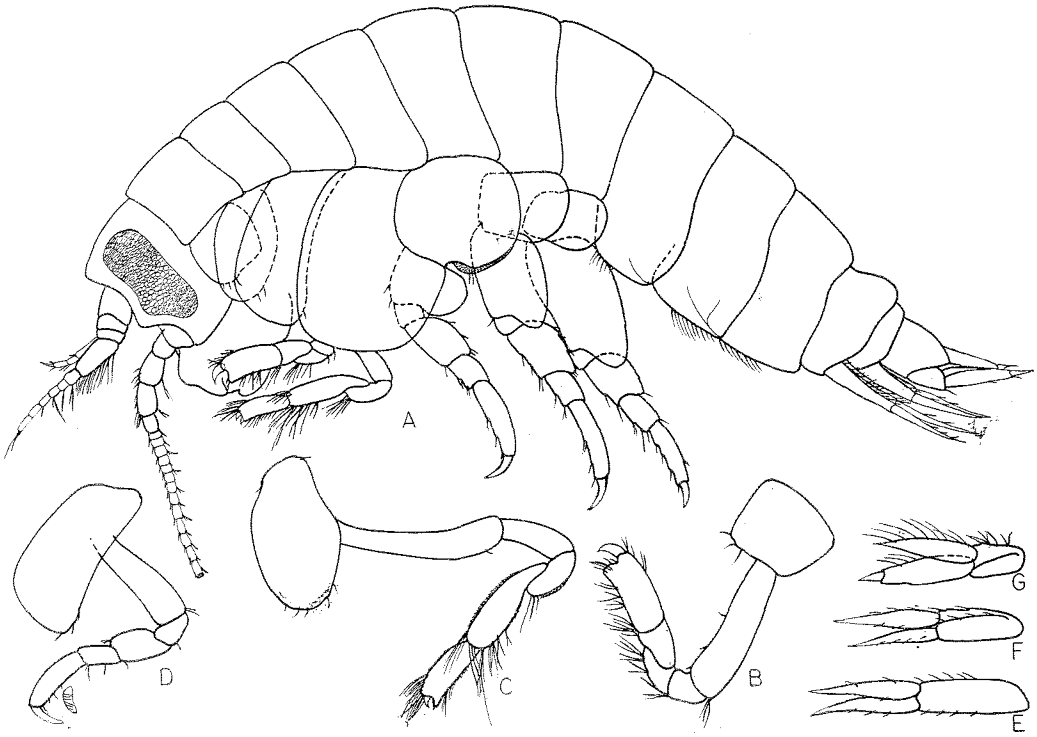


Fig. 7. *Eurythenes gryllus* (Lichtenstein). ?Male, 8 mm, St. 602. A, lateral view; B, C, gnathopods, 1, 2; D, pereopod 1; E, F, G, uropods 1, 2, 3.

St. 194, off Durban, 34°09'S 30°45'E, 4360 m, Globigerina ooze, SOT, 7. II. 1951. Badly damaged specimen, 18 mm.

Distribution:

North and south Atlantic Oceans, north Pacific Ocean (some perhaps of *E. obesus* type cited by BIRSTEIN and VINOGRADOV 1955 and 1958 as *E. gryllus)*, caught in hauls as deep as 6500 m and as shallow as 184 m. The south Pacific material cited herein is only provisionally called *E. gryllus*, and may be similar to that cited by HURLEY (1957). Some of the south Pacific specimens show large quantities of mineral particles in the stomach, indicating benthic feeding but the species otherwise has pelagic adaptations, such as oily bodies and imperfect, diffused eyes.

Eurythenes obesus (Chevreux, 1905)
(Fig. 8)

Katius obesus Chevreux, 1905: 1-5, figs. 1-3; STEPHENSEN 1925: 126-127; SCHELLENBERG 1926: 217-218, fig. 26d; K.H. BARNARD 1932: 56-58, fig. 21, pl. 1, fig. 1; CHEVREUX 1935: 63-65, pl. 10, figs. 4, 6; pl. 11, fig. 10.
Eurythenes obesus, SHOEMAKER 1956: 177-178.

Material:

St. 66, off Gabon, 4°00'S 8°25'E, 4020 m, S 200C (5300 m wire), 5. XII. 1950. Juvenile, 9 mm.
St. 183, Cape Town-Durban, 33°25'S 37°20'E, 5210 m, S 200C, E.F.D. 3000-3600 m, 28. I. 1951. Male, 11 mm, figured.

Diagnosis:

Dactyls of pereopods 3-5 long, about 60 % as long as article 6; combined lengths of articles 3-7 on the third pereopod five times as long as article 2.

Remarks:

The species differs from *E. gryllus* by the very long distal parts of the pereopods, especially pereopod 3 and the long dactyls of pereopods 3-5.

STEPHENSEN (1933) believed that *K. obesus* was the young and male of *E. gryllus*, but SHOEMAKER (1956) discovered a true large male of *E. gryllus* and another one is reported herein.

The head of *E. obesus* seems much smaller than that of *E. gryllus*. Dorsal notches on pleon segments 3 and 4 appear to be developing in the present specimen, much as in the supposed young *E. gryllus* specimens reported above. However, the third pleonal epimera are rounded behind and not

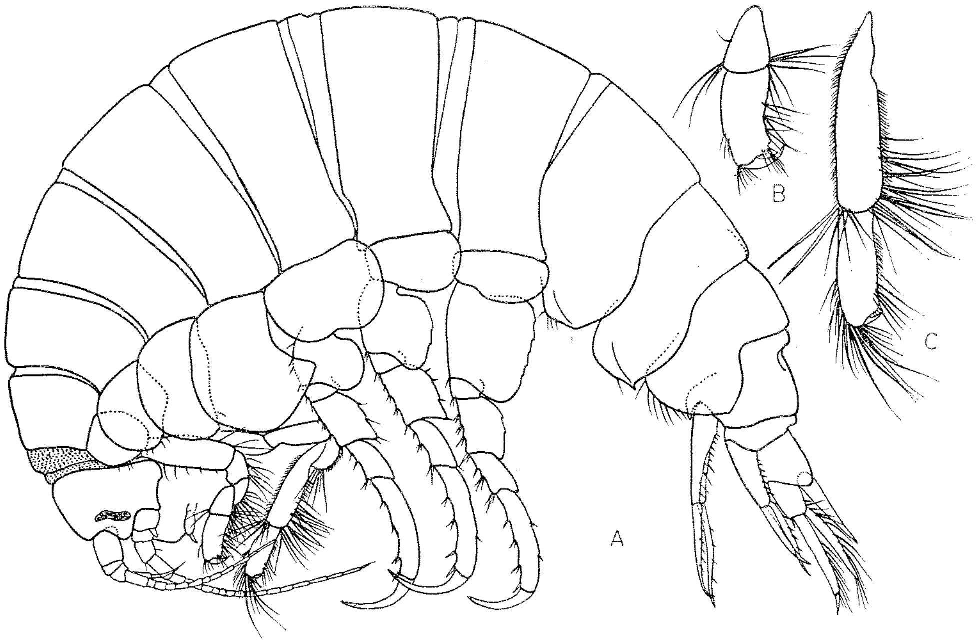


Fig. 8. *Eurythenes obesus* (Chevreux). Male, 11 mm, St. 183. A, lateral view; B, C, gnathopods 1, 2.

quadrate and the gnathopods show no evidence of slight chelateness seen in the young *E. gryllus* material.

Both *E. obesus* and *E. gryllus* bear the stout distal spine on article 6 of pereopods 1 and 2. The gills attached to the segments of gnathopod 2 and pereopods 1-3 in the *E. obesus* specimen at hand bear 3-4 broad proximal pleats.

Distribution:

Cosmopolitan between the polar circles, 5610-500 m.

Hippomedon antitemplado n. sp.
(Fig. 9)

Material:

St. 601, Tasman Sea, 45°51′S 164°32′E, 4400 m, Globigerina ooze, HOT, 14. I. 1952. Holotype, female, 15 mm. Unique.

Diagnosis:

Eyes absent, lateral lobes of head moderately acute; peduncular articles of first antenna not dentiform; third pleonal epimeron with a large blunt tooth detached from lower margin and lacking a notch; pleon segment 4 bearing a dorsal incision followed by a high keel-like carina terminating acutely; article 6 of gnathopod 1 with a distinct palm but not inflated, article 6 about two thirds as long as 5; epistome not produced, formed into a broad, flat lamina; coxae 1-3 with a microscopic notch on the lower posterior corners.

The mouthparts are like *Hippomedon denticulatus* (in Sars 1895: pl. 20) except for the much shorter third article of the mandibular palp; the mandible has 2 spines in the spine row. The gills of pereopods 5 and 6 each bear one slender accessory lobe.

Relationship:

Only four species of *Hippomedon* have any semblance of a carina on pleon segment 4. *Hippomedon antitemplado* differs from *H. frigidus* Stephensen, 1923 (p. 19) by the lack of a distal process on the first article of antenna 1 and by the shape of the third pleonal epimeron, with its tooth detached from the lower margin.

It differs from *H. holbolli* (in Sars 1895: pl. 21, fig. 2) by the more acute lateral lobes of the head, the lack of eyes, and the more dorsally situated tooth of the third pleonal epimeron, having the edge below it nearly vertical.

It resembles *H. longimanus* (Stebbing, 1888: pl. 13) from the abyssal North Atlantic more than other species but differs by the lack of a distal process on the first article of antenna 1 and the shape of the third pleonal epimeron, for which drawings should be compared.

It differs from *H. serratus* Holmes, 1905 (p. 473), by the lack of a process on the first article of antenna 1 and by the blunter, more remote tooth of the third pleonal epimeron.

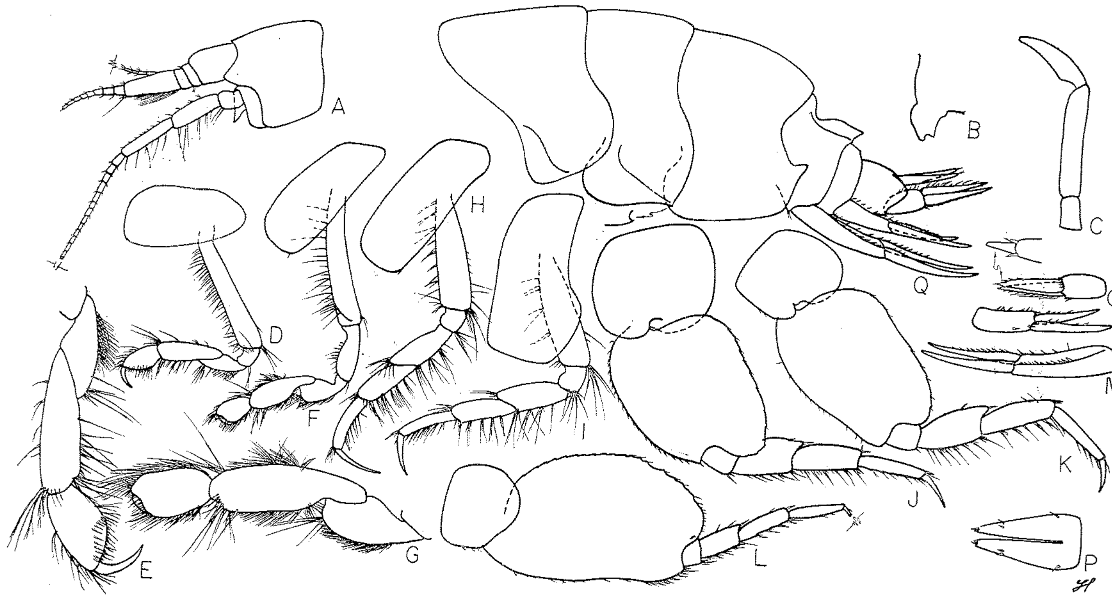


Fig. 9. *Hippomedon antitemplado* n. sp. Female, holotype, 15 mm, St. 601. A, head; B, epistome and upper lip; C, palp of mandible; D, E, gnathopod 1; F, G, gnathopod 2; H, I, J, K, L, pereopods 1, 2, 3, 4, 5; M, N, O, uropods 1, 2, 3; P, telson; Q, pleon.

Hippomedon concolor n. sp.
(Fig. 10)

Material:

St. 607, Tasman Sea, 44°18′S, 166°46′E, 3580 m, clay, HOT, 17. I. 1952. Holotype, female, 11 mm. Unique.

Generic assignment:

The unique specimen lacks pleon segment 6 and most of uropods 1 and 2. Even if these were present the species would be difficult to assign to a genus. By assuming the telson would be entire the species would fit into none of the known genera on the basis of mouthparts and gnathopods. By assuming the species to have a telson split half its length the species might be placed in *Paratryphosites,* a genus essentially monotypic since *P. minusculus* Gurjanova probably has been misassigned to that genus. There are so many other minor features of possible generic difference in mouthparts that it is not possible to accept the assignment of *H. concolor* to *Paratryphosites*. The only remaining alternative is to assume that the telson would be fully cleft. The condition of the first gnathopod causes difficulty in keys for articles 5 and 6 are so much the same length. If the species were assigned to *Tryphosa* it would be unique in the very oblique palm on the expanded sixth article of gnathopod 1. On the other hand if assigned to *Hippomedon,* it would differ in the equal lengths of the fifth and sixth first gnathopodal articles, whereas most Hippomedons have the fifth article greatly longer than the sixth. Indeed the general shape of article 6 and especially the similarity of the third pleonal epimeron to many Hippomedons are the features which have been relied on.

Diagnosis:

Eyes absent; lateral head lobes conical, apices not sharply acute; first article of antenna 1 slightly swollen and produced apically; fifth and sixth article of gnathopod 1 subequal in length, palm distinct, longer than hind margin of article 6; epistome and lower lip nearly straight in front; lower hind edge of article 2 on pereopod 5 excavated slightly (not damaged, condition identical on both sides of animal); lower edge of second pleon epimeron sinuate (both sides), third pleonal epimeron with thick posterior tooth which is attenuated and sharply acute distally; pleon segment 4 with dorsal erect, subacute keel; coxae 1-2 with a microscopic notch at each lower posterior corner.

Relationship:

This species is most closely related to the preceding *H. antitemplado* n. sp. The resemblance is remarkable at first sight; unless various parts are mounted flat or turned into comparable positions the two species might be confused easily. *H. antitemplado* bears the tendencies of many characters which show their full expression in *H. concolor,*

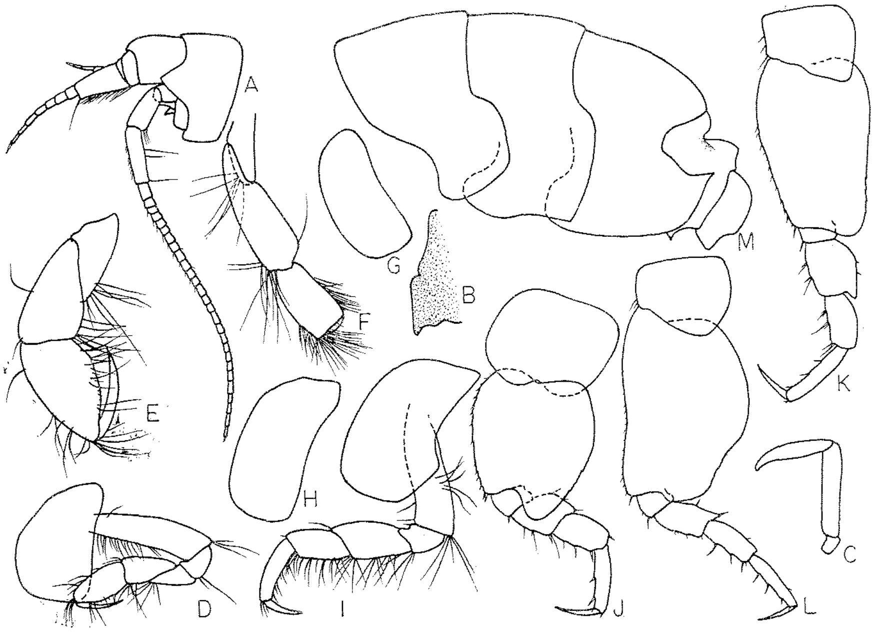


Fig. 10. *Hippomedon concolor* n. sp. Female, holotype, 11 mm, St. 607. A, head; B, epistome and upper lip; C, palp of mandible; D, E, gnathopod 1; F, gnathopod 2; G, H, coxae 2, 3; I, J, K, L, pereopods 2, 3, 4, 5; M, pleon, last segment missing, uropods broken.

such as the sinuate lower edge of the second pleonal epimeron, the distal swelling of the first antennal article, the shape of the mandibular palp and the third pleonal epimeron and the relatively uncommon possession of a dorsal crest on pleon segment 4. Holotypes of each species are females so that no sexual differences are involved. Undoubted differences of specific value exist in the first gnathopod as so diagnosed and figured; a comparison of the figures of the second gnathopods shows that one species has an oblique, the other a transverse palm; *H. antitemplado* bears lateral ridges on the first and second pleonal epimera, not seen on *H. concolor*. Except that *H. concolor* bears a distally modified first article on the first antenna, it differs from other relatives in the genus by the same factors stated for *H. antitemplado*.

Hippomedon tasmanicus n. sp.
(Fig. 11)

Material:

St. 601, Tasman Sea, 45°51′S 164°32′E, 4400 m, Globigerina ooze, HOT, 14. I. 1952. Holotype, ovigerous female, 17 mm; one male fragment, with antennae bearing calceoli. Total: 2 specimens.

Diagnosis:

Eyes absent, lateral lobes of head acutely produced; peduncular articles of first antenna not dentiform; third pleonal epimeron with small acute tooth, not incised; pleon segment 4 bearing a dorsal incision, followed by a low, smooth hump; article 6 of gnathopod 1 with a distinct palm but not inflated, article 6 about two thirds as long as 5; epistome not produced, formed into a broad, flat lamina; coxae 1-3 each with a minute distal posterior notch.

The mouthparts are like *Hippomedon denticulatus* (in SARS 1895: pl. 20) except for the first maxillary inner plate which is rather setose, bearing 9 setae; the mandible has 2 spines in the spine row. The gills of pereopods 5 and 6 each bear one slender accessory lobe.

Relationship:

The genus *Hippomedon* had 24 species (J. L. BARNARD 1958), but the taxonomic characters are rather subtle, largely proportional and have not been studied in relation to growth stages or intraspecific variations. Two principal shapes of third pleonal epimeron occur (apart from *H. bidentatus* and *H. striolatus)* which have the lower tooth slender and evenly tapering or with the lower edge of the tooth broadly inflated to form a stout tooth with all of the tapering occurring only on the lower edge. Occasionally, in the latter type the dorsal base of the tooth may bear an incising notch. The recognition of these types, considering intergradation, is a subjective ability and requires visual compari-

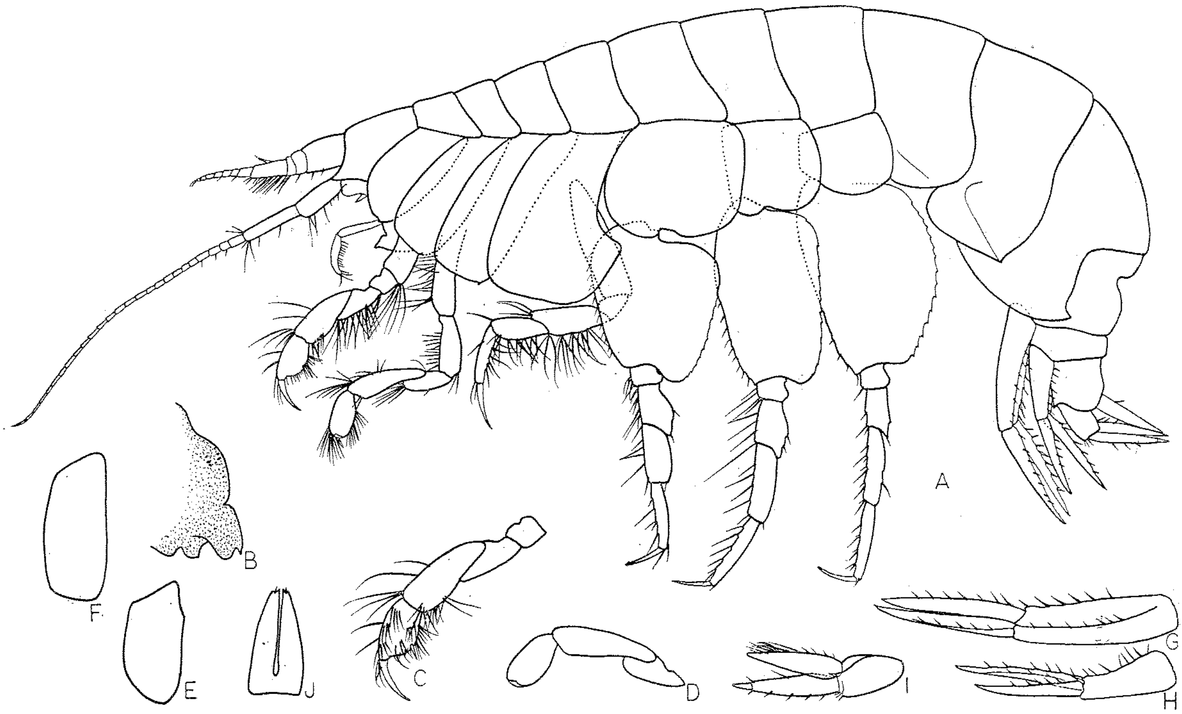


Fig. 11. *Hippomedon tasmanicus* n.sp. Female, holotype, 17 mm, St. 601. A, lateral view; B, epistome and upper lip; C, D, gnathopods 1, 2; E, F, coxae 1, 2; G, H, I, uropods 1, 2, 3; J, telson.

son, not written statements. It may prove that juvenile animals pass through stages of slender epimeral teeth and lack of notches before the stage of stout teeth and presence of notches is reached, which will necessitate realignment of the species when life histories are studied. For instance, *H. propinquus* may be the young of *H. denticulatus* (see SARS 1895: pls. 20 and 21), for even the projections on the first antennal peduncle may be products of advanced age.

The distinctive features of *H. tasmanicus* are the very acute lateral head lobes, the small tooth of the third pleonal epimeron and the lack of a carina on pleon segment 4. Three other species bear close relationship but *H. tasmanicus* differs from each as follows: from *H. geelongi* Stebbing, 1888 (pl. 11), by the relatively shorter sixth article of the first gnathopod and the shorter tooth of the third pleonal epimeron; from *H. longimanus* (Stebbing, 1888: pl. 13) by the lack of a carina on pleon segment 4 and contrasting shape of the sixth article on gnathopod 2; from *H. bandae* Pirlot, 1933 (p. 144) by the shape of the head, although PIRLOT's fig. 50 suggests that the head was crushed in mounting; by the slightly better developed tooth of the third pleonal epimeron and the distinct palm of gnathopod 1, whereas in *H. bandae* article 6 of gnathopod 1 is quite inflated.

Onesimoides Stebbing

Key to Onesimoides

1. Palm of gnathopod 1 transverse, entire 2
1. Palm of gnathopod 1 oblique, sinuate 3
2. Back slightly carinate; article 6 of gnathopod 1 moderately stout, palm not chelate .... *carinatus*
2. Back not carinate; article 6 of gnathopod 1 slender, palm slightly chelate....... *chelatus,* female
3. Article 6 of first gnathopod 1.5 times as long as broad, palm oblique; pleon segment 4 with dorsal carina .... *cavimanus*
3. Article 6 of first gnathopod slightly more than twice as long as broad, palm parallel to hind margin; pleon segment 4 lacking dorsal carina.................... *chelatus,* male

Onesimoides chelatus Pirlot, 1933
(Figs. 12, 13, 14 and Photogr. 1)

Onesimoides chelatus Pirlot, 1933: 134-139, figs. 43-45.

Material:

St. 52, San Tomé-Cameroon, 1°42'N 7°51'E, 2550 m, muddy clay, SOT, 30. XI. 1950. Male, 15 mm, figured.

St. 450, Celebes Sea, 1°50'N, 119°20'E, 4940-4970 m, HOT, 21. VIII. 1951. In *Nipa*-palm fruit, first fruit with 2 males (first gnathopods figured), 4 females, 11 juveniles and 3 fragments; second fruit with 58 specimens. The animals had entered the nut via the micropyle which may have been eaten out.

St. 453, Makassar Strait, 3°56'S 118°26'E, 2000m, greenish clay, ST 300, 24. VIII. 1951. Female, figured, 8.5 mm; female, ovigerous, 9 mm; ?sex 4.5 mm. Total: 3 specimens.

Diagnosis of male:

Article 6 of gnathopod 1 more than twice as long as broad, palm very oblique, nearly parallel with hind edge of article 6 but excavated and defined from the hind margin; palm about half as long as rest of hind margin, article 7 recurved, fitting palm; pleon segment 4 dorsally smooth, not carinate.

Remarks:

Two peculiarities are concerned with this species. First, the male and the female differ remarkably in their first gnathopods, a feature unique to the large family Lysianassidae. There appears to be no doubt that the two forms represent the same species, for they have been captured together inside a palm fruit from St. 450. The first gnathopods of the females are small, slender and slightly chelate, while those of the males are large, stout and not chelate, but the palm is oblique and excavated. The first gnathopods of the only 2 males associated with females in the coconut are figured to show two of the steps between the slender female-like gnathopod and the stout male-like gnathopod. The full male is figured from a specimen collected in the tropical eastern Atlantic ocean. It is a larger specimen and had gnathopod 1 more fully developed than in the Celebes males, but no other systematic differences could be detected. For this reason, the second peculiarity is the wide distribution of a benthic, abyssal species, known now from the Atlantic and the southwest Pacific, but it is feasible that such a wide distribution might be accounted for by the fact that

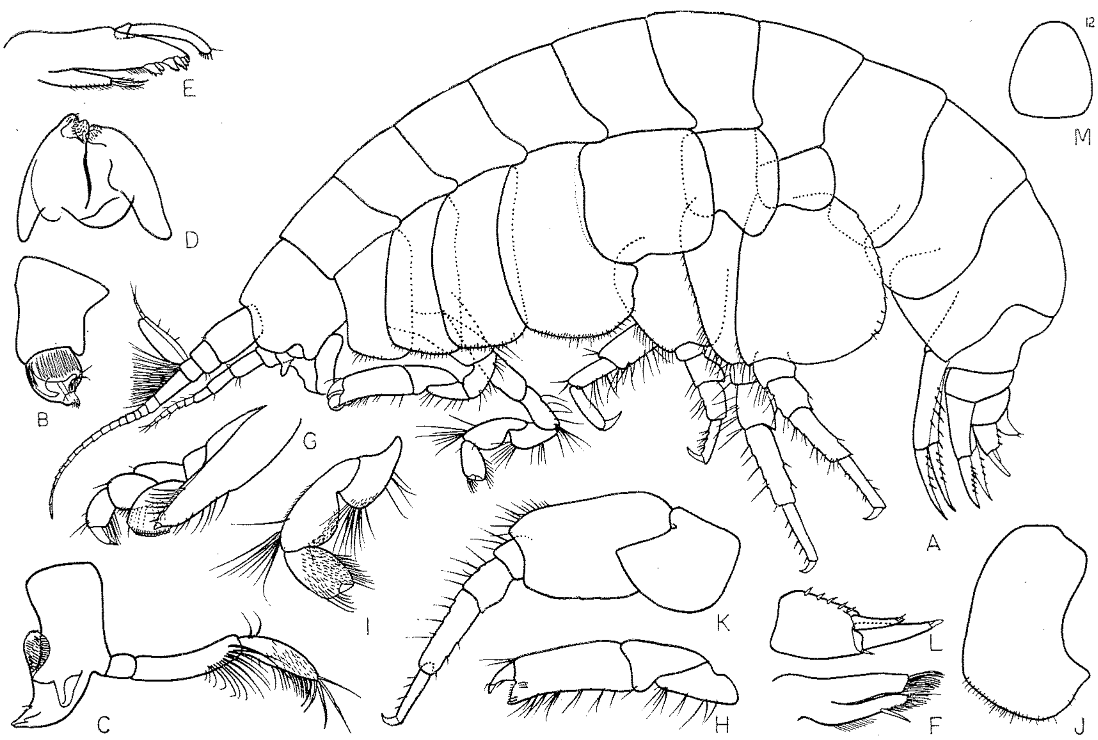


Fig. 12. *Onesimoides chelatus* Pirlot. Female, 8.5 mm, St. 453. A, lateral view; B, upper lip, posterior view; C, mandible; D, lower lip; E, F, maxillae 1, 2; G, maxilliped; H, I, gnathopods 1, 2; J, coxa 4; K, pereopod 4; L, uropod 3; M, telson.

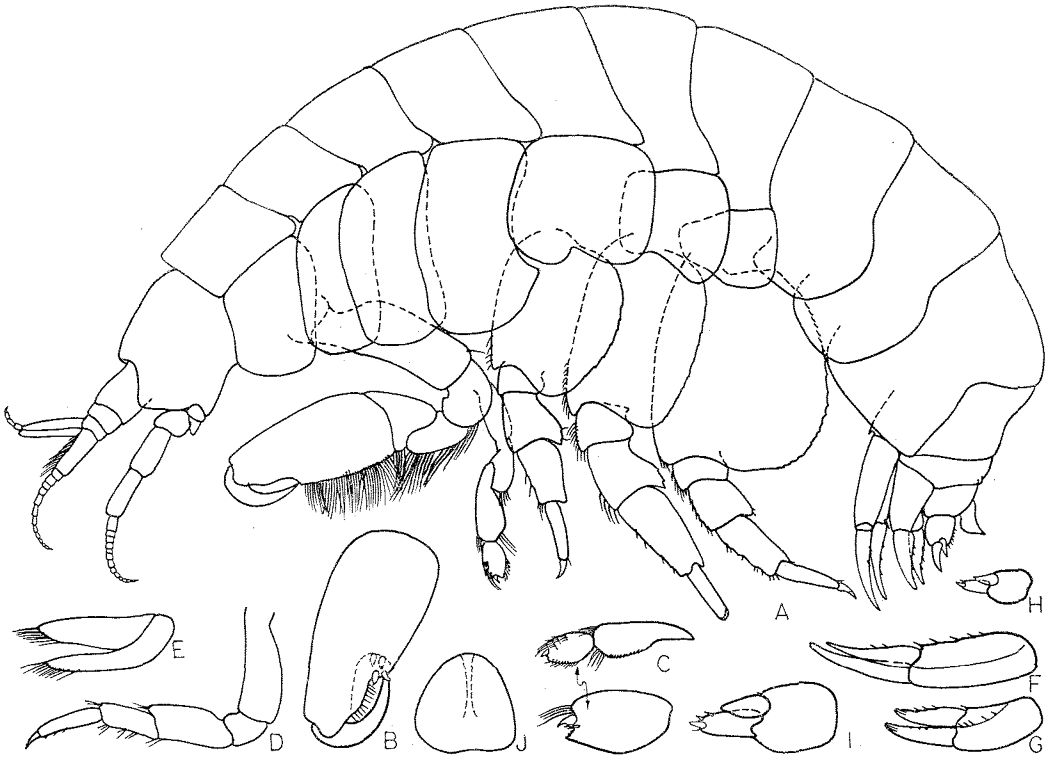


Fig. 13. *Onesimoides chelatus* Pirlot. Male, 15 mm, St. 52. A, lateral view; B, C, gnathopods 1, 2; D, pereopod 1; E, maxilla 2; F, G, H, uropods 1, 2, 3; I, uropod 3, enlarged; J, telson.

the species feeds on woody debris. The oily body of the large 15 mm male suggests that the species may be demersal and attack submerged waterlogged wood before it reaches bottom so that the animals might be transported long distances before the wood finally settles. On the other hand the species feeds on oily food such as coconut meat and its oiliness may have no connection with its ability to swim.

It will prove interesting to discover the females of the other two species of *Onesimoides,* which are distinguished in the preceding key, now that the male-female relationship of *O. chelatus* has been worked out.

Food:

According to Pirlot (1933) this species eats wood. The 9 mm female of St. 453 was dissected and the stomach found to be filled with a peculiar unidentifiable material, red in color, appearing like rumpled sheets of chitin, some as large as 0.2 mm across and clumps of reddish fine particulate detritus. The small 4.5 mm specimen of St. 453 was dissected and its gut filled with the same kind of red detritus.

The stomach of the male of St. 52 contained much finely particulate organic matter, with a few small mineral grains. The body was exceedingly oily. The stomach contents of a female from St. 450 were examined in comparison with scrapings of the coconut-like meat on which the amphipods were feeding and found to be identical in composition, being composed of highly refractile fibrous material.

Distribution:

Neighbourhood of the Celebes Sea, 4940 m, on the east sill of the basin at 2053 m, on the southwest sill of the basin in Makassar Strait, 2000 m and in the Moluccas Passage, 1264-1165 m; Gulf of Guinea, 2550 m.

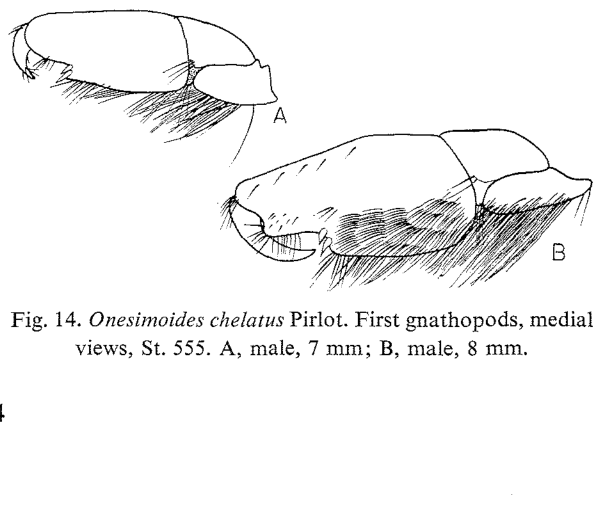
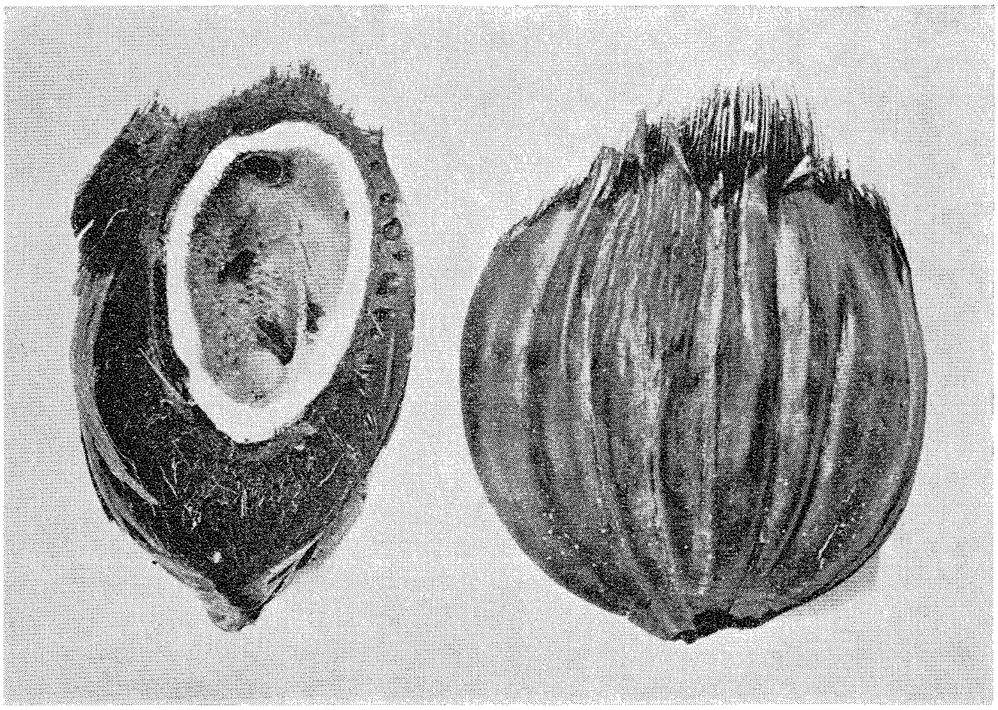


Fig. 14. *Onesimoides chelatus* Pirlot. First gnathopods, medial views, St. 555. A, male, 7 mm; B, male, 8 mm.



Photograph No. 1. Fruits of *Nipa*-palm at St. 450, dredged from 4940-4970 m in the Celebes Sea, containing 76 specimens of *Onesimoides chelatus* Pirlot which had entered the nuts through the micropyle and were eating the soft meat. The fruit on the left has been split open. Magnification, × $^1/_2$.

Orchomene ? takoradia n. sp.
(Fig. 15)

Material:

St. 30, Monrovia-Takoradi, 0°42′N 5°59′W, 5160 m, clay, ST 300, 18. XI. 1950. Holotype, female, 16 mm.

Diagnosis:

Eyes absent; lateral lobes of head very broad and rounded; antennae remarkably short; epistome slightly exceeding upper lip in front; mandible with distinctly ridged and toothed, but small molar, palp stout; mandibular lobes of lower lip stout; maxillae strongly styliform; inner lobes of second maxillae short, stout, unarmed, outer lobes very slender, armed apically with 3 spines; inner lobes of maxilla 2 much shortened, slender, not setose on inner edge, apex with one seta; article 4 of maxilliped short, not evenly claw-like (see figure); palm of gnathopod 1 with 3 small, sharp cusps; gnathopod 2 not minutely chelate, lacking palm, article 7 long, overlapping distal end; third pleonal epimeron rounded behind, dorsal surface of pleon segment 4 raised into a slight but massive boss; inner ramus of uropod 3 distinctly smaller than outer ramus; telson cleft nearly half its length.

Generic position:

It is questionable whether this species belongs to the genus *Orchomene* or any of its close relatives and it probably should form the type of a new genus. Although some species of the genus *Orchomene* show tendencies to bear characters of this new species, the special combination of them is unique. Particularly important is the shape of the second gnathopod, which in all other Orchomenes is minutely chelate. The shortened inner lobe of the second maxilla, the shape of maxilla 1 and maxillipedal palp article 4 also are certainly of generic importance. Nevertheless the writer hesitates to erect a new genus, until more abyssal orchomenids are discovered and possible intergrades described.

Orchomenella cavimanus (Stebbing, 1888), var.
(Fig. 16)

Orchomene cavimanus Stebbing, 1888: 679, pl. 22.
Orchomenella cavimanus, SCHELLENBERG 1926a: 285-287, fig. 25; K. H. BARNARD 1932: 69, fig. 27g.
Orchomenopsis excavata Chevreux, 1903: 94-96, fig. 7.
Orchomenopsis chevreuxi Stebbing, 1906: 721; CHEVREUX 1935: 60-62, pl. 16, fig. 15.

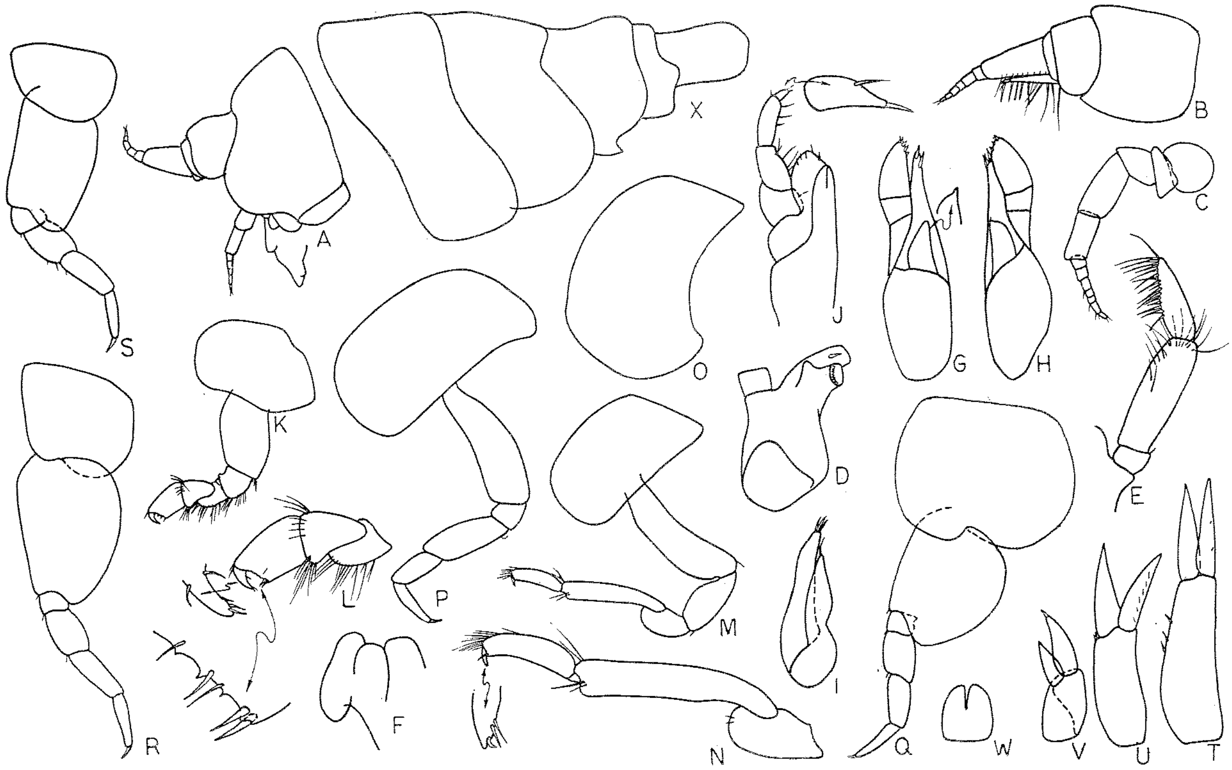


Fig. 15. *Orchomene takoradia* n. sp. Holotype, female, 16 mm, St. 30. A, head; B, C, antennae 1, 2; D, mandible; E, mandibular palp; F, lower lip, part; G, H, maxilla 1; I, maxilla 2; J, maxilliped; K, L, gnathopod 1; M, N, gnathopod 2; O, coxa 4; P, Q, R, S, pereopods 1, 3, 4, 5; T, U, V, uropods 1, 2, 3; W, telson; X, pleon segments 2-6.

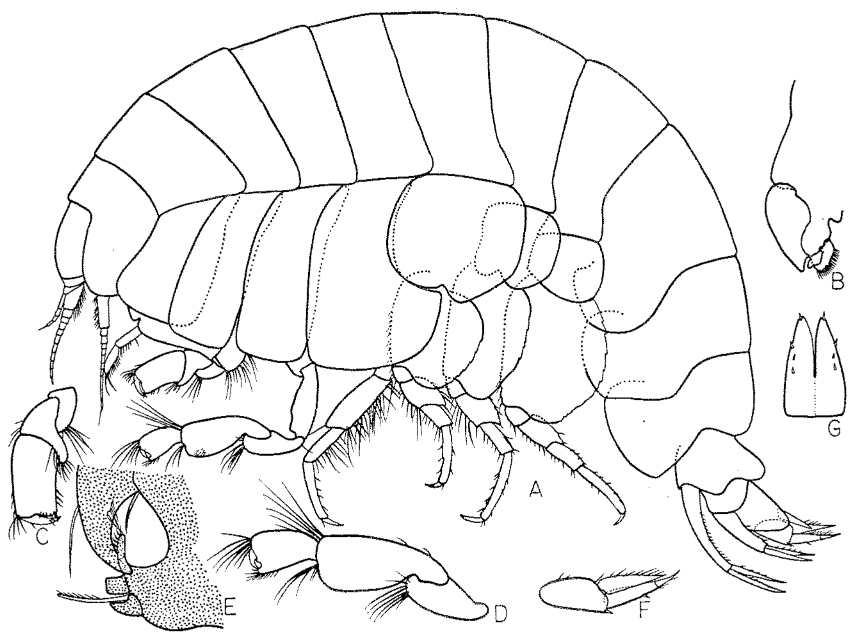


Fig. 16. *Orchomenella cavimanus* (Stebbing). Male, 10 mm, St. 607. A, lateral view; B, upper lip and epistome; C, D, gnathopods 1, 2; E, enlarged end of gnathopod 2; F, uropod 3; G, telson.

Material:

St. 575, Tasman Sea, 40°11'S 163°35'E, 3710 m, pteropod ooze, SOT, 19. XII. 1951. Female, 14 mm.

St. 607, Tasman Sea, 44°18'S 166°46'E, 3580 m, clay, HOT, 17. 1. 1952. Male, 10 mm, figured.

Diagnosis of new material:

Eyes absent; epistome straight in front, not produced; article 6 scarcely narrowing distally, article 5 short, with slender posterior lobe; article 6 of gnathopod 2 moderately stout, not narrowing distally, with concave palm, two stout spines and a complex defining ridge, article 7 well developed; third pleonal epimeron with straight posterior edge, lower corner rounded or subquadrate; pleon segment 4 with large dorsal hump; telson split slightly more than halfway.

Mouthparts like *O. abyssorum* (Stebbing, 1888: pl. 21) but palp article 3 of the mandible is less expanded proximally and maxilla 2 is like *O. musculosa* (Stebbing, 1888: pl. 20).

Remarks:

The specimens referred to in the above synonymy all have slight differences assorted among them which do not justify specific segregation but do require provisional varietal and subspecific designations, as discussed below.

In the original description of the species STEBBING (1888) did not show the peculiar process on the palm of gnathopod 2, but SCHELLENBERG (1926) did, although the fourth pleonal segment in his figure differed slightly from that on STEBBING's figure. CHEVREUX (1903) showed a slightly different interpretation of gnathopod 2 and probably overlooked the distinctness of the process for it is likely to be confused with a piece of dirt and is partly hidden by the finger. His fourth pleonal segment differed from both STEBBING's and SCHELLENBERG's figures. The material at hand exhibits still another slight difference in the fourth pleonal segment but has the process of gnathopod 2 as shown by SCHELLENBERG. The second maxillary plates on STEBBING's figure were subequal in size, but on CHEVREUX's and the present specimen they are very unequal. K. H. BARNARD (1932) showed an even more triangular and pointed process on pleon segment 4.

The specimen at hand has no eyes and only a slight trace of brownish pigment. The species differs from *O. abyssorum* (Stebbing, 1888) by the nonchelateness of gnathopod 2 and from the general conception of *O. chilensis* (Heller) and *O. musculosa* (Stebbing, 1888) by the expanding sixth article and concave palm of gnathopod 2.

Gut contents:

The stomach of this animal contained a small amount of material, of which about 90 % were silt particles, indicating that it feeds on the bottom. Its capture by previous expeditions at the surface, in pelagic tows, indicates its demersal habit.

Distribution:

Widely distributed by scattered records through the north and south Atlantic Oceans, the southern Indian Ocean and Antarctica, from the surface in the Antartic, Falklands and South Georgia to 228 m at Kerguelen and 3970 and 4360 m in the middle and north Atlantic. Recorded here from the Tasman Sea, 3580 m.

Orchomenella musculosa (Stebbing, 1888)
(Fig. 17)

Orchomene musculosus Stebbing, 1888: 673, pl. 20.

Material:

St. 183, off Simonstown, Durban, South Africa, 33°25'S 37°20'E, 5210 m, S 200C, E.F.D. 3000-3600 m, 28. I. 1951. 1 specimen, 8 mm.

Remarks:

Since K. H. BARNARD (1925) reduced this species to *O. chilensis* it has remained a synonym and was so considered by SCHELLENBERG (1926a). SCHELLENBERG combined under *O. chilensis* a large number of synonyms many of which have been reinstated as valid species since, especially by K. H. BARNARD (1932). I am still unclear as to precisely what *O. chilensis* is because I lack HELLER's (1865) original description. However, *O. musculosa* as described by STEBBING differs from all the other species which have ever been considered to belong to *O. chilensis*, in one way or another. It is my opinion that most of these species should remain valid, for each has minor but distinct differences which point to possible differences in habitat. It is probable that this closely allied group of Orchomenellas is pelagic, since many have been caught exclusively in plankton hauls or in surface nets, just as the present material. It is possible that water-mass subspecies are involved, with a range through considerable depths. Studies on the problem will not be stimulated by

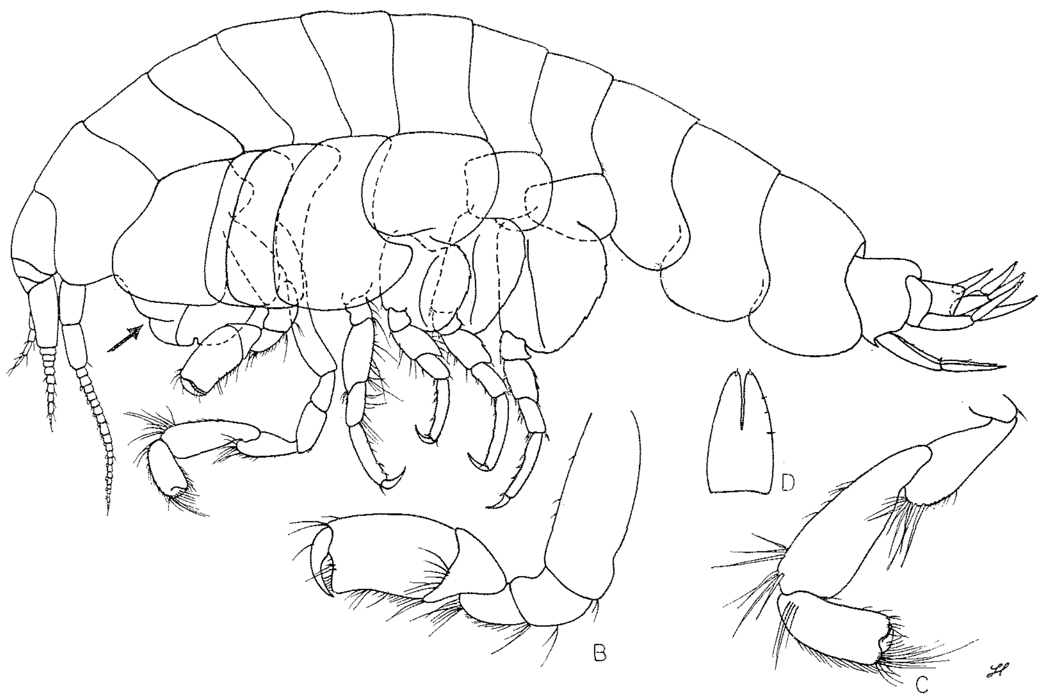


Fig. 17. *Orchomenella musculosa* (Stebbing). Specimen, 8 mm, St. 183. A, lateral view, arrow indicates epistome and upper lip; B, C, gnathopods 1, 2; D, telson.

fusing all of the species as has SCHELLENBERG; K. H. BARNARD (1932) is right in keeping them separated.

The present species or the precise form of it has not been captured according to the literature since its original description from the North Pacific. That it occurs off South Africa is of considerable interest in affirming that it is bathypelagic although it implies that the "chilensis"group of species is simply a variable genosome distributed in cosmopolitan fashion.

However, the writer is unable to accept the fusion of species which have such obvious differences as the chelateness or nonchelateness of the second gnathopods, which *O. musculosa* has in the negative. In this respect the species is most closely related to *O. proxima* Chevreux (CHEVREUX, 1903) which was fused to *O. chilensis* by SCHELLENBERG (1926a), K. H. BARNARD (1925) and affirmed by SHOEMAKER (1945a). In his original description CHEVREUX made a point of distinguishing *O. proxima* from *O. musculosa* and I believe his distinctions should stand. The telson is slightly less split in *O. musculosa,* the second gnathopod has a much larger, longer dactylus and the sixth article is more elongate and rectangular whereas in *O. proxima* it is stouter and more quadrangular. Whether *O. proxima* is indeed *O. chilensis* cannot be answered but *O. musculosa* certainly differs from *O. proxima* and conceptions of *O. chilensis* by various authors.

O. musculosa differs from *O. abyssalis* Stephensen, 1925 by the shorter and more lobate article 5 of gnathopod 1.

The mouthparts fit the figures of STEBBING (1888) precisely.

Paronesimoides lignivorus Pirlot, 1933

Paronesimoides lignivorus Pirlot, 1933: 140-143, figs. 46-48.

Material:

St. 453, Makassar Strait, 3°56′S 118°26′E, 2000 m, greenish clay, ST 300, 24. VIII. 1951. Specimen 5 mm and one rear end. Total: 2 specimens.

Distribution:

PIRLOT stated that this species eats wood; therefore it must be benthic. Confined to the Celebes Sea basin, on the east sill (PIRLOT) at 2053 m and on the southwest sill in Makassar Strait at 2000 m. Its distribution may prove to follow that of *Onesimoides chelatus,* with which it is associated.

Procyphocaris n. gen.

Diagnosis:

Head short but not deformed, with well developed lateral lobes; coxae 1 and 2 small, largely hidden by coxa 3; both pairs of gnathopods slightly subchelate; coxa 5 very large; pereopod 3 not indentured; mandible with well developed palp and ridged molar; accessory flagellum with 3 articles; pereopods not prehensile; uropod 3 with subequal rami; telson long and deeply cleft.

Type species: *Procyphocaris primata,* n. sp.

Relationship:

This is the least specialized genus so far described in the cyphocarid series of Lysianassidae. A progressive order of specialization is seen in the following scheme, where the genera are listed and the points of difference from *Procyphocaris* stated.

1. *Procyphocaris* n. gen. Mandible with palp and well developed molar ridges; head not deformed, lateral lobes well developed.

2. *Cyphocaris* Boeck. Mandibular molar ridged but the second article of pereopod 3 is deeply indentured and the head lacks lateral lobes or is badly deformed. All of the following genera also have heads modified as in *Cyphocaris.*

3. *Cyclocaris* Stebbing. The molar is thin and unridged (some published figures omit the molar); the chisel teeth are lost from outer plate of the maxilliped.

4. *Lepidepecreella* Schellenberg. Mandibular molar evanescent, chisel teeth of maxilliped lost as in all following genera, inner ramus of uropod 3 reduced.

5. *Mesocyphocaris* Birstein and Vinogradov. Mandibular molar absent, as in all following genera, inner ramus of uropod 3 reduced, pereopods prehensile.

6. *Paracyphocaris* Chevreux. First four pairs of pereopods are slightly to strongly prehensile, rami of uropod 3 subequal.

7. *Metacyclocaris* Birstein and Vinogradov. About in the same stage as the previous genus but all five pairs of pereopods are prehensile and the mandibular palp is better developed.

8. *Crybelocyphocaris* Shoemaker. Mandibular molar absent; accessory flagellum lost; inner ramus of uropod 3 small; pereopods 1 and 2 are slightly prehensile and urosome segments 2 and 3 are fused.

9. *Metacyphocaris* Tattersall. In addition to the absence of mandibular molar the palp has been lost; uropod 3 has a small inner ramus; the accessory flagellum is uniarticulate; pereopods 1-3 are prehensile.

10. *Crybelocephalus* Tattersall. Both the palp and the molar of the mandible are absent; the accessory flagellum is absent; pereopods 1 and 2 are prehensile.

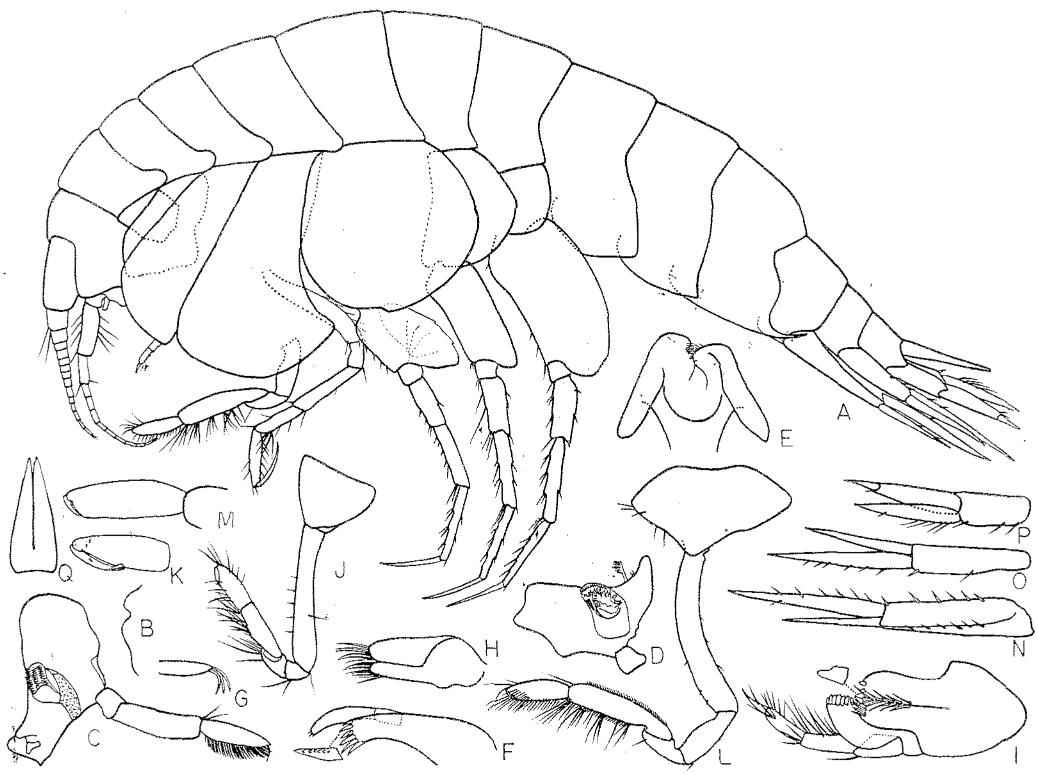


Fig. 18. *Procyphocaris primata* n. gen., n. sp. Female, holotype, 8 mm, St. 554. A, lateral view; B, epistome and upper lip; C, D, mandibles; E, lower lip; F, H, maxillae 1, 2; G, inner plate of maxilla 1; I, maxilliped; J, K, gnathopod 1; L, M, gnathopod 2; N, O, P, uropods 1, 2, 3; Q, telson.

Procyphocaris primata n. sp.
(Fig. 18)

Material:

St. 554, Great Australian Bight, 37°28'S 138°55'E, 1340-1320 m, Globigerina ooze, ST 300, 5. XII. 1951. Holotype, female, 8 mm. Unique.

Diagnosis:

With the characters of the genus.

The third pleonal epimeron has a long tooth, which is unique in the cyphocarid genera.

Pseudonesimus Chevreux, 1926

Pseudonesimus Chevreux, 1926: 3.

One of the more characteristic features of this genus is the shortened first coxa, not included by CHEVREUX in his diagnosis.

Pseudonesimus abyssi tasmanensis n. subsp.
(Fig. 19)

Pseudonesimus abyssi Chevreux, 1926: 3-5, fig. 2.

Material:

St. 601, Tasman Sea, 45°51'S 164°32'E, 4400 m, Globigerina ooze, HOT, 14. I. 1952. Holotype, female, 10 mm. Unique.

Diagnosis:

Differing from the typical subspecies known from the Gascogne Gulf, northeastern Atlantic Ocean, 4380 m, by the slight tooth developed at the lower corner of the third pleonal epimeron and the slightly more slender fifth and sixth articles of the first gnathopod. The apices of the lower lip are not as strongly incised as in the typical subspecies.

Remarks:

Because only two specimens of this specific complex are known, each from nearly opposite extremes of the Earth, the variation within a population is unknown and the distinctive features of the new subspecies may be little more than variations. The species is probably abyssally pelagic, rather than benthic, considering its wide range.

cf **Tmetonyx caeculus** (Sars, 1895)

Hoplonyx caeculus Sars, 1895: 98, pl. 35, fig. 1.
Tmetonyx caeculus, STEBBING 1906: 76-77.

Material:

St. 241, off Kenya, 4°00'S 41°27'E, 1510 m, Globigerina ooze, HOT, 15. III. 1951. 1 juv. 3 mm.

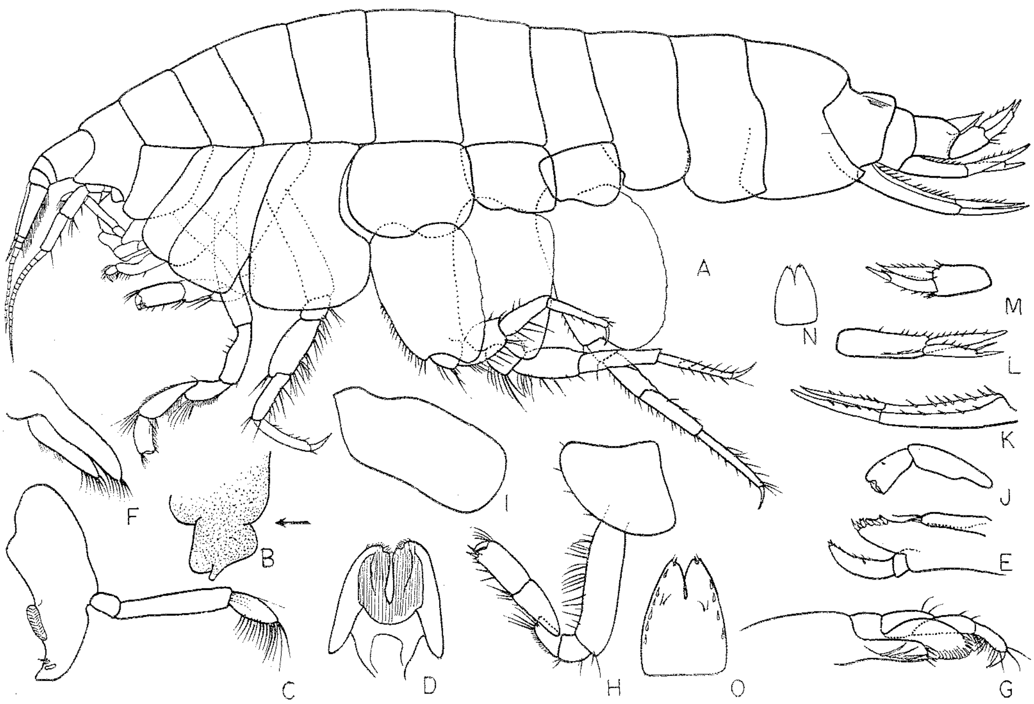


Fig. 19. *Pseudonesimus abyssi tasmanensis* n. subsp. Female, holotype, 10 mm, St. 601. A, lateral view; B, epistome and upper lip, arrow indicating front; C, mandible; D, lower lip; E, F, maxillae 1, 2; G, maxilliped; H, J, gnathopods 1, 2; I, coxa 2; K, L, M, uropods 1, 2, 3; N, O, telson.

Distribution:

Northeastern Atlantic Ocean: Barents Sea; 150-600 m; recorded here from the western Indian Ocean.

Remarks:

The present juvenile specimen of 3 mm length is very like *T. caeculus* as figured by SARS, differing only by the slightly more prolonged tooth of the third pleonal epimeron. Without accompanying adults I am unable to confirm the identification and do not wish to dissect the animal without additional materials.

Trischizostoma Boeck, 1861

Several problems concerning this genus remain unanswered. Some of these were discussed by STEBBING (1908: 59-61) but since that time several more have arisen.

Members of the genus obviously are semiparasitic, because of the piercing mouthparts. It is well known that parasites often are polymorphic and this fact must be kept in mind.

Including the new species to be described, two distinct groups, each representing 3 species, have been described. Each group shows remarkable contrasts in mouthparts, telson and head.

Nicaeense-Longirostre-Circulare group: Rostrum very large, conspicuous; mouthparts, including upper lip, mandibles and maxillae are strongly styliform; telson entire.

Remipes-Paucispinosum-Serratum group: Rostrum small, deflexed, inconspicuous; mouthparts much less styliform; telson cleft to middle.

The writer believes that these differences warrant separate genera. If, indeed, the two groups are congeneric then at least in the *Nicaeense* group the three species should be considered closely related subspecies. Had it not been for STEPHENSEN's description of *T. longirostre* as a full species the writer would have considered the new species to follow to be a subspecies of *T. nicaeense*. The problem requires statistical study with large amounts of material.

Key to Trischizostoma

1. Gnathopod 1, inner margin of article 7 bearing denticles .... *serratum*
1. Gnathopod 1, inner margin of article 7 smooth 2
2. Telson cleft to middle, rostrum inconspicuous 3
2. Telson entire, rostrum long 4
3. Palm of first gnathopod very spinose .... *remipes*
3. Palm of first gnathopod scarcely spinose .... *paucispinosum*
4. Article 6 of first gnathopod triangular .... *nicaeense*
4. Article 6 of first gnathopod oval .... *longirostre*
4. Article 6 of first gnathopod circular .... *circulare* n. sp.

Trischizostoma circulare n. sp.
(Fig. 20)

Material:

St. 203, off Natal, 25°36'S 35°21'E, 730 m, HOT, 21. II. 1951. Holotype, male, 24 mm; another damaged specimen 21 mm. Total: 2 specimens. Field color notes: bodies white, eyes dark brown, back with faintly rose longitudinal stripes.

Diagnosis:

Article 6 of gnathopod 1 nearly circular, article 7 with smooth inner margin; telson entire; rostrum long; article 6 of gnathopod 2 asymmetrical, distal end produced.

Relationship:

See the key and previous discussion for general group relationships. The species differs from *T. longirostre* Stephensen (STEPHENSEN 1927: pl. 1) by the shape of the sixth article on gnathopod 2. In other respects it is like *T. nicaeense* (in SARS 1895: pl. 12) except for the circular sixth article of gnathopod 1. The mouthparts are similar to those of the latter species except for the upper and lower lips which are figured herein, and the second coxa which is broadly rounded in front, not subacute. The gills are strongly pleated.

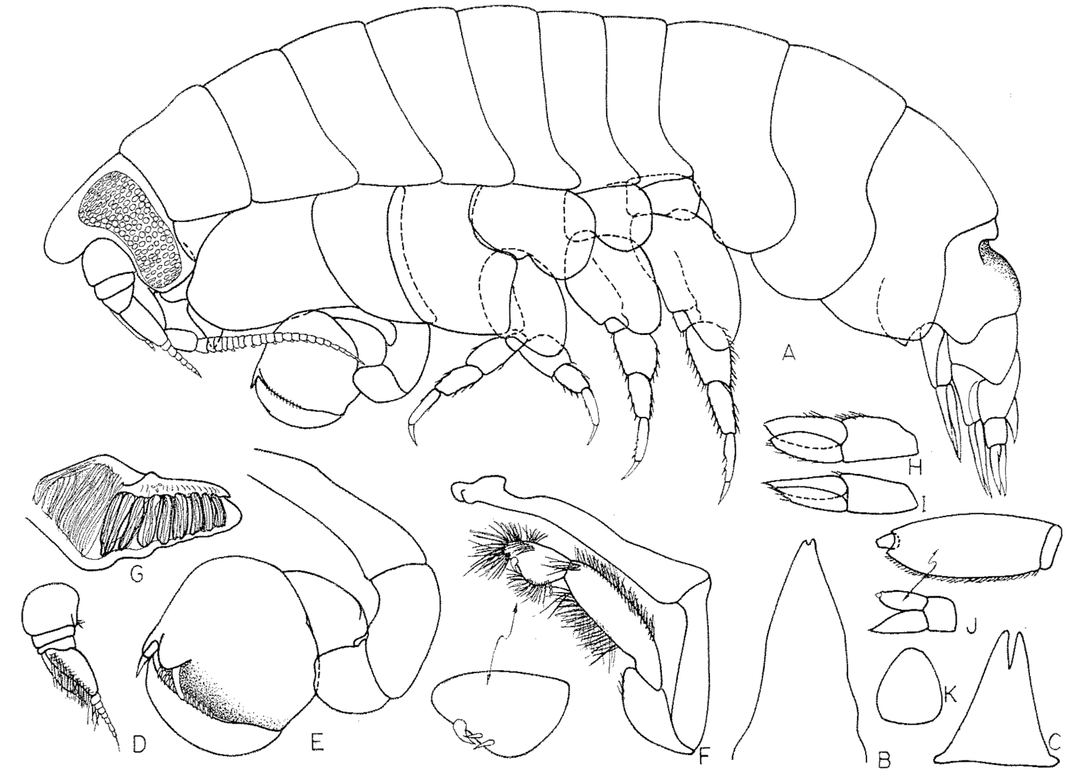


Fig. 20. *Trischizostoma circulare* n. sp. Male, holotype, 24 mm, St. 203. A, lateral view; B, C, upper and lower lips; D, antenna 1; E, F, gnathopods 1, 2; G, gill; H, I, J, uropods 1, 2, 3; K, telson.

Fig. 21. *Uristes cansada* n. sp. Female, holotype, 7 mm, St. 626. A, head; B, pleon; C, epistome; D, E, gnathopods 1, 2; F, gnathopod 2, enlarged; G, I, J, K, pereopods 1, 3, 4, 5; H, coxa 4; L, M, N, uropods 1, 2, 3; O, telson; P, female, 5.5 mm, dorsal configuration of pleon segments 3-6.

Uristes cansada n. sp.
(Fig. 21)

Material:

St. 626, Tasman Sea, 42°10′S 170°10′E, 610 m, Globigerina ooze, PGI 0.2, 20. I. 1952. Holotype, female, 7 mm; ovigerous female, 5.5 mm. Total: 2 specimens.

Diagnosis:

Lateral lobes of head acute and projecting; anterior edge of lower lip slightly projecting in front of the flat epistomal margin; article 6 of gnathopod 2 expanding distally, 2.5 times as long as article 5, palm oblique but well defined by 2 large spines; hind lobe of article 5 very small; third pleonal epimeron with broad, short, protruding, acute tooth at lower corner, hind margin straight; pleon segment 4 with an erect, tall conical tooth.

Relationship:

J. L. Barnard (1961) has provided a condensation of the genus *Uristes* in which the species were listed in a new arrangement. Among these species are two with which the present species bears closest relationship, particularly by the similar first gnathopods: *U. gigas* Dana (= *Tryphosa antennipotens* Stebbing, 1888: pl. 6) which also has a dorsal tooth on pleon segment 4 but it is more prostrate and the third pleonal epimeron is broadly rounded behind; *U. umbonatus* (Sars 1895: pl. 29, fig. 2) which lacks an erect tooth on pleon segment 4 and has a quadrate lower corner on the third pleonal epimeron.

No clearly defined eyes were seen. The mouthparts correspond to *U. umbonatus,* referred to above.

Another specimen of the same species, with all parts identical to the figured holotype has a much smaller dorsal tooth on pleon segment 4, as figured.

One interesting feature of this species is the quadrate anterior lower corner of the first pleonal epimeron.

Uristes velia n. sp.
(Fig. 22)

Material:

St. 555, Great Australian Bight, 37°21′S 138° 44′E, 875 m, PGI 0.2, clay, a little sand, 6. XII. 1951. Male, holotype, 7 mm. Unique.

Diagnosis:

Eyes absent, lateral lobes of head narrow, subacute; antenna 1 stout, short, accessory flagellum 3-articulate; epistome and upper lip with straight anterior margins; coxa 1 scarcely tapering; coxa 4 narrow; palm of gnathopod 1 oblique but defined by a spine, article 7 bearing a tooth on the inner margin; lower edge of article 2 on pereopod 4 with large serrations; third pleonal epimeron with posterior edge nearly straight, lower corner quadrate; pleon segment 4 with upright tent-shaped process; rami of uropods 1 and 2 lack spines.

Mouthparts are like *U. gigas* (Stebbing, 1888: pl. 6) but the outer plate of the maxilliped bears one apical spine of medium to short size and the inner edge bears 6 blunt, stout spines.

Relationship:

This species differs from *U. gigas* Dana by the stout first antenna, the serrations of pereopod 4 and the non-tapering sixth article of gnathopod 1 (which may be an artifact in Stebbing's 1888 drawings).

The new species resembles *U. natalensis* K. H. Barnard, 1916, but differs by the well produced fourth pleon segment and the lack of spines on the rami of uropods 1 and 2.

Valettiopsis Holmes, 1908

Valettiopsis Holmes, 1908: 494-495.

This is one of three lysianassid genera known to have a dentate primary cutting plate on the mandible. The others are *Valettia* and *Alicella.* Neither Holmes (1908) nor Chevreux (1909) pointed out that the first coxa of *Valettiopsis* is small nor did they mention that it is largely hidden by coxa 2. It is presumed by the writer that this condition prevails in the known species of *Valettiopsis.*

Valettiopsis multidentatus n. sp.
(Fig. 23)

Material:

St. 665, Kermadec Trench, 36°38′S 178°21′E, 2470 m, grey clay, HOT, 25. II. 1952. Holotype, female, 18 mm. Unique.

Diagnosis:

Segments dorsally toothed, commencing with pereon segment 5 and continuing through pleon segment 4; the teeth large and acute on pereon segment 7, and pleon segments 1, 2 and 4, tooth blunter on pleon segment 3; gnathopod 2 with dis-

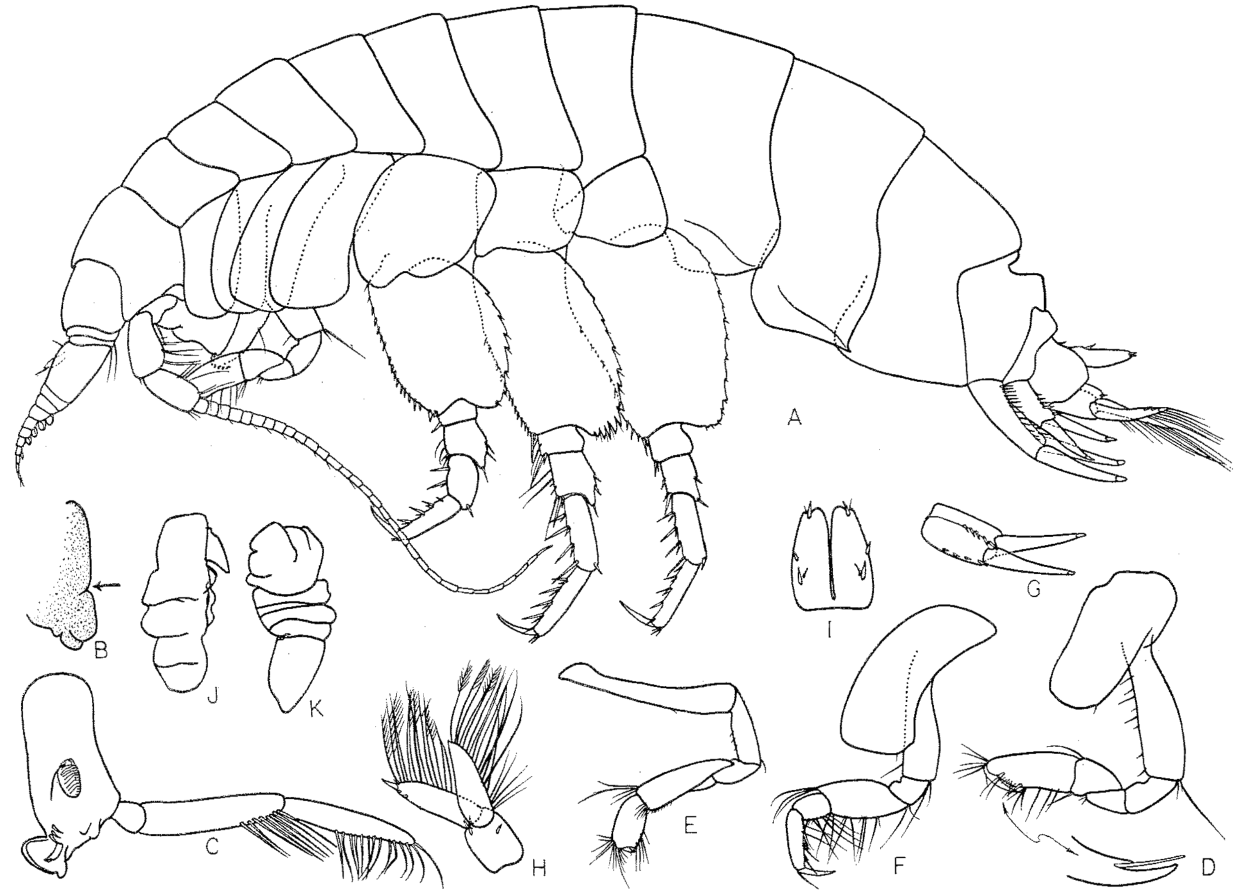


Fig. 22. *Uristes velia* n.sp. Male, holotype, 7 mm, St. 555. A, lateral view; B, epistome, arrow indicates front; C, mandible; D, E, gnathopods 1, 2; F, pereopod 1; G, H, uropods 2, 3; I, telson; J, K, gills.

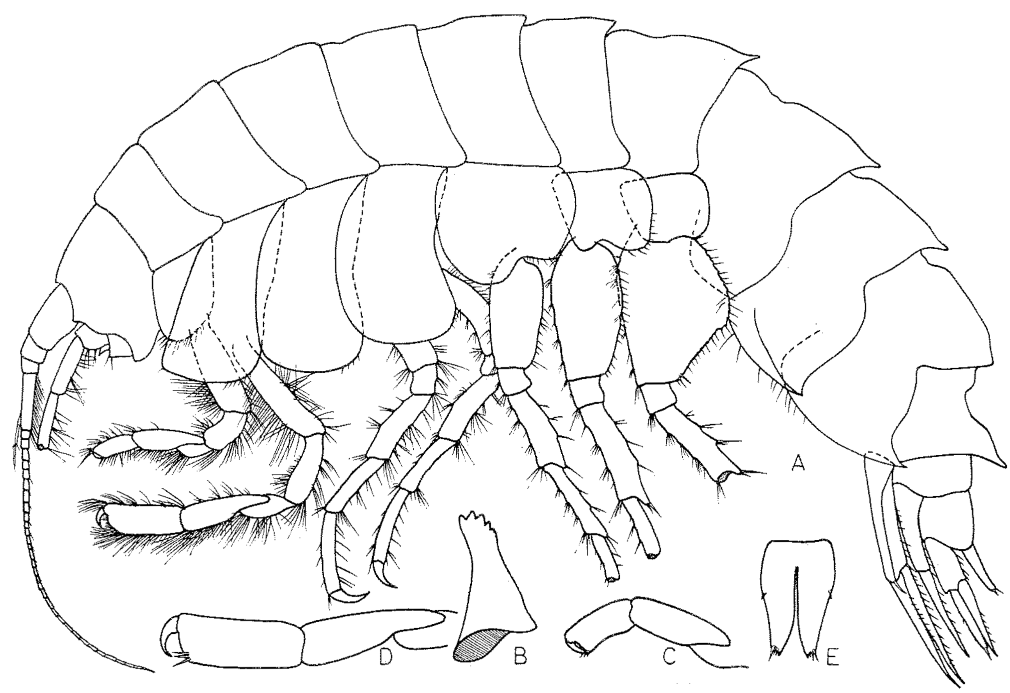


Fig. 23. *Valettiopsis multidentatus* n.sp. Female, holotype, 18 mm, St. 665. A, lateral view; B, body of mandible; C, D, gnathopods 1, 2; E, telson.

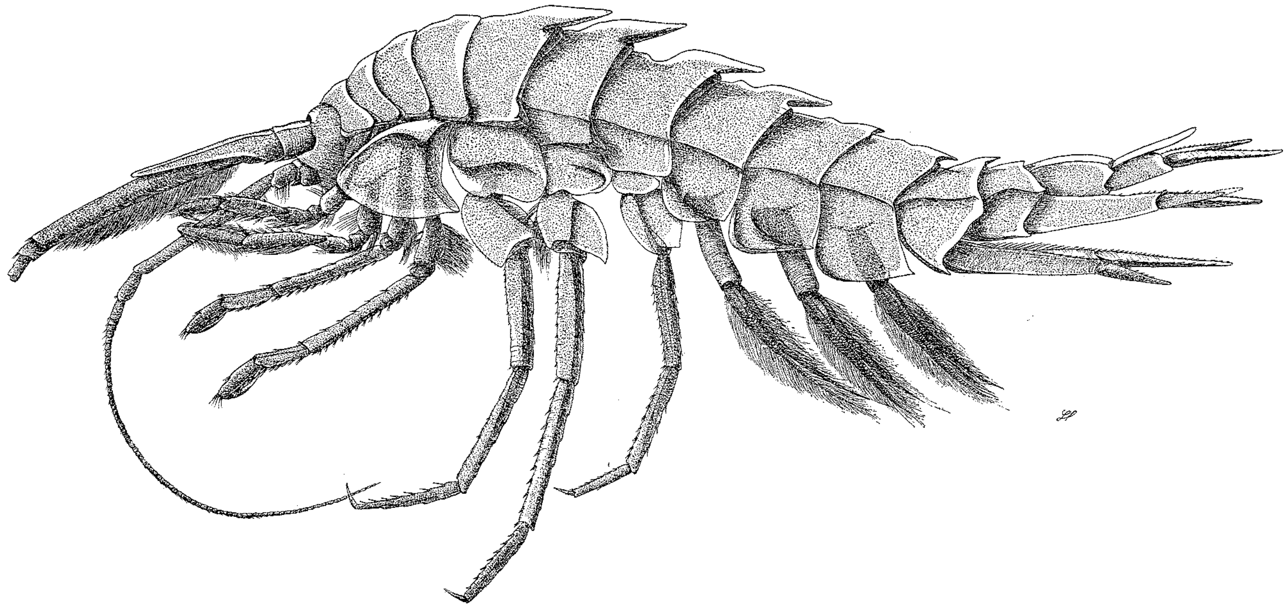


Fig. 24. *Parargissa galatheae* n.sp. Male, holotype, St. 194, 50 mm.

tinct, nearly transverse palm and long seventh article; pereopod 5 with article 2 broadly expanded and obliquely truncated below.

Relationship:

This species differs from the other known species *V. dentatus* Holmes, 1908 and *V. macrodactylus* Chevreux, 1909 by having more than the fourth pleonal segment dorsally toothed, six others being toothed. The large and well developed mouthparts and second gnathopod are like *V. macrodactylus* Chevreux, 1909.

FAMILY HYPERIOPSIDAE

Parargissa galatheae n. sp.

(Figs. 24, 25)

Material:

St. 194, off Durban, 34°09'S 30°45'E, 4360 m, Globigerina ooze, SOT, 7. II. 1951. Holotype, male, 50 mm.

Both third uropods and the telson are damaged, and the flagella of both first antennae are broken. In the drawing, uropod 3 is reconstructed from parts of both.

Diagnosis:

Body dorsally keeled, the keels large and produced into decumbent acute teeth projecting posteriorly on pereon segments 5-7 and pleon segment 1, the keels smaller but continuing to end acutely posteriorly on pleon segments 2-5; a lateral keel commencing on pereon segment 6 and terminating on pleon segment 5; pleon segment 6 lacking a middorsal keel but with its dorsolateral boundaries marked by a small sharp keel, so that the segment forms a rectangular block, with flat top and sides; head with acutely projecting lateral lobes; coxae 4-6 are rugged and stiff and bear surface ornamentation in the form of projecting, keel-like ridges (see drawings); article 1 of antenna 1 with lower distal corner produced to a short, acute tooth, article 2 produced laterally to a very long acute scale which is more than 3 times as long as article 1; article 2 short medially; article 3 much shorter than medial part of article 2 and bearing a slender accessory flagellum composed of 3 articles tipped with a small one; basal portion of primary flagellum very long, cylindrical, armed with ventral setae proximally; rest of antenna broken; article 5 of antenna 2 less than one fourth as long as article 4, flagellum about 2.5 times as long as article 4; epistome forming a very large bulbous anterior process fused to the head; upper lip with ventral edge broad and incised slightly but not deeply; third pleonal epimeron with straight posterior edge, lower corner prolonged acutely; telson damaged, slender, deeply cleft, apices bifid.

Relationship:

It is possible that this species is the adult of *Parargissa nasuta* Chevreux, 1908a which was described as a male, 5 mm. Often, males are determined only as animals lacking brood plates and *P. nasuta* may

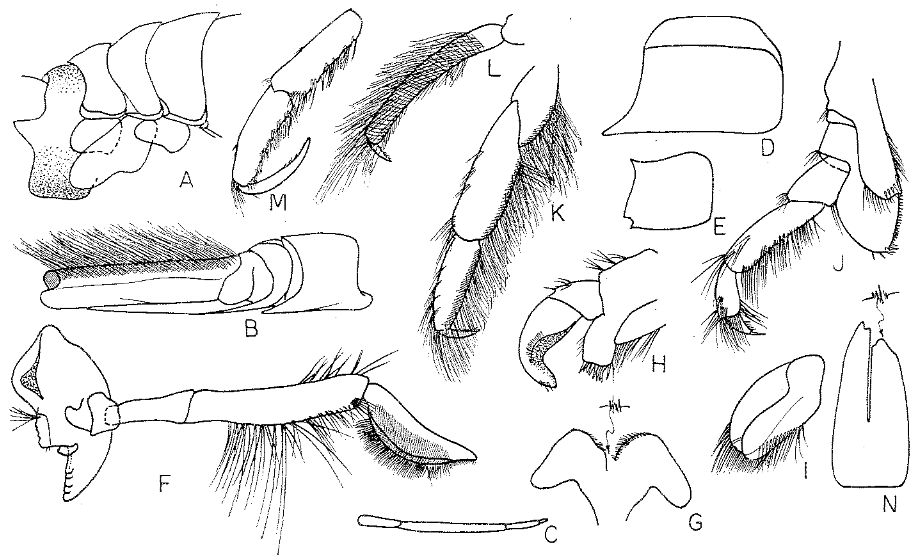


Fig. 25. *Parargissa galatheae* n. sp. Male, holotype, 50 mm, St. 194. A, head and first 3 pereon segments; B, antenna 1, oblique medial view; C, accessory flagellum; D, article 1 of antenna 1, lateral; E, article 3 of antenna 2, lateral; F, mandible; G, lower lip, damaged as marked; H, I, maxillae 1, 2; J, maxilliped; K, L, M, ends of gnathopods 1, 2 and pereopod 1; N, telson, damaged as marked.

simply be a juvenile animal. However, the transformation from *P. nasuta* to *P. galatheae* would require the following developments: acquisition of all ornamentation in the form of keels, teeth and ridges; a doubling of the relative length of the unsegmented basal portion of the first antennal flagellum so that it becomes twice as long as the scale of article 2; a further increase in the disproportion of articles 4 and 5 of antenna 2; the development of sharply acute lateral head lobes, instead of straight front edges; the asymmetrical and disproportionate enlargement of coxa 2; the shortening of article 2 on pereopod 5 so as to resemble the same articles on pereopods 3 and 4; and the shortening of the outer rami on uropods 1 and 2. The most serious objection to any thesis that *P. galatheae* is the adult of *P. nasuta* is the need for the remarkable change of article 2 on pereopod 5, which is sublinear in *P. nasuta* and oval in *P. galatheae*. It is unlikely that juveniles would not possess some evidence of the lateral head lobe or the large dorsal teeth and other adult features.

Parargissa galatheae is distinctly different from *P. arcuata* (Birstein and Vinogradov, 1955 and 1958), a species lacking ornamentation as in *P. nasuta,* but also lacking the scale of article 2 on antenna 1.

The first uropod is missing on the right side and the left one has the outer ramus considerably shorter than the inner which is probably the result of regrowth after damage, for the following new subspecies shows the outer ramus to be considerably longer. The same is true for the second uropod, which on the right side has a long outer ramus, nearly reaching the end of the inner but the left side shown in the drawing has this ramus shortened, as if damaged. The first antennal scale is also damaged apically.

Food:

The stomach contents were composed of numerous slender flakes of material which might be bits of epidermis or comminuted muscle strands, a few falcate flakes, some larger bulky brown particles resembling woody debris, and a very few small hooks, perhaps chitinous parts of polychaetes. All other members of the family Hyperiopsidae are pelagic so it is presumed the same is true for the present specimen.

Parargissa galatheae americana n. subsp.
(Fig. 26)

Material:

St. 716, Acapulco-Panama, 9°23′N 89°32′W, 3570 m, dark muddish clay, HOT, 6. V. 1952. Holotype, female, 42 mm. Unique.

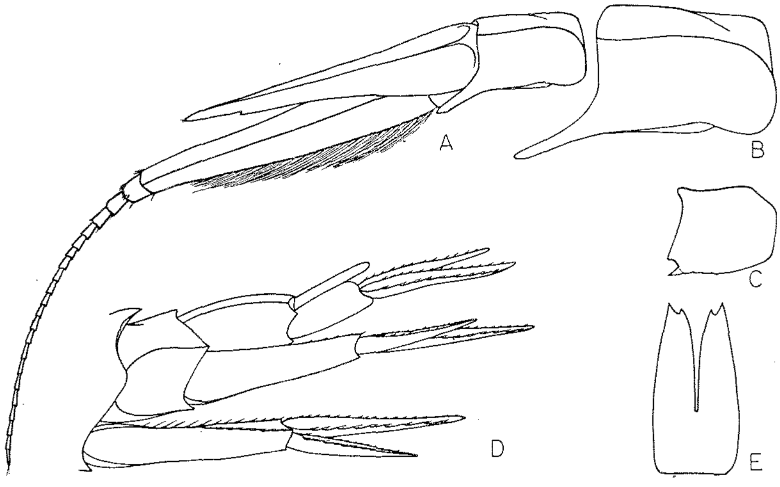
Diagnosis:

Like the type species except in the following characters: disto-lateral tooth of article 1 on antenna 1 much longer and more slender; dorsal tooth of pleon segment 2 slightly larger.

Remarks:

The specimen is less well preserved in many respects than the holotype of the type species, for the internal parts of the body are missing, resulting

Fig. 26. *Parargissa galatheae americana* n. subsp. Female, holotype, 42 mm, St. 716. A, antenna 1; B, article 1 of antenna 1; C, article 3 of antenna 2; D, uropods 1-3, lateral view; E, telson.



in a flabby mass of tissue. However, some of the parts which were damaged on the type species are in good condition, such as the first antennal flagellum, all the uropods and the telson. The outer rami of the uropods nearly reach the ends of the inner rami; the telson has bifid apices, but no spines or sockets are present in the notches. On the type species these appendages were damaged and abnormal as discussed above, so no subspecific differences are attributable to these conditions.

The principal difference is the more slender tooth of the first antenna. The dorsal tooth of pleon segment 2 may have been damaged on the type species specimen. The slight notch on the first antennal scale, drawn for the new subspecies was not apparent on the typical subspecies but in that case the scale was damaged apically.

FAMILY STEGOCEPHALIDAE

These animals are generally considered to be pelagic because of their ovoid and oily bodies, lack of eyes, and lack of mandibular palps and molars. In some cases the mouthparts are apparently modified for piercing and sucking but the laminar mandible might be considered useful for scraping benthic surfaces. Apparently there is no record of the animals having been caught in a benthic closing grab but the presence of mineral grains in the stomach contents of a few species indicates their demersal habits.

Euandania gigantea (Stebbing, 1888)

Andania gigantea Stebbing, 1888: 730, pl. 35.
Euandania gigantea, K. H. BARNARD 1932: 80; SHOEMAKER 1945a: 194.

Material:

St. 66, off Gabon, 4°00'S 8°25'E, 4020 m, S 200C (5300 m wire), 5. XII. 1950. Specimen, 10 mm.
St. 194, off Durban, 34°09'S 30°45'E, 4360 m, Globigerina ooze, SOT, 7. II. 1951. Specimen, 47 mm.
St. 662, Kermadec Trench, 36°22'S 178°23'W, 4630 m, HOT, 23. II. 1952. Specimen, 34 mm.

Distribution:

Cosmopolitan between the polar circles, known depths, 3430-1281 m.

Parandania boecki (Stebbing, 1888)
(Fig. 27)

Andania boecki Stebbing, 1888: 735, pl. 36.
Parandania boecki, STEBBING 1906: 95-96; WALKER 1909: 330; K.H. BARNARD 1916: 131-132; SCHELLENBERG 1926: 223, fig. 28c; SCHELLENBERG 1926a: 300; SCHELLENBERG 1931: 51; K.H. BARNARD 1932: 77-79; fig. 35; STEPHENSEN 1933: 22-23; K.H. BARNARD 1937: 148; SHOEMAKER 1945: 194-195; BIRSTEIN and VINOGRADOV 1955: 239-240; BIRSTEIN and VINOGRADOV 1958: 238.
Parandania Boecki, CHEVREUX 1905: 7; CHEVREUX 1935: 66-67.
Parandania Boeckii, PIRLOT 1930: 8-9.

Material:

St. 279, Seychelles-Ceylon, 1°00'N 76°17'E, 4320 m, ST 300, 8. IV. 1951. Female, 14 mm.
St. 660, Kermadec Trench, 35°35'S 178°51'W, 7800-7310 m, ST 600, 22. II. 1952. Male, 10 mm, figured.

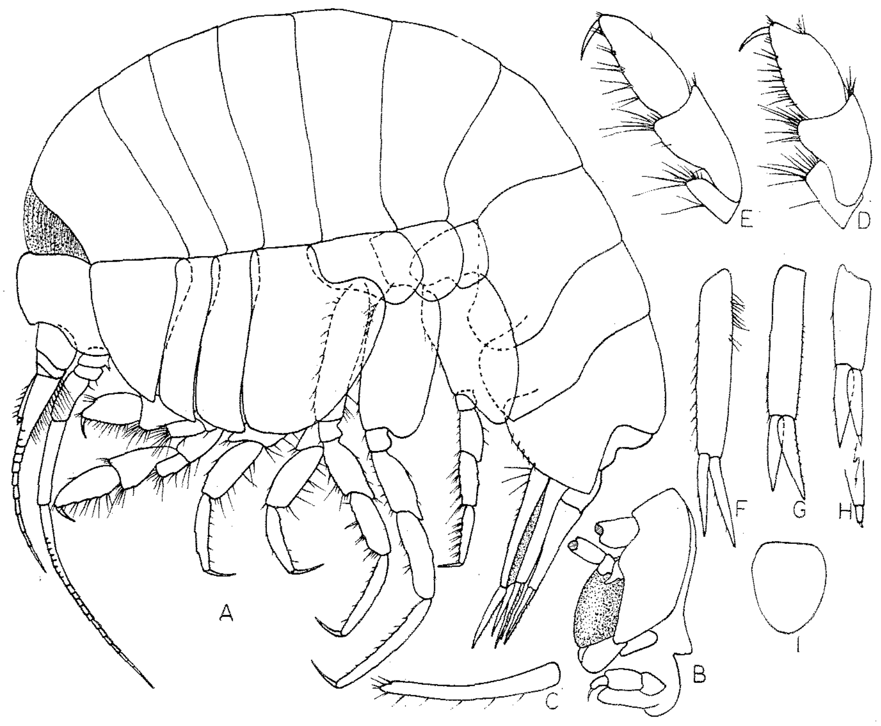


Fig. 27. *Parandania boecki* (Stebbing). Male, 10 mm, St. 660. A, lateral view, head pulled down; B, lateral view of head, epistome stippled; C, accessory flagellum; D, E, gnathopods 1, 2; F, G, H, uropods 1, 2, 3; I, telson.

Remarks:

The specimens exhibit several discrepancies from STEBBING's original drawings in the longer rami of the uropods and the less well developed accessory flagellum. Despite its common occurence only two groups of figures subsequent to the originals have been published and no one has worked out the morphological variations in the species. The present specimen is figured, for this reason.

Distribution:

Cosmopolitan, except for the arctic. Pelagic. Minimum recorded depth 300 m; minimum depth of closed haul 2200 m.

Food:

The stomach was filled with a spongy mass of material composed of finely particulate matter and three kinds of empty cell "tests", one kind spherical, another oval, the third a clavate sac. This species may feed on coelenterates or salps.

Phippsiella nipoma n. sp.
(Fig. 28)

Material:

St. 471, Sunda Trench, 10°26′S 114°15′E, 2990-2810 m, clay and vulcanic tuff, ST 300, 10. IX. 1951. Female, 8.5 mm, "sitting in a hole in the tuff-stone".

St. 607, Tasman Sea, 44°18′S 166°46′E, 3580 m, clay, HOT, 17. I. 1952. Female, 20 mm; female, 7 mm.

Vema St. 54, Cape Basin, south Atlantic Ocean, 4680 m. Holotype, ?sex, 2 mm.

Total: 4 specimens.

Diagnosis:

Rostrum poorly developed; third pleonal epimeron with a prolonged posterior edge, lower posterior corner angular, not produced, lacking evidence of a notch.

Relationship:

This species differs from other known species by the shape of the third pleonal epimeron which is neither serrated as in *P. similis* (in SARS 1895: pl. 70, fig. 1) nor notched as in *P. minima* Stephensen, 1925 (p. 131) and *P. kergueleni* Schellenberg, 1926 (p. 220). The rostrum is small, unlike *P. rostrata* K. H. Barnard, 1932 (p. 76). The holotype will be figured in BARNARD (1961 b).

Distribution:

Apparently a widely distributed species of bathypelagic and demersal habits: South Atlantic, Tasman Sea, Java Deep, caught in hauls of maximum depth ranging from 1861 m to 4680 m, probably in midwater.

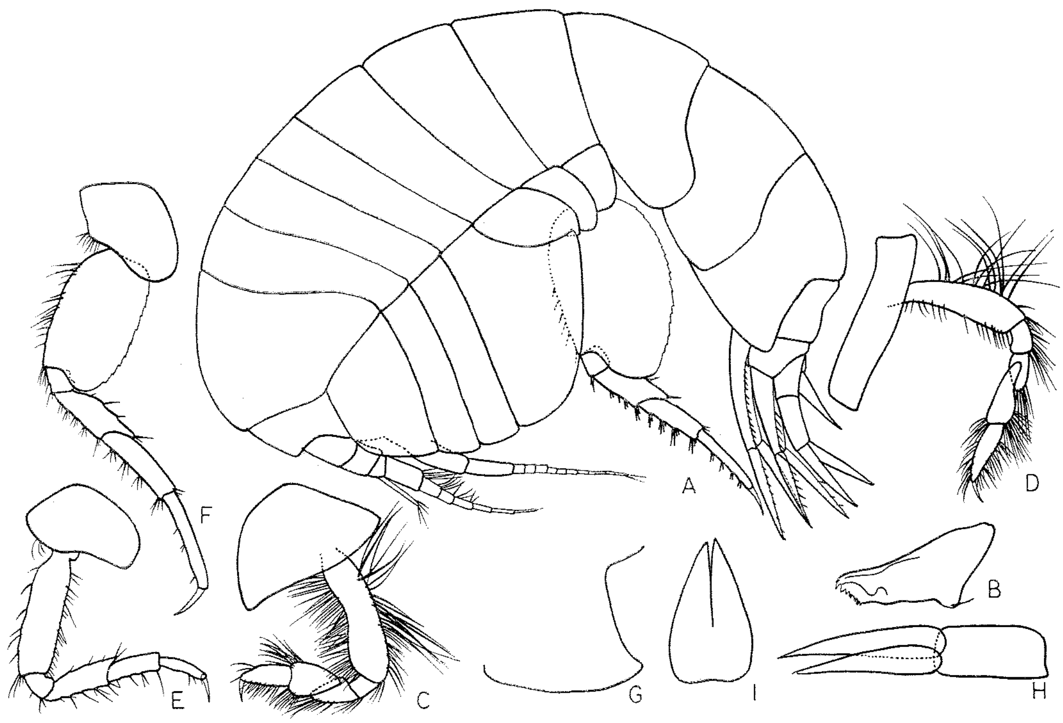


Fig. 28. *Phippsiella nipoma* n. sp. Female, 8.5 mm, St. 471. A, lateral view; B, mandible; C, D, gnathopods 1, 2; E, F, pereopods 3, 4; G, third pleonal epimeron; H, uropod 3; I, telson.

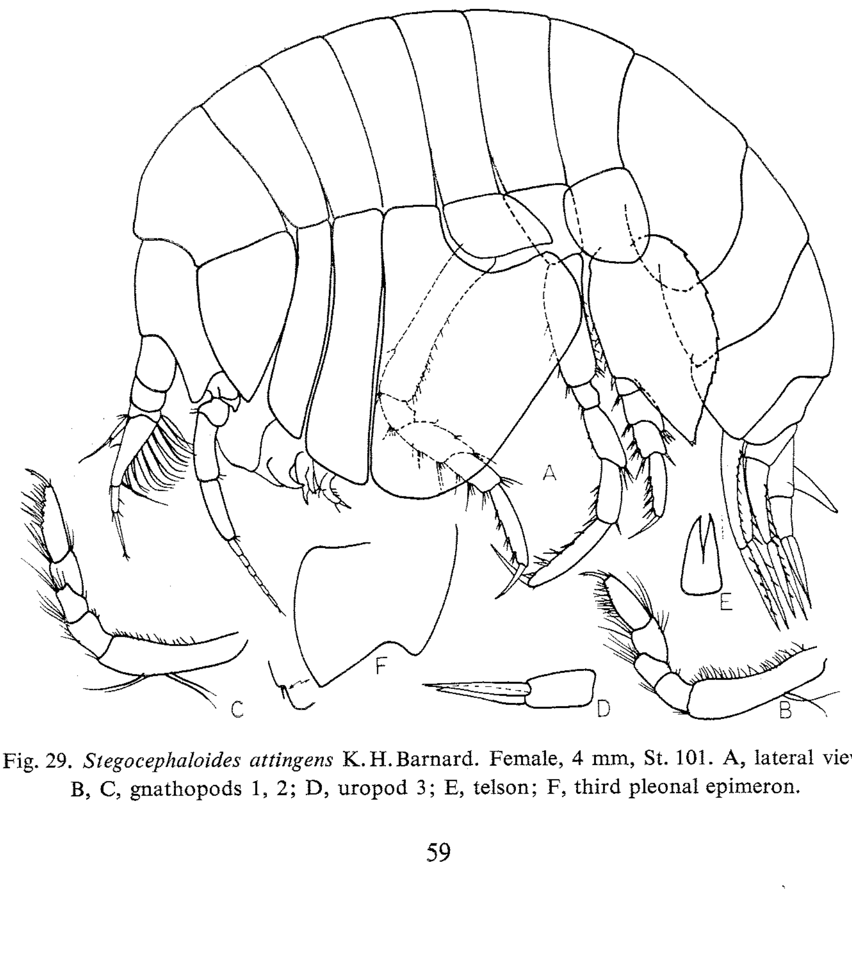


Fig. 29. *Stegocephaloides attingens* K.H. Barnard. Female, 4 mm, St. 101. A, lateral view; B, C, gnathopods 1, 2; D, uropod 3; E, telson; F, third pleonal epimeron.

Stegocephaloides attingens K. H. Barnard, 1916
(Fig. 29)

Stegocephaloides attingens K. H. Barnard, 1916: 131, pl. 26, fig. 5.

Material:
St. 101, off Angola, 8°50′S 12°32′E, 990 m, greenish mud, ST 300, 12. XII. 1950. Female, 4 mm.

Remarks:
This species is closely related to *S. auratus* (Sars, 1895: pl. 70, fig. 3) but has only one serration on the third pleonal epimeron. The accessory flagellum is slightly shorter, less serrations occur on article 2 of pereopod 5 and coxa 4 is less truncate below.

Stegocephaloides attingens is like *S. christianensis* (in Sars 1895: pl. 70, fig. 2) but the second article of pereopod 3 is longer and narrower.

Food:
About 50 % of the stomach contents consisted of mineral particles, the remainder of finely particulate organic matter.

Distribution:
Angola to Cape of Good Hope, 990-1280 m.

FAMILY AMPELISCIDAE

Ampelisca albedo n. sp.
(Fig. 30)

Material:
St. 638, Wellington-Auckland, 37°33′S 175°57′E, 660 m, clay with a little sand, PGI 0.2, 26. I. 1952. Holotype, female, 7 mm. Unique.

Diagnosis:
Head broad, lower front edge protruding and expanded; only upper pair of corneal lenses present and they are quite large; lower pair absent; article

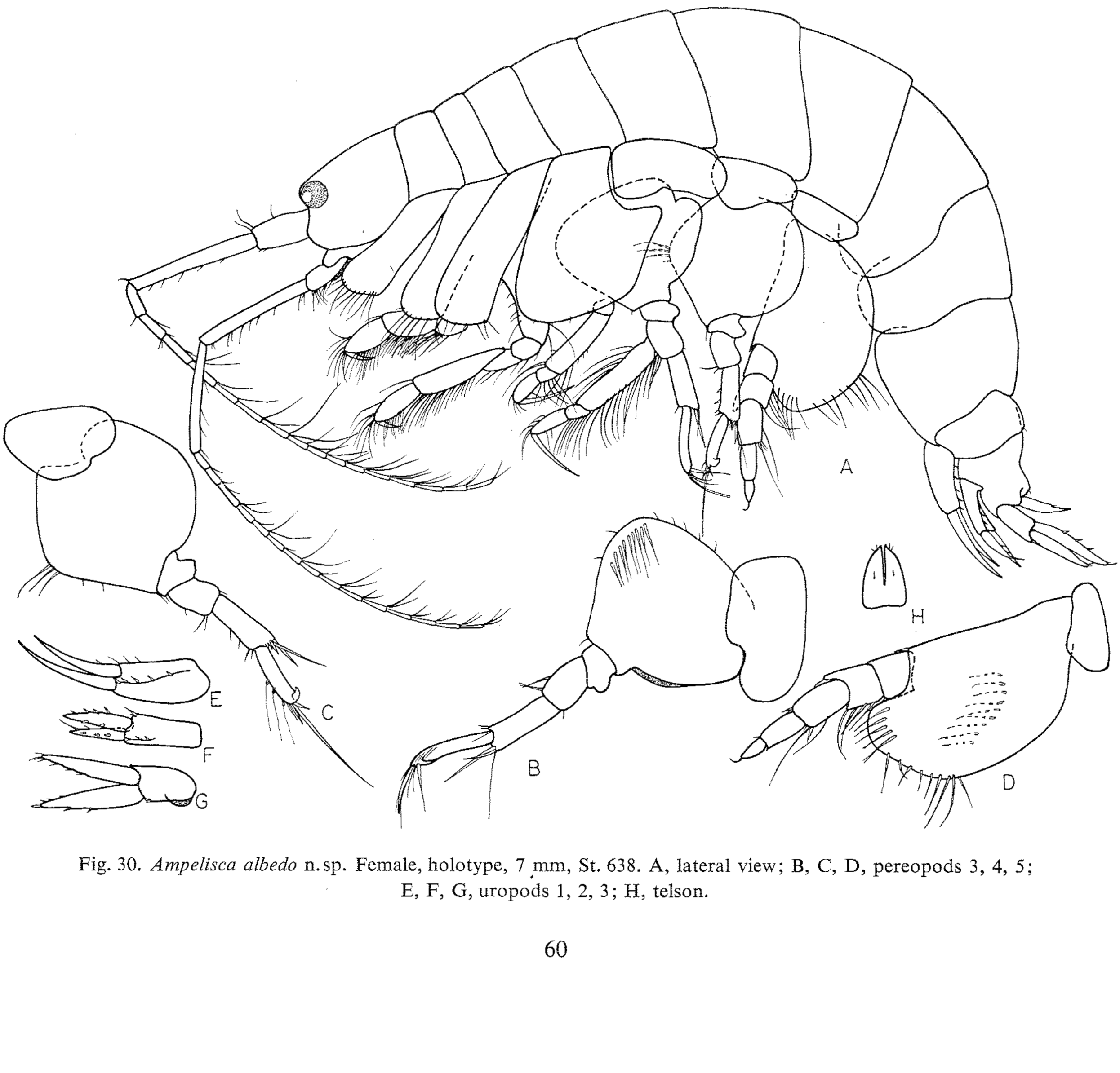


Fig. 30. *Ampelisca albedo* n. sp. Female, holotype, 7 mm, St. 638. A, lateral view; B, C, D, pereopods 3, 4, 5; E, F, G, uropods 1, 2, 3; H, telson.

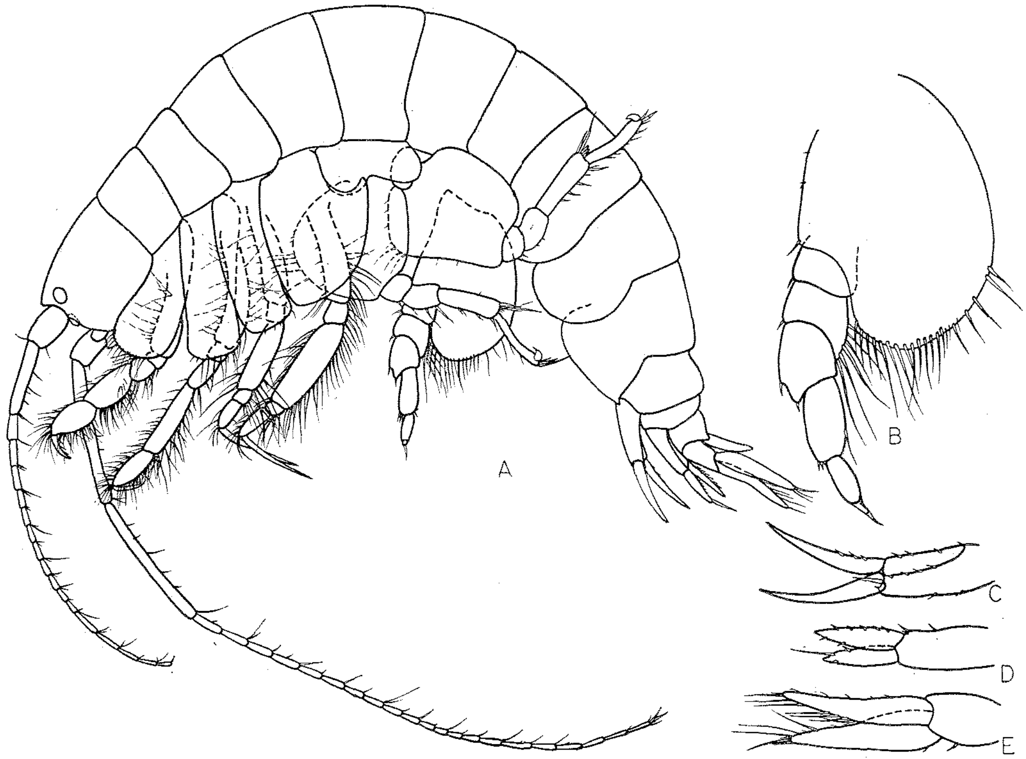


Fig. 31. *Ampelisca chiltoni* Stebbing. ?Male, 9 mm, St. 626. A, lateral; B, pereopod 5; C, D, E, uropods 1, 2, 3.

2 of antenna 1 twice as long as article 1; antennae 1 and 2 equal in length, about three fourths as long as body; coxae 1-3 each with a small tooth at lower posterior corner; articles 3 and 4 of pereopod 5 equal in length, articles 5-7 slender, decreasing in length and breadth; third pleonal epimeron with a slightly convex posterior edge and a medium-sized tooth at the lower corner; pleon segment 4 with a small massive dorsal hump, not keel-shaped; uropod 1 reaching end of uropod 2, rami long, naked; outer ramus of uropod 2 bearing a long apical spine; rami of uropod 3 lanceolate; apices of telson acute and attenuated.

Relationship:

This species is related to *Ampelisca hemicryptops* K. H. Barnard, 1930 and *A. barnardi* Nicholls, 1938, but lacks the lower pair of concealed lenses on the head. It has been examined with great care in this regard.

Two other species of *Ampelisca, A. brachyceras* Walker, 1904 and *A. misakiensis* Dahl, 1944 possess only a single dorsal pair of lenses but each species has quite a different fifth pereopod in comparison with *A. albedo*. See J. L. Barnard (1960) for a key to *Ampelisca* and the shapes of fifth pereopods for all species of *Ampelisca*.

Ampelisca chiltoni Stebbing, 1888
(Fig. 31)

Ampelisca chiltoni Stebbing, 1888: 1042, pl. 103.

Material:

St. 626, Tasman Sea, 42°10'S 170°10'E, 610 m, Globigerina ooze, PGI 0.2, 20. I. 1952. Young male, 9 mm, figured; and a 4 mm juvenile. Total: 2 specimens.

Diagnosis:

Head with lower front edge oblique, nearly transverse; eyes larger than shown by Stebbing, the lower pair oriented to point forward; first antenna only slightly longer than peduncle of second, article 2 about half again as long as article 1; article 4 of pereopod 5 slightly longer than 3, posterior edge with a small flat lobe; article 5 with an anterior notch; article 6 only slightly longer than 5; uropod 1 nearly reaching end of uropod 2, its outer ramus not spinulate; uropod 2 having a long apical spine on outer ramus; uropod 3 rather long; telson long, narrow, apices slightly incised, each with a stout spine; third pleonal epimeron with posterior edge smoothly convex, lower corner with a small tooth; pleon segment 4 with dorsal edge slightly elevated, flat, but not carinate, posterior corner angular.

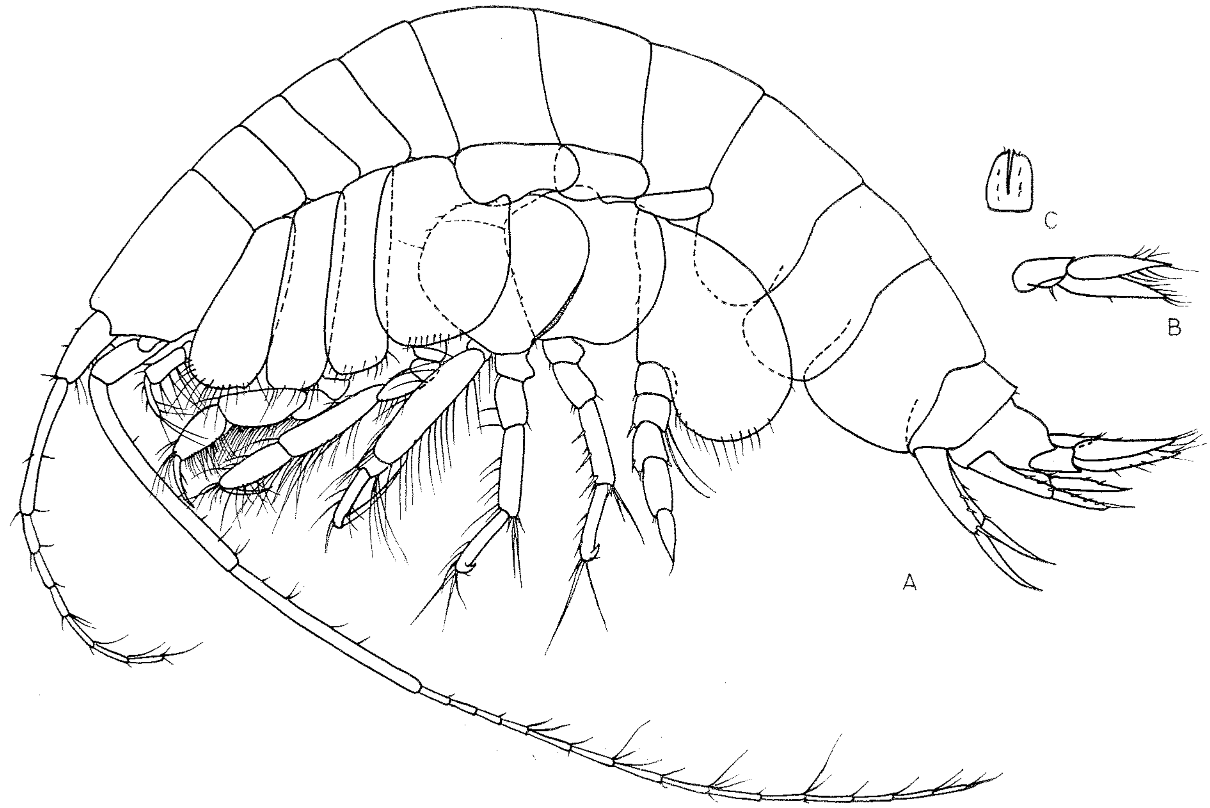


Fig. 32. *Ampelisca gusta* n.sp. Female, holotype, 4.5 mm, St. 241. A, lateral view; B, uropod 3; C, telson.

Remarks:

STEBBING's drawing of the third epimeron on the wholemount failed to show the small tooth but his other enlarged drawing showed it as in the present specimens. This is the second record of the species.

Distribution:

New Zealand, 282 m; Tasman Sea, 610 m.

Ampelisca gusta n. sp.
(Fig. 32)

Material:

St. 241, off Kenya, 4°00'S 41°27'E, 1510 m, pure Globigerina, HOT, 15. III. 1951. Holotype, female?, 4.5 mm. Unique.

Diagnosis:

Corner of head near first antenna produced, margin below that oblique; corneal lenses absent; antenna 1 shorter than peduncle of antenna 2, article 2 twice as long as article 1; antenna 2 as long as body; articles 3 and 4 of pereopod 5 subequal in length, articles 5 and 6 subequal, article 5 with an anterior spine, article 2 produced downward to the end of article 4, its lower edge rounded; third pleonal epimeron with slightly convex posterior edge and small lower tooth; pleon segment 4 with a low dorsal, massive but angular process; uropod 1 failing to reach the end of uropod 2, rami naked; outer ramus of uropod 2 with apical spine; rami of uropod 3 lanceolate, moderate in stoutness; telson broad, apices blunt except for medial cusps.

Relationship:

This species bears a remarkable resemblance to *Ampelisca catalinensis* J.L.Barnard, 1954 (= *A. eoa?,* see J.L.BARNARD 1960) and has been compared directly with the holotype specimen of *A. catalinensis*. *Ampelisca gusta* differs from *A. catalinensis* only by the shorter first antenna, the more produced lateral corner of the head and the slightly stouter rami of the third uropods. Young *A. catalinensis* specimens have the fifth article of pereopod 5 shorter than in J.L.BARNARD's (1954) figures of a large adult and are more like *A. gusta* in this respect; however, the rami of the third uropods are just as slender in young as in adult *A. catalinensis*.

The new species is related to *Ampelisca bransfieldi* K.H.Barnard, 1932, but the tooth on the third pleonal epimeron is smaller and the lateral corner of the head is more produced. From *A.*

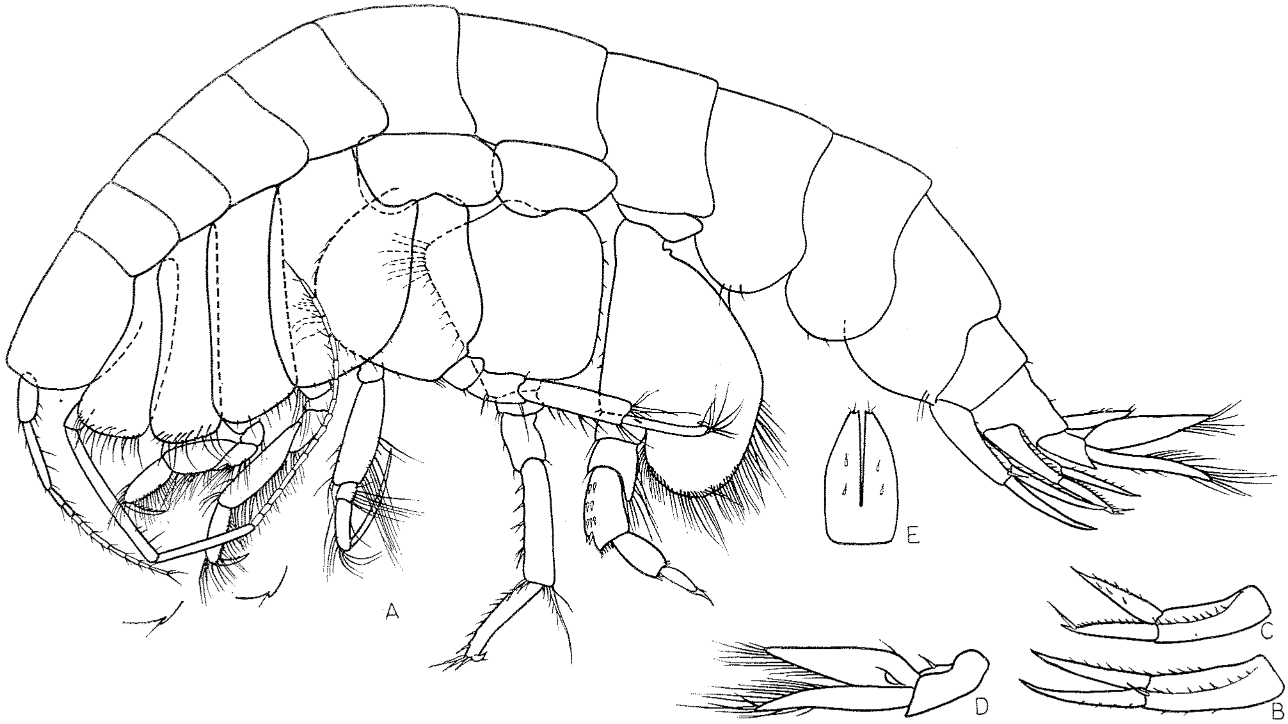


Fig. 33. *Ampelisca hermosa* n.sp. Female, holotype, 14 mm, St. 742. A, lateral view; B, C, D, uropods 1, 2, 3; E, telson.

coeca Holmes, 1908 (see J.L.BARNARD 1960) the new species differs by the longer second article of the first antenna. *A.gusta* is related also to *A.amblyopsoides* J.L.Barnard, 1960, but in *A.amblyopsoides* the first uropod fully reaches the end of uropod 2, the rami are spinose, the tooth on the third pleonal epimeron is larger, the lateral corner of the head is less produced and the second article of antenna 1 is shorter.

It must be remarked that from these materials and those of BARNARD (1960, eastern Pacific) and BARNARD (1961, south Atlantic) more evidence is accumulating on the remarkable similarity of the various bathyal species of *Ampelisca,* and many of them may prove to belong to a complex of subspecies.

Ampelisca hermosa n. sp.
(Fig. 33)

Material:

St. 742, Gulf of Panama, 7°28'N 79°37'W, 500 m, green clay, PGI 0.2, 16. V. 1952. Holotype, female, 14 mm; two other specimens, 12 and 9 mm. Total: 3 specimens.

Diagnosis:

Head broad, with lower front edge oblique, corneal lenses absent; antenna 1 reaching slightly beyond end of peduncular article 4 of antenna 2; article 2 of antenna 1 about 1.3 times as long as article 1; antenna 2 about half as long as animal; lower posterior corners of coxae 1 and 2 with a small slit; article 2 of pereopod 5 convex, extending down to end of article 4, article 4 longer than article 3, posterior lobe small, article 5 longer than articles 3-4 combined, bearing an anterior notch and 3 sets of lateral spines, articles 6 and 7 shorter and more slender than article 5; third pleonal epimeron with slightly convex posterior edge and a small sharp tooth at the lower posterior corner; uropod 1 reaching to the end of uropod 2; uropod 2 with a long apical spine on the outer ramus; rami of uropod 3 slender, lanceolate; telson evenly tapering, apices of lobes incised; pleon segment 4 with a low, simple dorsal process.

Relationship:

This eastern Pacific animal appears to be a geminate species of the bathyal Caribbean *Ampelisca abyssicola* Stebbing, 1888 (pl. 104) from 714 m. It is particularly related by the long fifth article of pereopod 5 and has only slight, perhaps unimportant differences from *A.abyssicola,* as follows: article 5 of antenna 2 is shorter; pleon segment 3 has

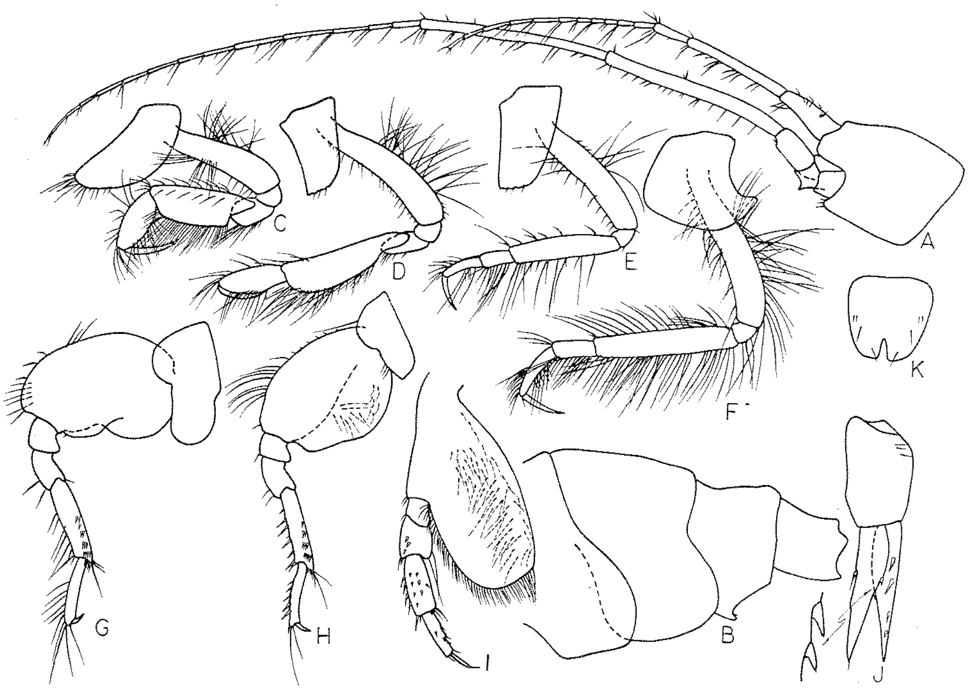


Fig. 34. *Byblis ceylonica* n. sp. Female, holotype, 15 mm, St. 281. A, head; B, pleon segments 2-6 (5-6 fused); C, D, gnathopods 1, 2; E, F, G, H, I, pereopods 1, 2, 3, 4, 5; J, uropod 3; K, telson.

a distinct tooth instead of being quadrate; and pleon segment 4 has a dorsally straight-margined process, not slightly saddle-shaped.

Byblis ceylonica n. sp.
(Fig. 34)

Material:

St. 281, Seychelles-Ceylon, 3°38′N 78°15′E, 3310 m, Globigerina ooze, ST 300, 10. IV. 1951. Holotype, female, 15 mm. Unique.

Diagnosis:

Eyes absent; antenna 2 three fourths as long as body, antenna 1 broken, probably exceeding peduncle of antenna 2; cleft of telson one fourth its length; rami of uropod 3 not serrate but armed with a few stout spines; anterolateral head angle not cuspate; third pleonal epimeron with posterior edge bulging slightly, rounded at lower corner; hind lobe of article 2 on pereopod 5 densely setose; coxae 1-3 with distal anterior corners angular and slightly prolonged, lower edges serrate, coxa 1 moderately setose, coxae 2-3 poorly setose.

Relationship:

In other respects the species has the aspect of *Byblis barbarensis* J. L. Barnard, 1960, with the first 2 uropods similar, the first with a distolateral spine on the peduncle, but the gnathopods are much smaller in relation to the body than in *B. barbarensis*. The new species differs from *B. barbarensis* specifically by the poorly cleft telson, the shape of the first 3 coxae, which in *B. barbarensis* are rounded in front, and the unserrated rami of uropod 3.

The blindness of the species and the shortness of the telsonic cleft relates *B. ceylonica* to *B. abyssi* (see key in J. L. Barnard 1960), but it differs from *B. abyssi* by the non serrate rami of the third uropods, the rounded-bulging, not subquadrate, third pleonal epimeron, and the angular first 3 coxae.

The new species is also closely related to *B. serrata* (see *B. minuticornis* in Sars 1895: pl. 66, fig. 3) but differs by the first antenna reaching to the end of the peduncle of the second antenna, whereas in *B. serrata* it scarcely exceeds the fourth peduncular article of the second antenna. It differs also by the less deeply cleft telson and the angular first 3 coxae.

Byblisoides arcillis n. sp.
(Fig. 35)

Material:

St. 453, Makassar Strait, 3°56′S 118°26′E, 2000 m, greenish clay, ST 300, 24. VIII. 1951. Holotype, male, 10 mm.

St. 491, Makassar Strait, 4°56′S 117°39′E, 1560 m, muddy clay, ST 300, 14. IX. 1951. Female, 9 mm.

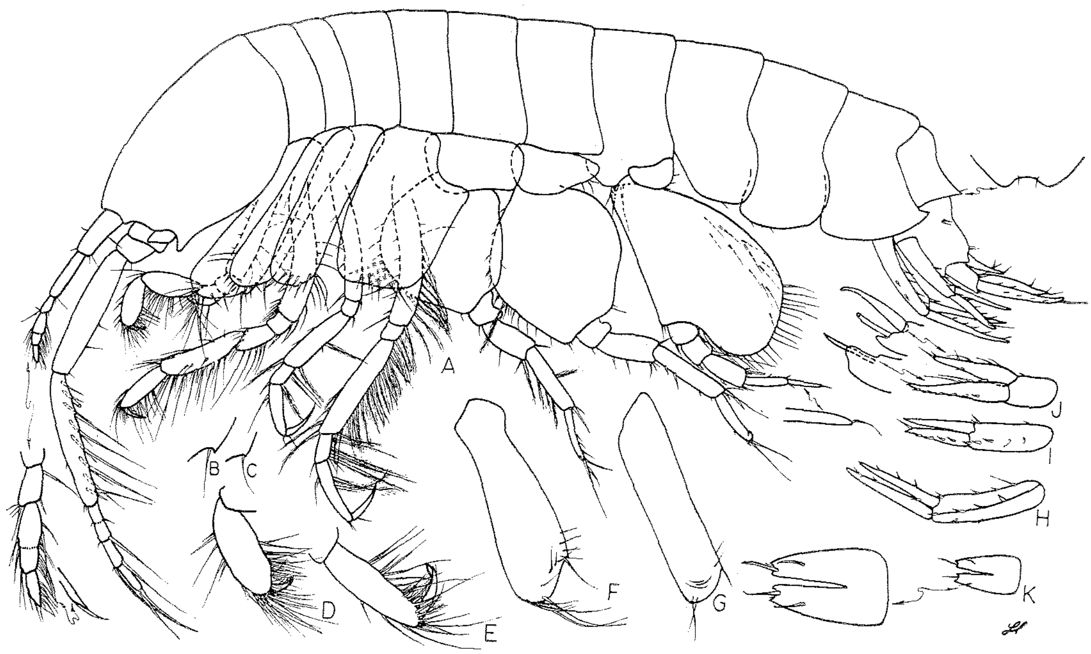


Fig. 35. *Byblisoides arcillis* n. sp. Male, holotype, 10 mm, St. 453. A, lateral view; B, C, lower hind corners of coxae 1, 2; D, E, gnathopods 1, 2; F, G, coxae 1, 2; H, I, J, uropods 1, 2, 3; K, telson.

Diagnosis:

Lower edge of the lobe on the second article of pereopod 5 evenly rounded; anterior edge of fifth article on pereopod 5 lacking long plumose setae; lower anterior corners of articles 4 and 5 on pereopod 5 each bearing a short, blunt spine; article 7 of pereopod 5 equal to article 6 in length; antenna 2 about twice as long as head; anterior part of lower edge on coxa 1 convexly produced and setose, behind which the margin sweeps upward to the posterior corner and is bare of major setae; dorsal process of pleon segment 4 acute from lateral view, composed of two rounded bilateral lobes from dorsal view.

Relationship:

The shape of the first coxa is the most striking difference of this species when compared with the type species, *Byblisoides juxtacornis,* and *B. esferis* n. sp., to follow. The dorsal view of the fourth pleonal segment was not described for *B. juxtacornis* by K. H. BARNARD (1932), but its bilobate character is a distinctive contrast to *B. esferis.* Gill lamellae are beautifully preserved in this specimen; they are white, shiny, flattened oval sacs, with no surface ornamentation.

Byblisoides esferis n. sp.
(Fig. 36)

Material:

St. 626, Tasman Sea, 42°10'S 170°10'E, 610 m, Globigerina ooze, ST 300, 20. I. 1952. Holotype, male?, 7 mm and 2 other specimens, est. 12 mm (broken), and 7 mm. Total: 3 specimens.

Diagnosis:

Lower edge of the lobe on the second article of pereopod 5 evenly rounded; anterior edge of fifth article on pereopod 5 lacking long plumose setae; lower anterior corners of articles 4 and 5 on pereopod 5 each bearing a short, blunt spine; article 7 of pereopod 5 shorter than article 6; antenna 2 short, only 1.5 times as long as head, contrasted with twice as long as in the type species, *Byblisoides juxtacornis* K. H. Barnard (BARNARD 1932: 87); coxa 1 evenly rounded below; dorsal edge of pleon segment 4 straight, not ornamented.

Relationship:

Except for the fact that the description of still another new species in this genus precedes, it would have been practical to include the present material from the Tasman Sea in the type species *B. juxtacornis* from the Palmer Archipelago, considering the minute differences. At first sight, the differences are easily overlooked and the geographic separation be-

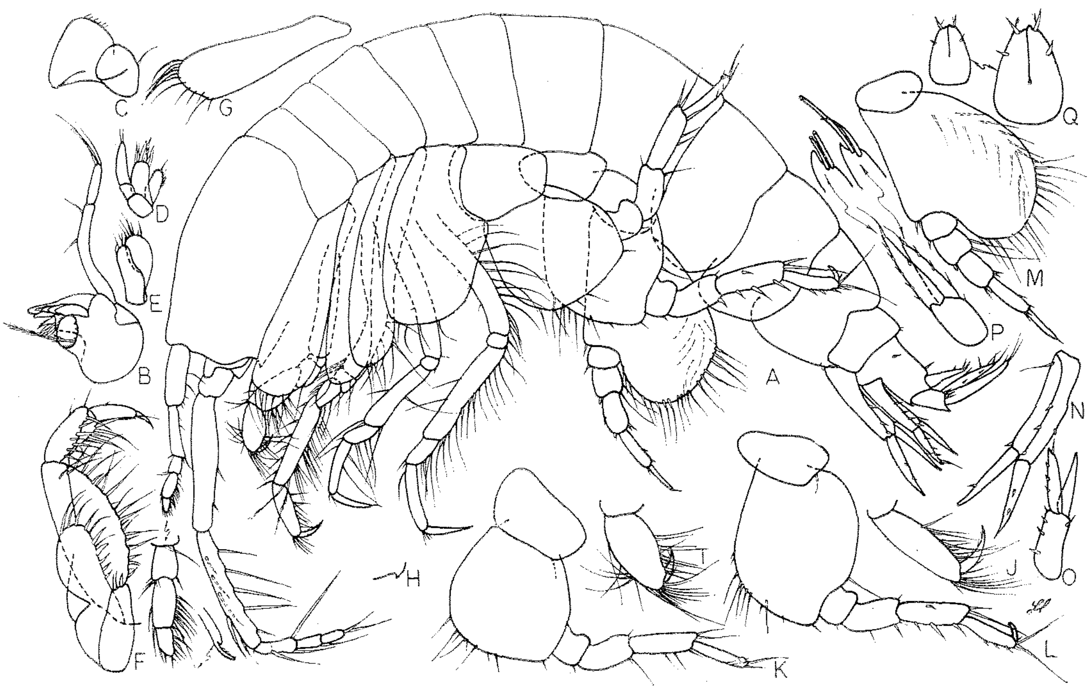


Fig. 36. *Byblisoides esferis* n.sp. ?Male, holotype, 7 mm, St. 626. A, lateral view; B, mandible; C, half of lower lip; D, E, maxillae 1, 2; F, maxilliped; G, coxa 1; H, lower tooth of coxa 1; I, J, gnathopods 1, 2; K, L, M, pereopods 3, 4, 5; N, O, P, uropods 1, 2, 3; Q, telson.

tween the Palmer Archipelago and deep waters of the Tasman Sea is no greater a barrier than between California and the Galapagos, which have some identical faunal elements. However, *B. arcillis* n. sp., preceding, was collected in the Makassar Strait, near the Equator and in a complex faunal region where direct gene flow with the Antarctic is unlikely, especially in bathybenthic organisms. The differences of the Makassar species from the Antarctic one are no greater than between the Tasman and Antarctic ones, indicating the need for specific segregation of all three species. No doubt, these minute differences might suggest subspeciation, and the writer has no quarrel with this view. However, it is occasionally the case that the more peculiar or unusual a genus is in comparison with its familial relatives, the more minor will be its interspecific differences. As a genus, composed of only the type species, *Byblisoides* is indeed unusual in the Ampeliscidae, where most of the other genera are immensely polyspecific. It is also peculiar in its generic morphological criteria, the club-like first antenna, the short antennal flagella and the lower head process.

All of the diagnostic features quoted above specifically distinguish the new species from *B. juxtacornis*.

The upper lip is broadly and slightly incised asymmetrically. Otherwise, the mouthparts have been figured.

Haploops Liljeborg, 1855

A key to this interesting genus is given below. The genus *Haploops* is characterized by the nearly linear second article of pereopod 5 and on this basis I believe that *H. securiger* K.H. Barnard (Barnard 1932) should be transferred to the genus *Byblis*.

Shoemaker (1931) suggested and Dunbar (1954) consummated the removal of *H. robusta* Sars to *H. setosa* Boeck. Neither author mentioned the presence or absence of a row of spines on the lower edge of article 3 of pereopod 5, a character useful in separating *H. spinosa* Shoemaker, 1931 from *H. tubicola* Liljeborg (see Sars 1895). Until this point can be elucidated I am provisionally reviving *H. robusta* in the following key.

Key to Haploops

1. Corneal lenses present 2
1. Corneal lenses absent 7
2. Corneal lenses two in number 3
2. Corneal lenses four in number 5
3. Female antenna 1 as long as 2 4
3. Female antenna 1 reaching only to end of peduncle of antenna 2 . . . . *descansa* n. sp.
4. Lower edge of article 3 of pereopod 5 spinose . . . . *spinosa*
4. Lower edge of article 3 of pereopod 5 not spinose . . . . *tubicola*
5. Pereopod 5, articles 6-7 together much shorter than article 3 . . . . *dellavallei*
5. Pereopod 5, articles 6-7 together longer than article 3 6
6. Pereopod 5, article 5 with long anterior lobe . . . . *sibirica*
6. Pereopod 5, article 5 lacking distinct anterior lobe . . . . *laevis*
7. Pereopod 5, articles 4-7 decreasing in length and width in a normal sequence, articles 6 and 7 half as wide as 5 . . . . *abyssorum*
7. Pereopod 5, article 6 much more slender than 5, articles 6 and 7, $^1/_3$ or less as wide as 5 8
8. Pereopod 5, posterior lobe of article 2 projecting slightly below end of article 3 9
8. Pereopod 5, posterior lobe of article 2 very small, scarcely evident 11
9. Lower edge of article 3 on pereopod 5 spinose 10
9. Lower edge of article 3 on pereopod 5 not spinose . . . . *setosa* and *proxima*
10. Uropod 1 nearly reaching end of uropod 2, article 2 of pereopod 5 about 2.5 times as wide as article 4 . . . . *"robusta"*
10. Uropod 1 shortened, article 2 of pereopod 5 less than 1.5 times as wide as article 4 . . . *lodo* n. sp.
11. Pereopods 3-4, article 5 produced distally, inner ramus of uropod 1 shorter than outer . . . *similis*
11. Pereopods 3-4, article 5 not produced distally, inner ramus of uropod 1 equal to outer in length . . . . *vallifera*

Haploops descansa n. sp.
(Fig. 37)

Material:

St. 626, Tasman Sea, 42°10'S 170°10'E, 610 m, Globigerina ooze, PGI 0.2, 20. I. 1952. Holotype, ovigerous female, 7 mm. Unique.

Diagnosis:

Head with transverse front edge, a pair of upper corneal lenses present; antenna 1 shorter than peduncle of antenna 2, the latter shorter than the body; article 2 of pereopod 5 with concave hind margin, produced below into a lobe nearly reaching the end of article 3; lower edge of article 3 not spinose; articles 6-7 together shorter and less than one fifth as wide as article 5, article 5 lacking distinct distal lobes; fifth articles of pereopods 3 and 4 not distally produced; third pleonal epimeron with straight hind edge and rounded lower corner; inner ramus of uropod 1 shorter than outer; rami of uropod 2 subequal; telson short, cleft nearly to base.

Relationship:

See the preceding key to the genus *Haploops*. The species bears closest resemblance to *H. tubicola* Liljeborg (see Sars 1895: pl. 67) but differs by the short first antenna and the equal sized rami of uropod 2. It is also closely related to *H. spinosa* Shoemaker, 1931, differing mainly by the lack of spines along the lower edge of article 3 on pereopod 5 and the straight hind margin of the third pleonal epimeron.

Haploops lodo n. sp.
(Fig. 38)

Material:

St. 716, Acapulco-Panama, 9°23'N 89°32'W, 3570 m, dark muddish clay, HOT, 6. V. 1952. Holotype, female, 7.5 mm, figured; and 6 other specimens. Total: 7 specimens.

Diagnosis:

Front edge of head nearly transverse; eyes and corneal lenses absent; antenna 1 reaching end of peduncle of antenna 2, the latter broken on all specimens but probably shorter than body; article 2 of pereopod 5 slender, with concave hind margin, produced below into a lobe reaching the end of ar-

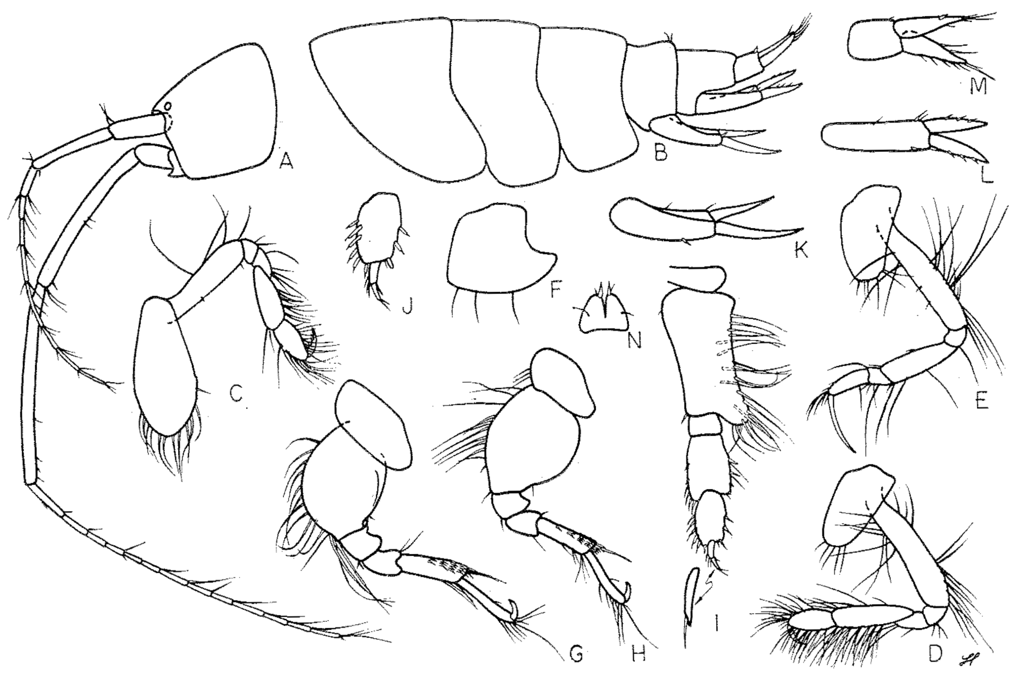


Fig. 37. *Haploops descansa* n.sp. Female, holotype, 7 mm, St. 626. A, head; B, pleon; C, D, gnathopods 1, 2; E, G, H, I, pereopods 1, 3, 4, 5; F, coxa 4; J, end of pereopod 5; K, L, M, uropods 1, 2, 3; N, telson.

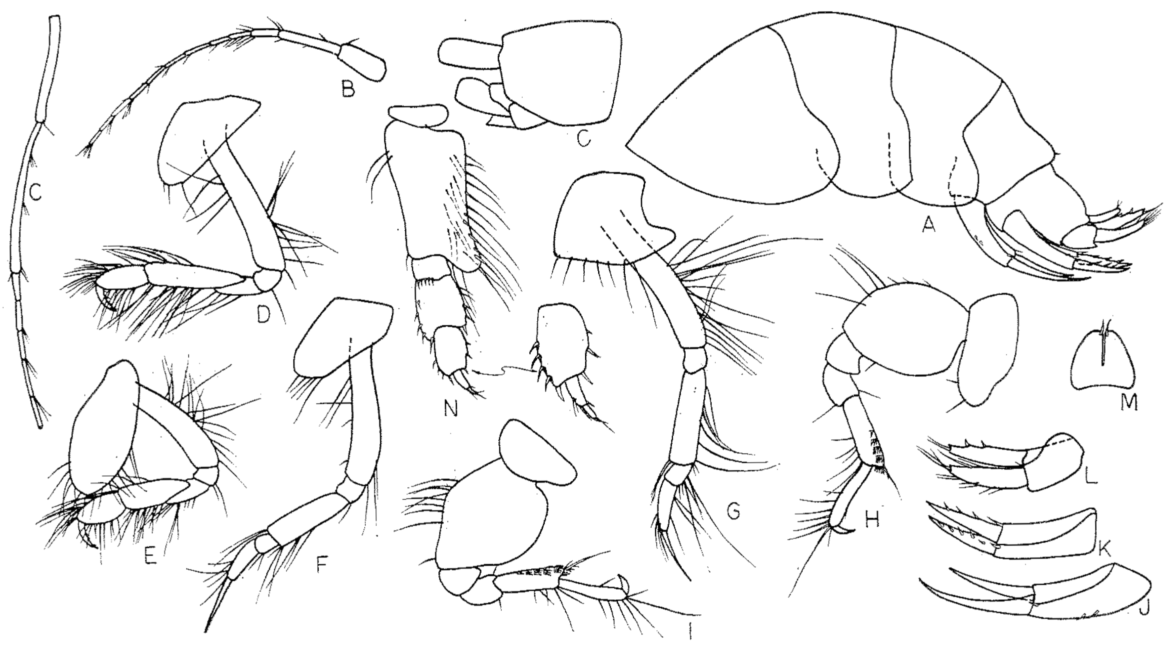


Fig. 38. *Haploops lodo* n.sp. Female, holotype, 7.5 mm, St. 716. A, pleon; B, C, antennae 1, 2; D, E, gnathopods 2, 1; F, G, H, I, N, pereopods 1, 2, 3, 4, 5; J, K, L, uropods 1, 2, 3; M, telson; O, head of another specimen.

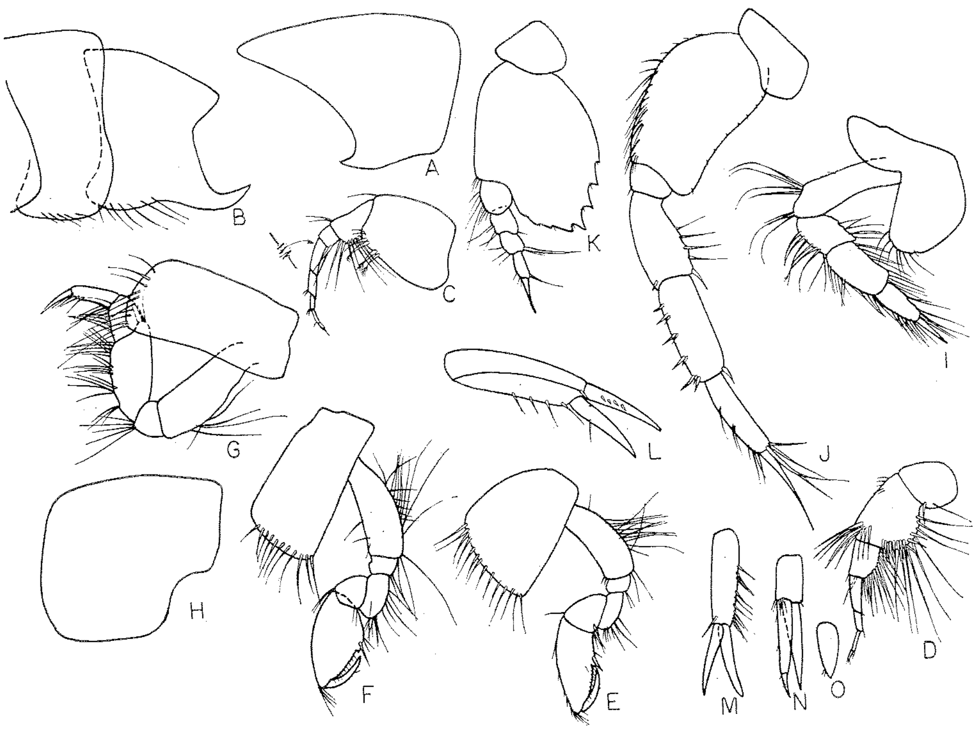


Fig. 39. *Harpinia australis* n.sp. Female, holotype, 5 mm, St. 554. A, head; B, pleon segments 2, 3; C, D, antennae 1, 2, accessory flagellum broken; E, F, gnathopods 1, 2; G, I, J, K, pereopods 1, 3, 4, 5; H, coxa 4; L, M, N, uropods 1, 2, 3; O, half of telson.

ticle 3; lower edge of article 3 spinose; articles 6 and 7 together shorter and less than one fourth as wide as article 5; article 5 bearing a small distal anterior lobe; fifth articles of pereopods 3 and 4 not distally produced; third pleonal epimeron with bulging posterior edge and rounded lower corner; inner ramus of uropod 1 shorter than outer, the outer ramus barely exceeding the peduncle of uropod 2; rami of uropod 2 subequal; telson short, cleft about two thirds its length.

Relationship:

This species is very closely related to *Haploops robusta* (in Sars 1895: pl. 68, fig. 2) but differs by the shortened first uropod, the lesser cleft telson, the narrower second article of pereopod 5, the shorter first antenna and the shape of the rami on uropod 3, for which figures should be compared.

FAMILY PHOXOCEPHALIDAE

Harpinia abyssalis Pirlot, 1932

Harpinia abyssalis Pirlot, 1932: 69-74, figs. 16-18; J. L. Barnard 1960a: 347 (and key).

Material:

St. 477, S. of Bali, 9°01'S 114°48'E, 780 m, sandy clay, PGI 0.2, 11. IX. 1951. Fcmalc, 5.5 mm.

Distribution:

Flores Sea, Makassar Strait and northern Indian Ocean south of Bali (scarcely removed from Flores Sea), 780-1310 m.

Harpinia australis n. sp.

(Fig. 39)

Material:

St. 554, Great Australian Bight, 37°28'S 138°55'E, 1340-1320 m, Globigerina ooze, ST 300, 5. XII. 1951. Holotype, female, 5 mm. Unique.

Diagnosis:

Head with large acute lower tooth; article 2 of pereopod 5 reaching down to end of article 4, lower posterior edge with 3 large and blunt teeth bounded on each side by a small one, anterior edge lacking expanded setal row; third pleonal epimeron with sinuate lower edge and a very long upturned posterior tooth; outer ramus of uropod 1 bearing 4 short spines, inner ramus bearing one long seta;

rami of uropod 2 naked; inner ramus of uropod 3 nearly as long as outer; apices of telson acute.

Relationship:

This species is most closely related to *Harpiniopsis profundis* J. L. Barnard, 1960a but differs mainly in the tooth armature on the fifth pereopod, which in *H. profundis* is composed of 2 large teeth below and several small ones above.

Harpinia cinca n. sp.

Material:

St. 101, off Angola, 8°50'S 12°32'E, 990 m, greenish mud, ST 300, 12. XII. 1950. Female, ovigerous, 6 mm.

Vema St. 54, Cape Basin, south Atlantic Ocean, 4680 m. Holotype, female 5.5 mm.

Diagnosis:

Head with medium sized process at lower corner; epistome not produced; article 2 of pereopod 5 produced down to end of article 3, posterior edge with 3 small serrations, below which is a large posteriorly directed tooth followed by a smaller one; lower edge with about 5 serrations; distal anterior edge of article 2 quite expanded and armed with up to 25 large plumose setae; rest of appendage rather short; third pleonal epimeron bearing a medium sized, sligthly upturned tooth at lower corner. Male unkown.

Relationship:

This species resembles *Harpinia latipes* Norman, 1900 (p. 338) in the produced tooth of the third pleonal segment and the expanded setal row of pereopod 5 but differs by the fact that the teeth of pereopod 5 are on the posterior edge of article 2, whereas they are on the ventral edge in *H. latipes*. This species will be figured in Barnard (1961 b).

Except for the longer tooth on the lower part of the head, the Galathea specimen is identical to the type of *H. cinca*. The writer is uncertain of the taxonomic value of this difference and prefers simply to include the specimen under this species without further subspecific partitioning.

Distribution:

Cape Basin, 1861-4680 m; southeastern Atlantic Basin (Angola), 990 m.

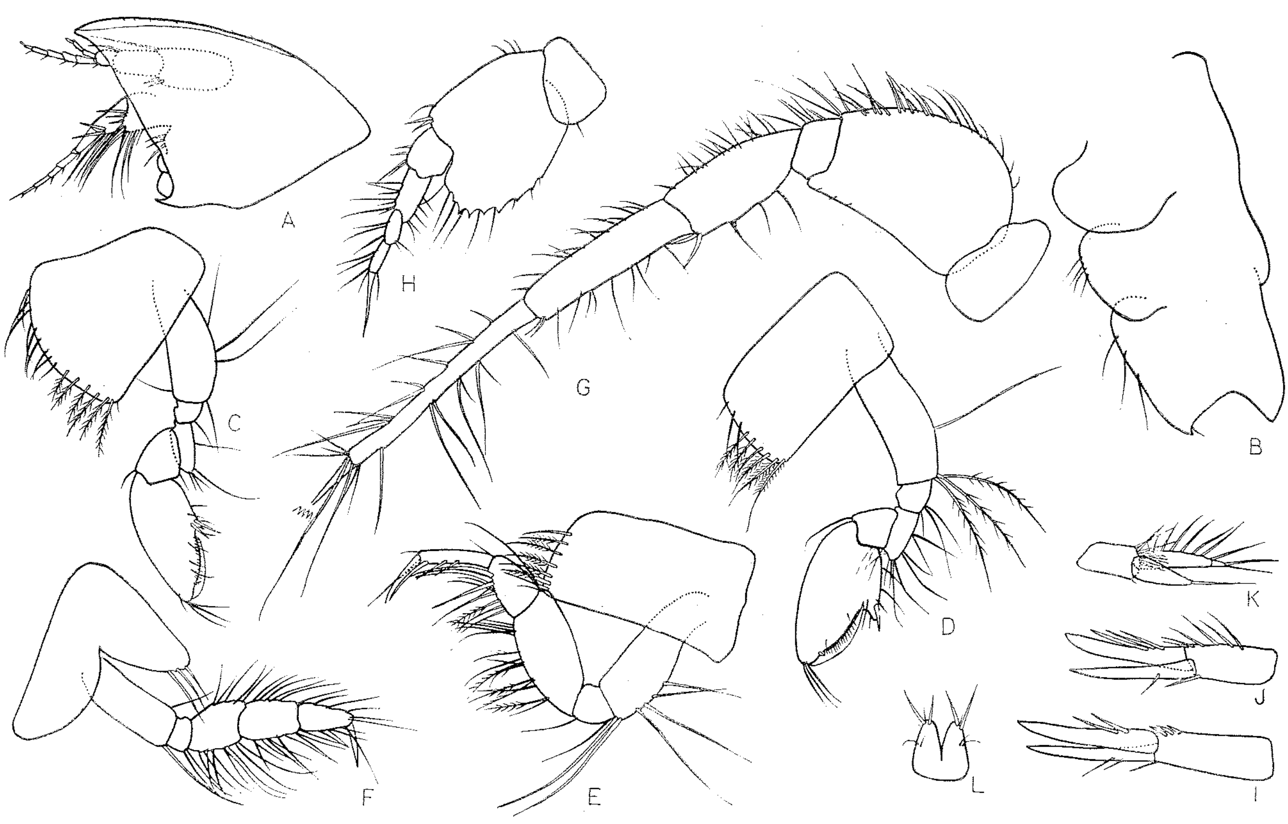


Fig. 40. *Harpinia nadania* n. sp. Female, holotype, 4.25 mm, St. 626. A, head; B, pleon segments 1-3; C, D, gnathopods 1, 2; E, F, G, H, pereopods 1, 3, 4, 5; I, J, K, uropods 1, 2, 3; L, telson.

Harpinia nadania n. sp.
(Fig. 40)

Material:

St. 626, Tasman Sea, 42°10'S 170°10'E, 610 m, Globigerina ooze, ST 300, 20. I. 1952. Holotype, female, 4.25 mm. Unique.

Diagnosis:

Head with lower antennal corner bearing an acute, medium-sized process; dorsal surface of head bearing a longitudinal keel; pereopod 4 slender; pereopod 5 rather plain, article 2 with 5 small sharp teeth on posterior edge, lower corner with a pair of large teeth; uropods 1 and 2 with spines on both rami; apices of telson rounded; third pleonal epimeron with straight posterior edge, lower corner with a small tooth.

Relationship:

From *H. abyssalis* Pirlot, 1932 this species differs by the shorter tooth on the third pleonal epimeron and the sharper teeth of pereopod 5.

Harpinia palabria n. sp.
(Fig. 41)

Material:

St. 626, Tasman Sea, 42°10'S 170°10'E, 610 m, Globigerina ooze, PGI 0.2, 20. I. 1952. Holotype, female, 3.25 mm; figured female, 2.75 mm; 19 other specimens. Total: 21 specimens.

Diagnosis:

Head with acute lower tooth of moderate size; pereopod 4 quite stout for the genus and the basal posterior edge of its second article bearing a cusp, an unusual feature; article 2 of pereopod 5 reaching down to end of article 5, bearing 8 very large acute posterior teeth and a remnant of another; lower anterior edge of article 2 with 4 stout setae but not considered herein as an expanded setal row (see J. L. BARNARD 1960a); article 3 of pereopod 5 with an anterior row of stout setae, another unusual feature; third pleonal epimeron with a large posterior tooth and an oblique lateral row of setae; uropods 1 and 2 with apical setae on the rami; inner ramus of uropod 3 two thirds as long as outer; apices of telson broadly rounded.

Relationship:

This is an unusual species in the several points so noted in the diagnosis. Disregarding the unique features of pereopods 4 and 5 this species bears resemblance to *Harpiniopsis profundis* J. L. Barnard, 1960a, to which it would be keyed in the harpiniid key of p. 345 but differs from it by the uniformly large teeth of pereopod 5, as well as the lateral setae of the third pleonal epimeron. Actually, the species bears a closer resemblance to the north Atlantic *H. latipes* Norman, 1900 (see also CHEVREUX 1927) to which it would be keyed by assuming an expanded anterior setal row on the distal part of article 2 on pereopod 5. The two species are similar in the large teeth of pereopod 5, the teeth on the third pleonal epimeron and head and the anterior setal row of article 3 on pereopod 5. Apparently *H. latipes* lacks the lateral setal row on the third pleonal epimeron and the cusp on pereopod 4.

Heterophoxus oculatus (Holmes, 1908)

Heterophoxus oculatus (Holmes), J. L. BARNARD 1960a: 320-324, pls. 59, 60, 61 (with references).

Material:

St. 743, Gulf of Panama, 7°27'N 79°37'W, 600 m, green clay, PGI 0.2, 16. V. 1952, one specimen.

Distribution:

Widely distributed in the eastern Pacific Ocean from Puget Sound to Panama and with a wide bathymetry, from 10 m to 1920 m. Below about 600 m the species is blind. Its greatest abundance lies between the depths of 80 and 400 m.

Joubinella Chevreux, 1908

Joubinella Chevreux, 1908: 8-11.

The writer believes that no specific distinctions can be made between *Joubinella traditor* Pirlot, 1932 and the type species *J. ciliata* Chevreux, 1908. The distinctions suggested by PIRLOT were weak, as he admitted, and would seem to hinge largely on the third uropod, but I believe from my experience with other Phoxocephalidae (BARNARD 1960a) that the slight differences are due to CHEVREUX' figured specimen being a gerontic female with a tendency for the inner ramus of the third uropod to lengthen in old age.

The two species *J. bychovskii* and *J. strelkovi* (both Gurjanova 1952) seem also to have no specific distinction except in shape of head and rostrum which

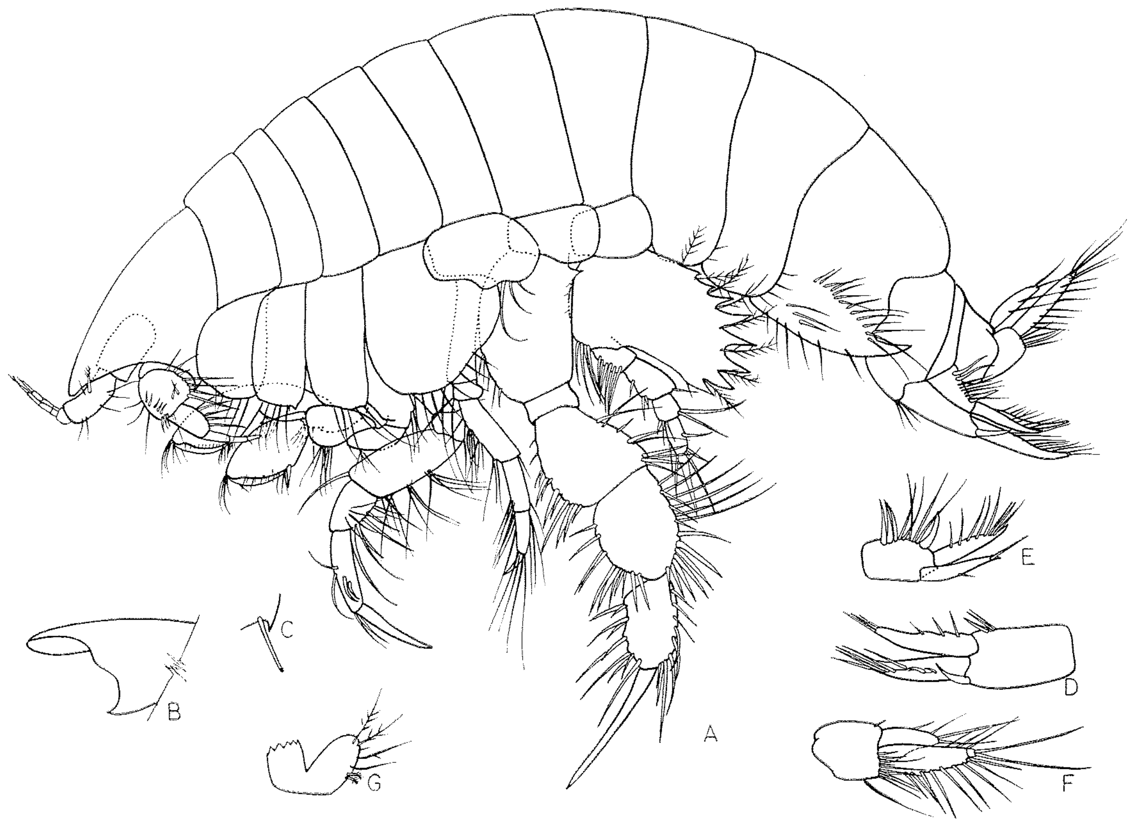


Fig. 41. *Harpinia palabria* n.sp. Female, 2.75 mm, St. 626. A, lateral view; B, head; C, lower corner of coxae 1-3; D, E, F, uropods 1, 2, 3; G, telson.

I believe is simply a variation of a sexual nature, since the two species are based on different sexes.

The two pairs of species *ciliata-traditor* and *bychovskii-strelkovi* differ from each other in the shape of gnathopod 1, which in the first pair has a sharply deflexed distal portion of article 6, not fully developed in the second pair. Another feature of more importance qualitatively is the presence of a large distal peduncular spine on the first uropod in the first pair of species and not in the second.

If this scheme of speciation proves to be correct after further analysis and comparison of materials then the distribution of the species would be a northern Pacific endemic species *(bychovskii-strelkovi)* and a south Pacific-Atlantic species *(ciliata-traditor)*.

Joubinella traditor Pirlot, 1932

Joubinella traditor Pirlot, 1932: 74-81, figs. 19-21.

Material:

St. 554, Great Australian Bight, 37°28′S 138°55′E, 1340-1320 m, Globigerina ooze, ST 300, 5. XII. 1951. Female, 5.5 mm.

St. 626, Tasman Sca, 42°10′S 170°10′E, 610 m, Globigerina ooze, ST 300, 20. I. 1952. 2 specimens.

Distribution:

Probably a pelagic species. Banda Sea, maximum possible depth 310 m; Tasman Sea, maximum possible depth, 610 m; Great Australian Bight, maximum possible depth 1320-1340 m.

Paraphoxus pyripes K.H.Barnard, 1930

Paraphoxus pyripes K.H.Barnard, J.L.Barnard 1960a: 277 (with synonymy).

Material:

St. 626, Tasman Sea, 42°10′S 170°10′E, 610 m, Globigerina ooze, PGI 0.2, 20. I. 1952. Male, 5 mm; female 5.5 mm. Total: 2 specimens.

Distribution:

Antarctica and north to New Zealand, surface to benthos of 750 m. (Paraphoxids are true burrowers but males often swarm at the surface).

FAMILY HAUSTORIIDAE

Key to the Haustoriidae

1. Antenna 1 geniculate between articles 1 and 2 2
1. Antenna 1 not geniculate 3
2. Gnathopod 2 lacking article 7 .... *Bathyporeia*
2. Gnathopod 2 bearing article 7 .... *Amphiporeia*
3. Coxa 1 vestigial, less than $^1/_4$ as long as coxa 3 4
3. Coxa 1 not vestigial, at least $^1/_2$ as long as coxa 3 5
4. Coxa 2 vestigial, less than $^1/_4$ as long as coxa 3 .... *Urohaustorius*
4. Coxa 2 not vestigial, almost as large as coxa 3 .... *Cardenio*
5. Pereopod 2 similar to pereopod 3 .... *Eohaustorius*
5. Pereopod 2 similar to pereopod 1 6
6. Coxae 1-2 obtusely pointed below 7
6. Coxae 1-2 rounded below 9
7. Articles 4 and 5 of pereopods 4-5, $^3/_4$ as broad as article 2 of pereopod 5 .... *Haustorius*
7. Articles 4 and 5 of pereopods 4-5, $^1/_3$ as broad as article 2 of pereopod 5 8
8. Telson split its full length .... *Zobracho* n.gen.
8. Telson split $^1/_3$ its length .... *Priscillina*
9. Gnathopods chelate .... *Platyischnopus*
9. Gnathopods subchelate 10
10. Article 5 of first gnathopod subequal to 6 in length 11
10. Article 5 of first gnathopod 1.5 times longer than 6 12
11. Articles 4-5 of pereopod 5 grossly expanded .... *Haustoriopsis*
11. Articles 4-5 of pereopod 5 slender .... *Pontoporeia*
12. Inner ramus of uropod 3 scale-like, half as long as outer ramus .... *Carangolia*
12. Inner ramus of uropod 3 subequal to outer 13
13. Mandibular palp large, on basal process, article 3 subfalcate, molar small, toothed .... *Phoxocephalopsis*
13. Mandibular palp small, directly on mandibular body, article 3 linear, molar large, smooth 14
14. Article 4 of pereopod 4 not expanded, article 2 of pereopod 5 not greatly produced downward .... *Urothoe*
14. Article 4 of pereopod 4 expanded, article 2 of pereopod 5 greatly produced downward *Urothoides*

Carangolia n. gen.

Diagnosis:

Mandible very large, bulky; the mandibular triturating surface is large and smooth and lies apically at the cutting edge rather than in the normal molar position; mandibular palp small in relation to the body of the mandible but is triarticulate; antenna 1 not geniculate; pereopods 3-5 slender; coxae 1-4 subequal; uropod 3 small, short, stubby.

Type species: *Carangolia mandibularis* n.sp.

Relationship:

Except for the structure of the mandibles and third uropods this genus resembles *Urothoe* Dana closely.

Carangolia mandibularis n. sp.

Material:

Vema St. 54, Cape Basin, south Atlantic Ocean, 4680 m. Holotype, ?sex, 2.25 mm.

Diagnosis:

Article 2 of pereopod 3 not greatly shortened, evenly lobate and castellate behind; article 2 of pereopod 4 lacking long setae behind; eyes absent; accessory flagellum vestigial.

This species will be figured in BARNARD (1961).

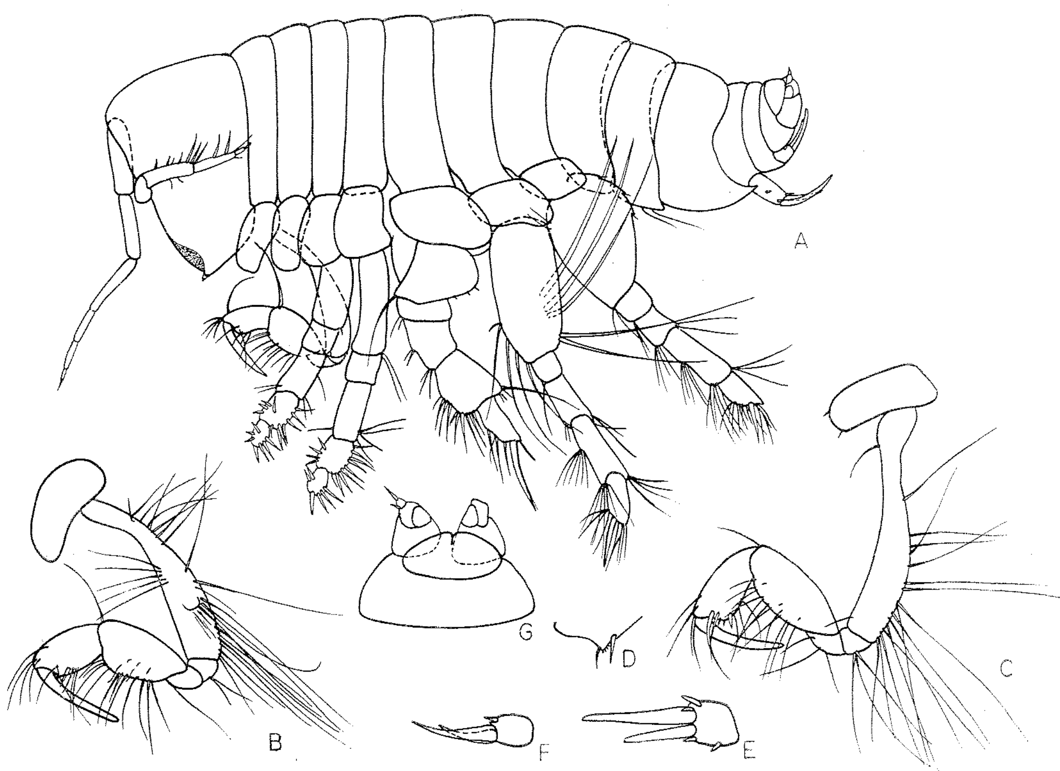


Fig. 42. *Carangolia puliciformis* n. sp. Female, 3 mm, St. 626. A, lateral view; B, C, gnathopods 1, 2; D, palmar corner of gnathopod 1; E, F, uropods 1, 2; G, dorsal view of pleon segment 6 with attached third uropods and telson.

Carangolia puliciformis n. sp.
(Fig. 42)

Material:

St. 626, Tasman Sea, 42°10'S 170°10'E, 610 m, Globigerina ooze, ST 300, 20. I. 1952. Holotype, female, 3.5 mm; figured female, 3 mm; dissected female, 3 mm; another specimen 3 mm. Total: 4 specimens.

Diagnosis:

Article 2 of pereopod 3 very short, asymmetrically lobed behind, margin smooth; article 2 of pereopod 4 bearing 5 long setae; eyes and accessory flagellum absent.

Mouthparts similar to the type species, *C. mandibularis* Barnard, 1961.

Relationship:

Differing from the type species only by the points in the diagnosis. The second article of pereopod 3 in *C. mandibularis* bears marginal castellations and pereopod 4 lacks long setae. The palm of gnathopod 2 on *C. puliciformis* lacks the small projection seen on *C. mandibularis*.

Both species resemble fleas, hence the name chosen for the new species.

Zobracho n. gen.

Diagnosis:

Antenna 1 not geniculate; mandibular molar slender, cylindrical; lower lip with well developed mandibular lobes; article 4 of maxillipedal palp blunt apically, setose; coxa 1 evanescent but not vestigial, about one half as long as coxa 3; coxae 1-2 obtusely pointed below; fifth articles of gnathopods more than 1.5 times as long as sixth articles; pereopod 2 like pereopod 1; articles 4 and 5 of pereopods 4 and 5 are about one third as broad as article 2 of pereopod 5; telson split its full length; uropod 3 well developed, setose, inner ramus on female half as long as outer ramus.

Type species: *Zobracho canguro,* n. sp.

Relationship:

The new genus differs from *Priscillina* Stebbing by the fully split telson; from *Haustorius* Muller by the poorly expanded fourth and fifth articles of pereopods 4 and 5 and the presence of mandibular lobes on the lower lip; from *Urothoe* Dana by the pointed first 2 coxae and the smaller mandibular molar; from *Phoxocephalopsis* Schellenberg by the pointed first 2 coxae.

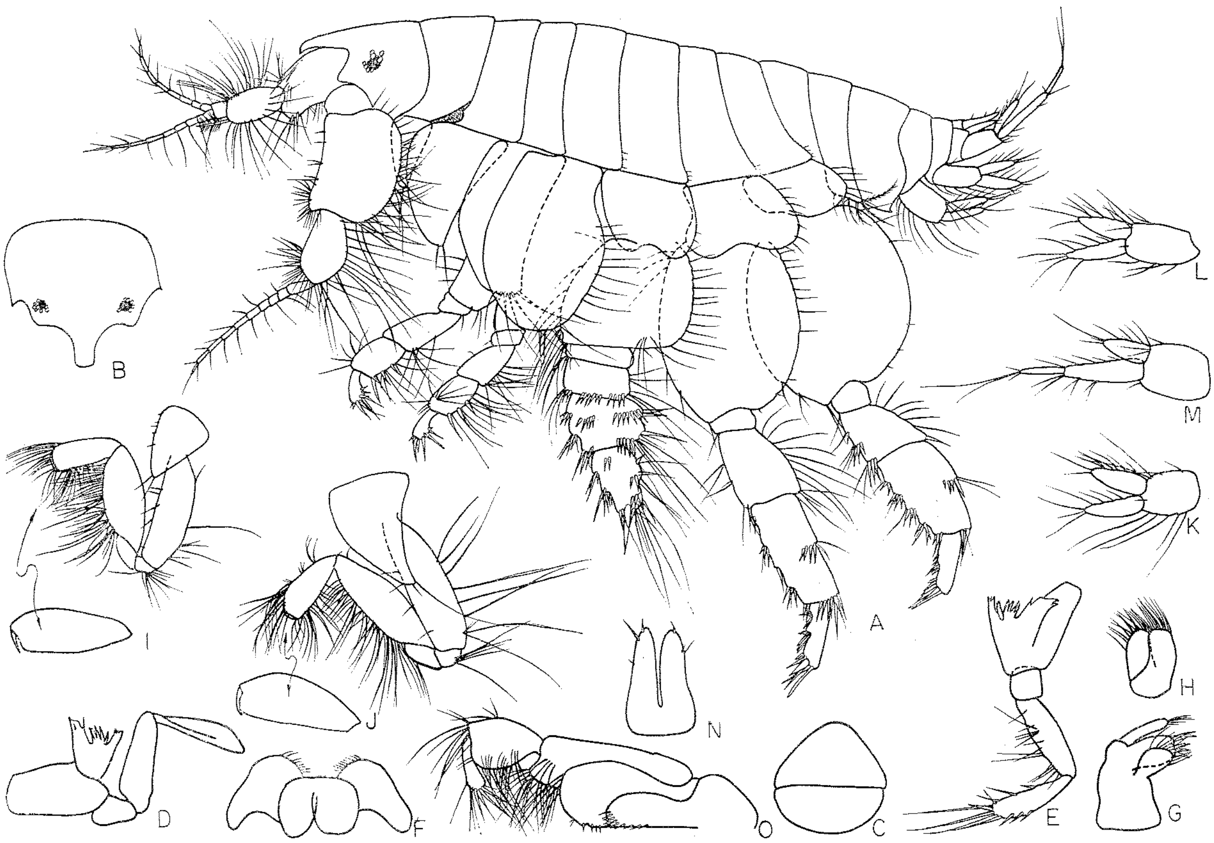


Fig. 43. *Zobracho canguro* n. gen., n. sp. Female, holotype, 5.5 mm, St. 555. A, lateral view; B, head, dorsal view; C, upper lip; D, E, mandibles; F, lower lip; G, H, maxillae 1, 2; I, J, gnathopods 1, 2; K, L, M, uropods 1, 2, 3; N, telson; O, maxilliped.

Zobracho canguro n. sp.
(Fig. 43)

Material:

St. 555, Great Australian Bight, 37°21'S 138°44'E, 875 m, clay, a little sand, PGI 0.2, 6. XII. 1951. Holotype, female, 5.5 mm. Unique.

Diagnosis:

With the characters of the genus.

Eyes composed of a few loosely aggregated ommatidea and a small amount of pigment; rostrum well developed; rami of uropods flat, straight, not deformed; third pleonal epimeron with bulbous hind edge and small, sharp tooth at lower corner.

The inner plate of the first maxilla is attached so as to overlie the outer plate and obscure it from view when examining the attached appendage.

FAMILY LEUCOTHOIDAE

Leucothoe panpulco n. sp.
(Fig. 44)

Material:

St. 716, Acapulco-Panama, 9°23'N 89°32'W, 3570 m, dark muddish clay, HOT, 6. V. 1952. Holotype, female, 9 mm, figured; another specimen 7 mm. Total: 2 specimens.

Diagnosis:

Eyes poorly developed, composed of a small mass of dense tissue; third palp article of mandible more than half as long as second article; article 3 of antenna 1 only one fourth as long as article 1; article 6 of gnathopod 1 exactly twice as long as anterior edge of article 5, finger slender, one fourth as long as article 6; palm of gnathopod 2 minutely dentate, the small projections increasing slightly in size distally; third pleonal epimeron slightly convex behind, sinuous, lower corner quadrate; telson elongate, apex rounded, not ornamented.

Relationship:

The 21 species of the genus *Leucothoe* are not well defined but the present species is distinct from most of them by the poorly developed eyes. It is distinct from the following bathyal or abyssal species: *L. tridens* Stebbing, 1888 bears an apically trifid telson; *L. miersi* Stebbing, 1888 has a markedly shortened third mandibular palp article; *L. rostrata* Chevreux,

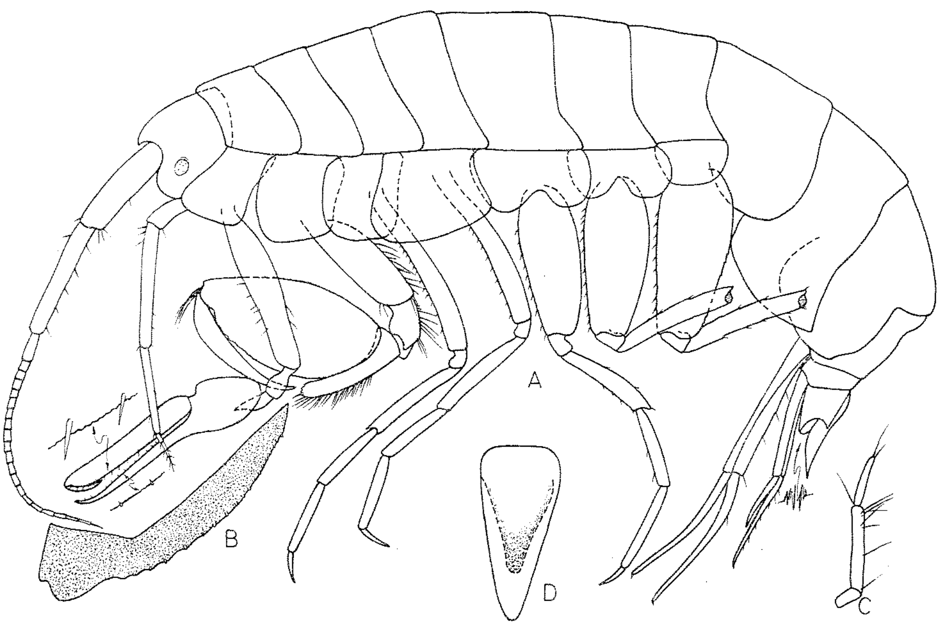


Fig. 44. *Leucothoe panpulco* n.sp. Female, holotype, 9 mm, St. 716. A, lateral view; B, palm of gnathopod 2; C, palp of mandible; D, telson.

1908 has a large rostrum and short telson; *L. uschakovi* Gurjanova, 1951 has a strongly toothed third pleonal epimeron and the third article of the first antenna is more than half as long as article 1. Essentially the new species is a nearly blind *L. spinicarpa* (in SARS 1895: pl. 100, 101, fig. 1) with similar mouthparts, antennae and gnathopods.

The third uropods are missing on both specimens.

FAMILY AMPHILOCHIDAE

Gitanopsis difficilis n. sp.

(Fig. 45)

Material:

St. 555, Great Australian Bight, 37°21′S 138°44′E, 875 m, clay, a little sand, PGI 0.2, 6. XII. 1951. Holotype, ovigerous female, 2.2 mm. Unique.

The single specimen of this new species is in poor condition, having lost the ends of the second antennae, the third uropods and the ends of the pereopods; however, in dissecting the species it was determined that it is clearly unrelated to any other known species and so will be described.

Diagnosis:

Head with rostrum extending to end of first article of antenna 1; a vestigial scale-like accessory flagellum is present; eyes irregularly oval, bleached, not distinguished into dark and light zones; coxa 1 much smaller than coxa 2 and hidden by it; article 2 of gnathopod 1 lacks any basal cusp, anterior edge bearing 3 stout spines; gnathopod 2 with the lobe of article 5 reaching the end of article 6; both gnathopods with expanding, broad sixth articles, palms slightly oblique, microscopically pectinate but not toothed, defined by 2 spines at the corner; article 7 (dactyl) simple, except for one slit-like tooth on the inner edge; pleon segment 3 with straight posterior edge, similar to *G. inermis* Sars, 1895 (pl. 77, fig. 1) with lower corner sharply quadrate; telson cannot be compared with uropod 3, but it is intermediate in length, tapering, and triangular.

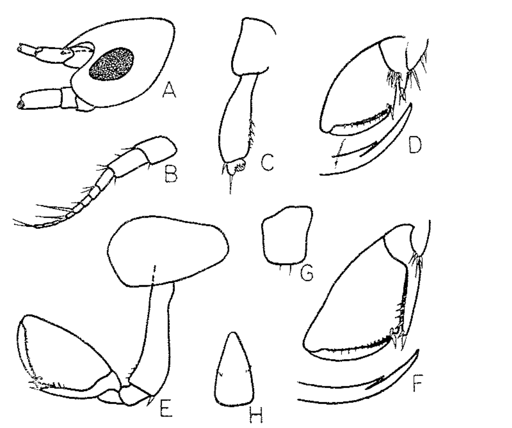


Fig. 45. *Gitanopsis difficilis* n.sp. Female, holotype, 2.2 mm, St. 555. A, head; B, antenna 1; C, basal article of right gnathopod 1; D, end of gnathopod 1; E, gnathopod 2; F, end of gnathopod 2; H, telson.

Relationship:

STEPHENSEN (1949: 6) has provided a key to *Gitanopsis,* in which the present species fits section B, those species with the hind lobe of article 5 on gnathopod 2 reaching to the corner of the palm on article 6. The new species differs from both *G. pusilla* K. H. BARNARD, 1916 (see STEPHENSEN 1949) and *G. tortugae* Shoemaker, 1933 by the more triangular telson, the simple article 7 of both gnathopods, the uniform eyes and other features. The new species is also related to *G. marionis* Stebbing, 1888 (pl. 38) but the gnathopodal palmar articles are more rectangular and expanding and the posterior edge of the third pleonal epimeron is straight, not convex. From *G. inaequipes* Schellenberg, 1926 the new species differs by the less attenuated telson and the much larger and better developed first gnathopod. Finally, from *G. inermis* Sars, 1895 (pl. 77, fig. 1) the species differs by the shorter telson and the uniform eyes. The mouthparts of the new species are identical to those of *G. inermis* and the general body shape, including the coxae fits *G. inermis.*

FAMILY STILIPEDIDAE

Alexandrella dentata Chevreux, 1912
(Fig. 46)

Alexandrella dentata Chevreux, 1912: 134-138, figs. 31-33.

Material:

St. 554, Great Australian Bight, 37°28'S 138°55'E, 1340-1320 m, Globigerina ooze, ST 300, 5. XII. 1951. Female, 9 mm; juvenile 6 mm. Total: 2 specimens.

Remarks:

Except for the shape of the dorsal carina on pleon segment 4 these specimens correspond exactly to Chevreux' excellent description and figures. Neither specimen is in good condition, both having lost the ends of the pereopods and having lost some pieces of uropods but at least one of each part is present on either specimen. The dorsal carina of pleon segment 4 differs from that of CHEVREUX' type by increasing elevation posteriorly rather than being perfectly flat-topped. The writer considers this not of specific value. The young juvenile has the second coxae on both sides of the animal considerably reduced in size when compared with either coxae 1 or 3 but the larger female specimen has coxa 2 as drawn by CHEVREUX.

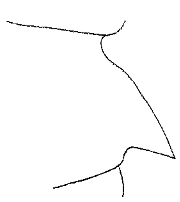


Fig. 46. *Alexandrella dentata* Chevreux. Female, 9 mm, St. 554. Dorsal configuration of pleon segment 4.

Distribution:

Antarctic, Alexander I. Island, 71°S, 297 m; Great Australian Bight, 37°S, 1340-1320 m.

FAMILY PARDALISCIDAE

Arculfia n. gen.

Diagnosis:

Rostrum about half as long as first article of antenna 1, article 2 only half as long as 1, base of primary flagellum long and unsegmented, not inflated; accessory flagellum well developed; cutting edge of mandible smooth on both sides; third mandibular palp article shorter than article 1; upper lip not incised below; lower lip with fused inner lobes; maxilla 2 with setae lining inner edge of inner plate; maxilliped with relatively long articles supporting the small fused inner lobes, article supporting outer plates is short, palp well developed; gnathopod 1 simple, gnathopod 2 with distinct palm; articles 5 and 6 of gnathopods about subequal in length; telson split its full length.

Type species: *Arculfia trago* n. sp.

Relationship:

A key to the Pardaliscidae was provided by J. L. BARNARD (1959a). The presence of an accessory flagellum and the minute third article of the mandibular palp separate the genus from all others in the family, except *Halice* Boeck. It differs from *Halice* only by the subchelate, not simple second gnathopod. The mouthparts project below in a quadrangular assemblage, not conical, unlike *Halicella* Schellenberg, 1926a.

Arculfia trago n. sp.
(Fig. 47)

Material:

St. 626, Tasman Sea, 42°10'S 170°10'E, 610 m, Globigerina ooze, PGI 0.2, 20. I. 1952. Holotype, female, 7 mm, ovigerous; and one broken specimen, head end only. Total: 2 specimens.

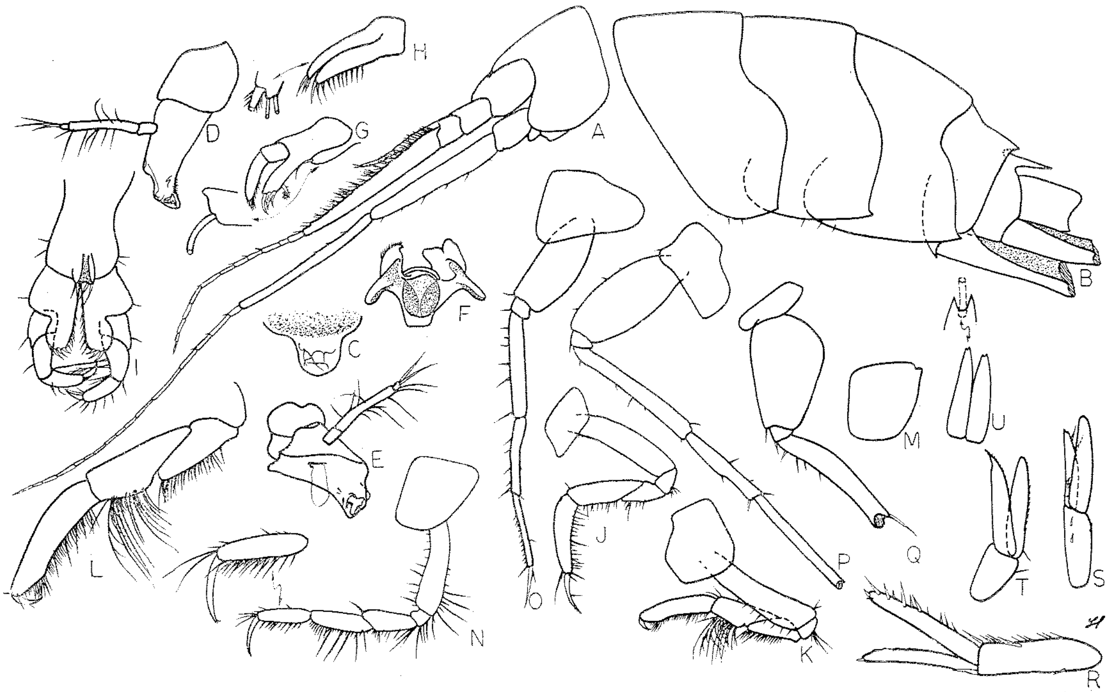


Fig. 47. *Arculfia trago* n. gen., n. sp. Female, holotype, 7 mm, St. 626. A, head; B, pleon; C, upper lip; D, E, mandibles; F, lower lip; G, H, maxillae 1, 2; I, maxilliped; J, K, gnathopods 1, 2; L, gnathopod 2, enlarged; M, coxa 3; N, O, P, Q, pereopods 2, 3, 4, 5; R, S, T, uropods 1, 2, 3; U, telson.

Diagnosis:

With the characters of the genus. Pleonal epimera with convex posterior edges and small points at the lower corners; dorsum of pleon segment 4 with a false tooth covered by a margin of chitin, dorsum of pleon segment 5 with a distinct tooth. Pereopods 1 and 2 have the sixth articles slightly broadened and resemble gnathopods, more so than the first gnathopod of the species.

Pardisynopia n. gen.

Diagnosis:

Head with rostrum extending about half way along the first article of antenna 1; article 2 of antenna 1 half or less as long as article 1; accessory flagellum well developed; base of primary flagellum on antenna 1 slender, segmented; upper lip scarcely incised below; neither right nor left mandible with primary cutting edge toothed; article 3 of mandibular palp of medium length, much longer than article 1; lower lip with inner lobes fused; maxilliped with well developed palp; articles supporting inner and outer lobes not excessively elongated; inner lobes not projecting beyond margin of supporting article; gnathopods 1 and 2 simple, fifth articles subequal or shorter than sixth; articles 4 and 5 of pereopods 1 and 2 inflated, as broad as article 2; telson split to its base.

Type species: *Pardisynopia tambiella,* n. sp.

Relationship:

At first it was considered that this type species could be assigned to the genus *Pardaliscella* since the major differences seem to be the quantitative feature of enlarged articles on the first two pereopods. However, another species of the new genus was discovered in the eastern Pacific Ocean in the *Velero IV* collections (to be published later) that has generic characters identical to the type species and which appears to warrant the erection of a new genus. These features, besides the inflated pereopods, are the fully cleft telson, which in *Pardaliscella* is slit only about half of its length, but especially the smooth, not toothed primary cutting edge of the mandible on both sides. In *Pardaliscella* at least one of the mandibles has a strongly toothed cutting edge. In addition, the inner lobes of the maxilliped are much smaller than in *Pardaliscella* and do not project beyond the margin of the article on which they are borne. The writer believes that these are sufficiently important differences to warrant a new genus, and with the forthcoming *Velero IV* report the genus will be composed of two species.

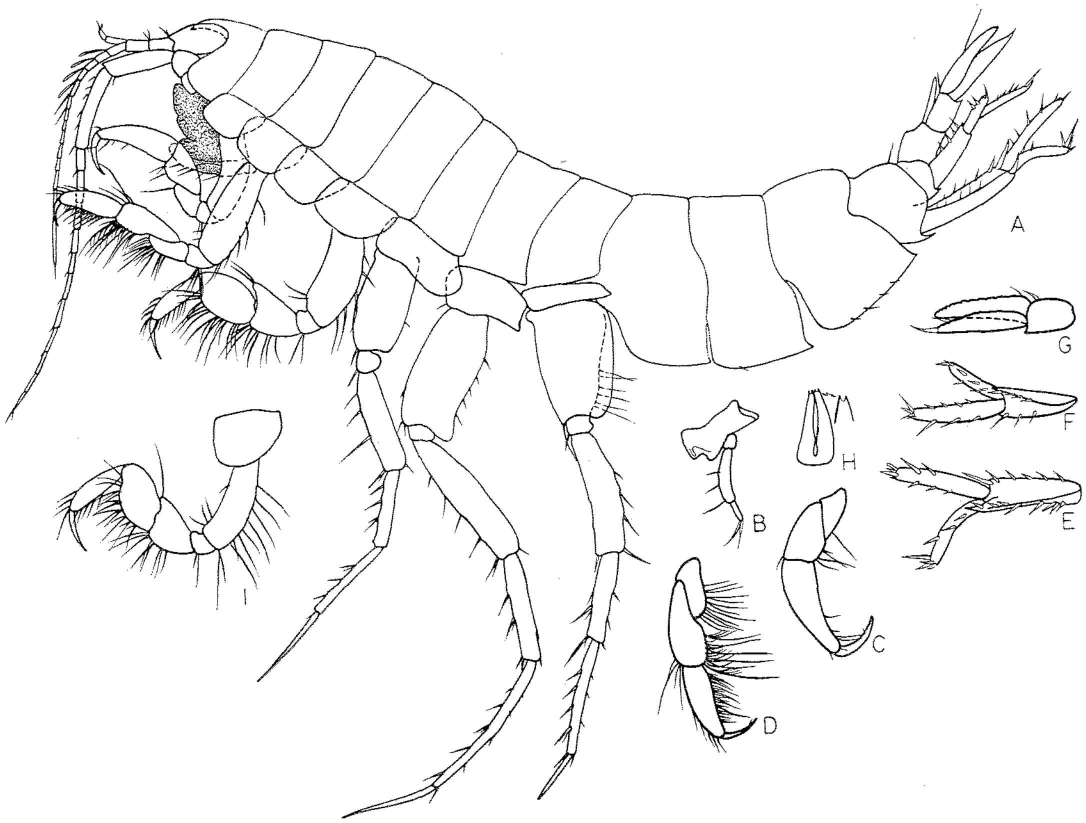


Fig. 48. *Pardisynopia tambiella* n. gen., n. sp. Female, holotype, 4 mm, St. 626. A, lateral view; B, mandible; C, D, gnathopods 1, 2; E, F, G, uropods 1, 2, 3; H, telson; I, pereopod 1.

Notes:

The new genus *Pardisynopia* poses some problems concerning amphipod classification, which involve the family Synopiidae and the possibility that its members do not deserve family status.

The genus *Pardisynopia* is unique in the family Pardaliscidae for its stout first and second pereopods. This case has a parallel in the genus *Synopia* Dana which has familial status because of its stout first and second pereopods. Except for this character *Synopia* would belong to the Tironidae where it is closely related to *Tiron* by its accessory eyes. The writer believes that these two cases, in closely related families (Tironidae and Pardaliscidae) should be treated with parallel decisions. If history were repeated then the new genus should be used as the type of a new family and the otherwise close relationship to Pardaliscidae would be obscured. On the other hand, the writer believes that the Synopiidae do not deserve family rank and should be submerged in the Tironidae.

Pardisynopia tambiella n. sp.
(Fig. 48)

Material:

St. 626, Tasman Sea, 42°10′S 170°10′E, 610 m, Globigerina ooze, PGI 0.2, 20. I. 1952. Holotype, ovigerous female, 4 mm. Unique.

Diagnosis:

Article 2 of pereopod 4 with a lobe at lower posterior corner; pleonal epimera all with a distinct small tooth at the lower corners.

Relationship:

Only the two characters of the diagnosis above will separate this species from the second to be described in a forthcoming paper. In addition, the sixth coxa has a small posterior tooth but I am not certain that part of its configuration was not due to damage.

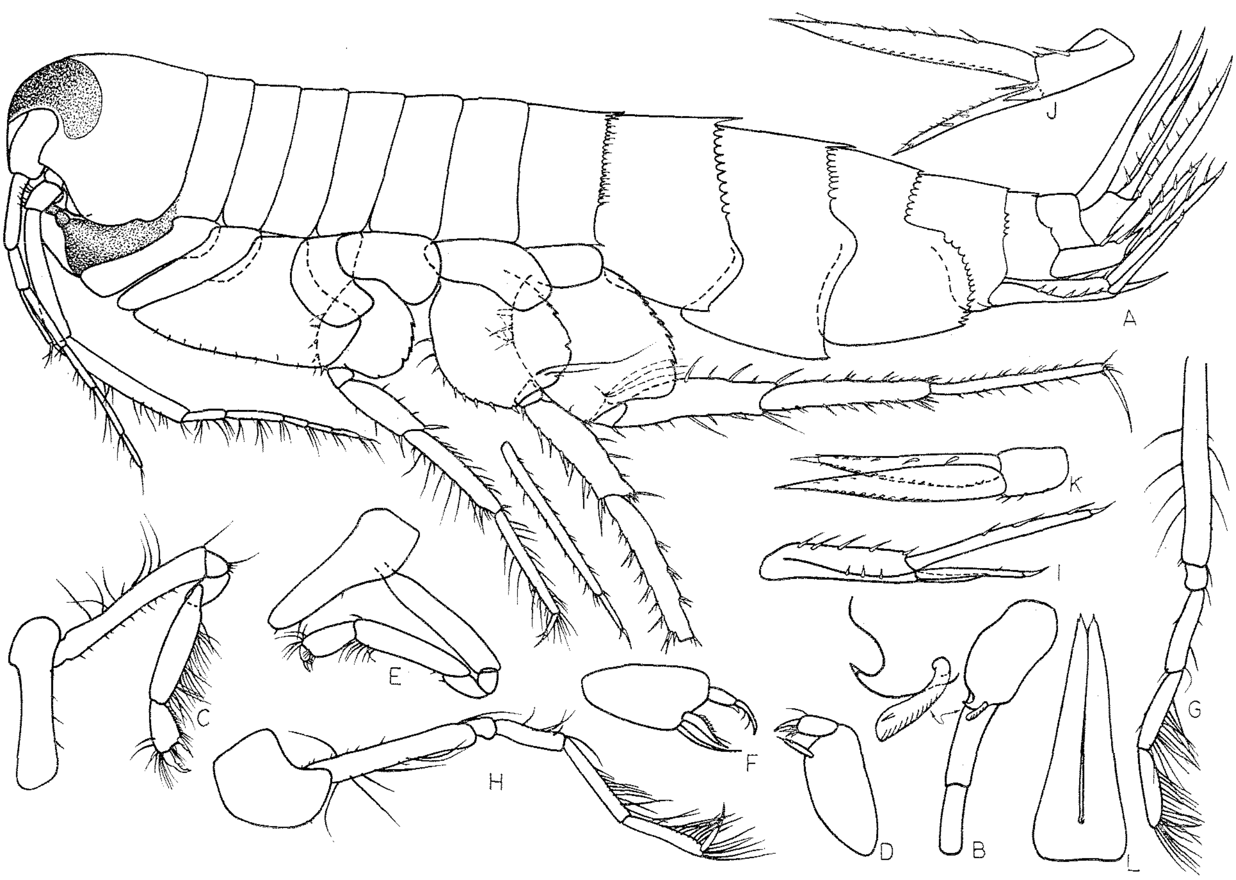


Fig. 49. *Syrrhoe ?affinis* Chevreux. Female, 7 mm, St. 626. A, lateral view; B, antenna 1; C, D, gnathopod 1; E, F, gnathopod 2; G, H, pereopods 1, 2; I, J, K, uropods 1, 2, 3; L, telson.

FAMILY TIRONIDAE

Syrrhoe ?affinis Chevreux, 1908
(Fig. 49)

Syrrhoe affinis Chevreux, 1908: 7-9, fig. 4; SEXTON 1911: 202-207, pl. 3, figs. 1-8; CHEVREUX 1927; 86, pl. 7, fig. 27; CHEVREUX 1935: 98, pl. 13, fig. 7.

Material:

St. 626, Tasman Sea, 42°10'S 170°10'E, 610 m, Globigerina ooze, ST 300, 20. I. 1952. Female, 7 mm; young male, 7 mm; specimen 6.5 mm. Total: 3 specimens.

Diagnosis:

Eyes apparently absent but head possessing an area composed of cellular material not organized into ommatidea; article 2 of pereopods 3-5 only sparsely and minutely toothed; dorsal posterior margins of pereon segment 7 and pleon segments 1-3 sharply serrate, with a dorsal tooth on pereon segment 7 and pleon segments 1-2; posterolateral margin of pleon segment 4 serrate and pleon segment 5 bears one serration; posterior margin of third pleonal epimeron serrate, with a smooth margin between it and dorsal margin; medial distal margin of article 1 on antenna 1 with an unciform tooth and accessory laminiform process. Mouthparts like *S. crenulata* (in SARS 1895: pl. 136).

Relationship:

This species differs from *Syrrhoe semiserrata* Stebbing, 1888 (pl. 51) by the dorsal serrations of pereon segment 7 and pleon segments 1-4.

It differs from *S. crenulata* Goes by the less deeply serrate second article of pereopods 3-5, the gap in the serrations on the third pleonal epimeron and the shorter sixth article of gnathopod 2.

From *S. psychrophila* Monod, 1926 (SCHELLENBERG 1931 and K. H. BARNARD 1932) it differs only by the minor feature of the shorter sixth article on gnathopod 2. Perhaps the serrations of pleon segment 4 have been overlooked in *S. psychrophila*.

The wide geographic separation of the present locality and that of the north Atlantic Ocean for the type casts doubt on the validity of specific concepts in this genus and suggests that *S. crenulata* var. *psychrophila* Monod, 1926 (= *S. psychrophila* by SCHELLENBERG 1931 and K. H. BARNARD 1932) is the same as *S. affinis* and the present specimens, and that these are varieties of *S. crenulata*. Several discrepancies must be cleared up: *S. affinis* and the present specimens lack eyes; the specimens at hand have an accessory process in the form of an articulated laminiform tooth on antenna 1; *S. affinis* and the present specimens have short sixth articles on gnathopod 2; the present specimens have serrations on pleon segments 4 and 5 which may have been overlooked in previous material, because they are very difficult to see. Actually, the shape of the second gnathopod may be the important specific feature.

Distribution:

Originally described from the north Atlantic Ocean off Morocco, 460-888 m; west of the English Channel, 440 m.

FAMILY OEDICEROTIDAE

Key to the Oedicerotidae

This key attempts to minimize the use of eyes. Nevertheless, several genera cannot remain separate without some reference to eyes, as seen in the last part of the key.

1. Gnathopod 2 chelate 2
1. Gnathopod 2 subchelate 3
2. Mandibular molar normal . . . . *Pontocrates*
2. Mandibular molar degraded . . . . *Synchelidium*
3. Primary plate of mandible short, not projecting, untoothed 4
3. Primary plate of mandible projecting, toothed 6
4. Gnathopod 2 with posterior lobe of article 5 guarding article 6 5
4. Gnathopod 2 with posterior lobe of article 5 projecting at right angles, not guarding article 6 . . . . *Westwoodilla* and *Bathymedon*
5. "Mandibular palp article 2 strongly curved" . . . . *Arrhis*
5. "Mandibular palp article 2 straight" . . . . *Aceroides*
6. Uropod 2 reaches only to end of peduncle of uropod 3 7
6. Uropod 2 reaches $^3/_4$ along rami of uropod 3 8
7. Gnathopods 1 & 2, article 5 strongly lobate . . . . *Halicreion*
7. Gnathopods 1 & 2, article 5 not lobate . . . . *Parhalimedon*
8. Mandible lacking palp . . . . *Metoediceros*
8. Mandible bearing palp 9
9. Mandibular molar lacking triturating surface 10
9. Mandibular molar bearing teeth and ridges 15
10. Mandibular molar small, leaf-like, produced into a spine, coxa 4 produced acutely behind *Exoediceropsis*
10. Mandibular molar bulbous or cylindrical, coxa 4 not produced behind 11
11. Lower lip, inner lobes fused 12
11. Lower lip, inner lobes separate 13
12. Telson entire . . . . *Perioculodes*
12. Telson emarginate . . . . *Perioculopsis*
13. Gnathopods 1-2 structurally alike 14
13. Gnathopods 1-2 structurally dissimilar . . . . *Paroediceros*
14. Gnathopods 1 & 2, lobe of article 5 long, guarding article 6 . . . . *Arrhinopsis*
14. Gnathopods 1 & 2, lobe of article 5 short, not guarding article 6 . . . . *Oediceros*
15. Gnathopod 1, palm transverse . . . . *Carolobatea*
15. Gnathopod 1, palm oblique 16
16. Gnathopods 1 and 2, article 5 not distinctly lobate 17
16. Gnathopods 1 and 2, article 5 grossly lobate 19
17. Gnathopod 2 subchelate 18

17. Gnathopod 2 simple.. *Bathyporeiapus*
18. Eyes unpaired, fused; base of pereopod 5 broadly lobed distally................ *Methalimedon*
18. Eyes paired; base of pereopod 5 sharply narrowed distally..................... *Parhalimedon*
19. Back multicarinate.. *Acanthostepheia*
19. Back not multicarinate, usually smooth, occasionally tuberculate......................... 20
20. Coxa 4 produced acutely backward distally............................... *Paroediceroides*
20. Coxa 4 not produced backward distally.. 21
21. Pereopods 1-2, article 7 absent.. *Exoediceros*
21. Pereopods 1-2, article 7 present.. 22
22. Eyes completely fused.. 23
22. Eyes separated by a median line or space or absent.. 24
23. Eyes forming a semicircular ring.. *Gulbarentsia*
23. Eyes forming a circle or oval.. *Paraperioculodes*
24. Gnathopod 2, lobe of article 5 projecting erectly at 90°, not guarding article 6.............. 25
24. Gnathopod 2, lobe of article 5 projecting forward distally at angle of 45° or less, guarding article 6.. 28
25. Eyes lateral... *Oediceropsis*
25. Eyes contiguous at midline or absent.. 26
26. Maxilla 2, outer plate lacking stout spine... 27
26. Maxilla 2, outer plate bearing stout spine.. *Anoediceros*
27. Basal portion of flagellum on antenna 2 swollen.......................... *Lopiceros* n. gen.
27. Basal portion of flagellum on antenna 2 slender............. *Oediceroides* and *Oediceropsoides*
28. Antenna 1 longer than antenna 2... *Monoculopsis*
28. Antenna 1 not longer than antenna 2.. *Monoculodes*

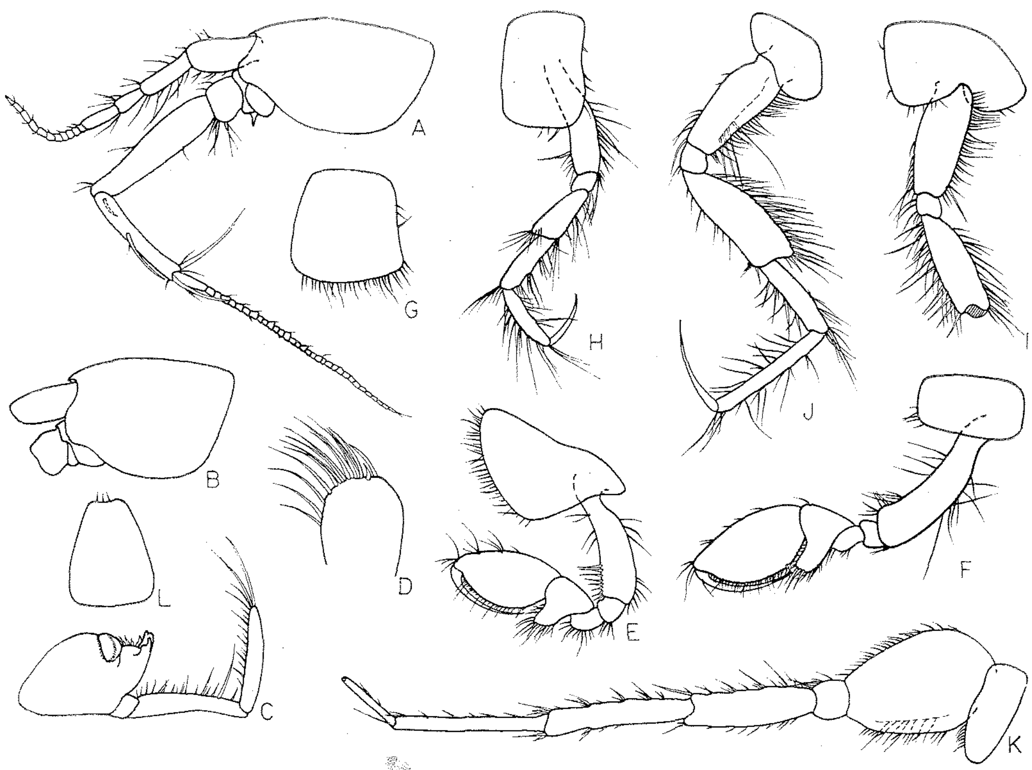
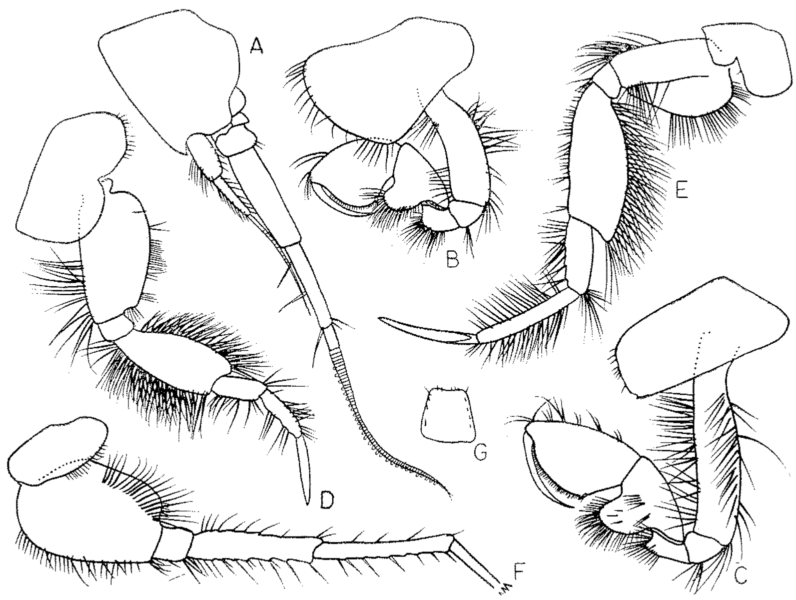


Fig. 50. *Anoediceros hanseni* Pirlot. ?Male, 6 mm, St. 557. A, B, head, two views; C, mandible; D, outer plate of maxilla 2; E, F, gnathopods 1, 2; G, coxa 4; H, I, J, K, pereopods 1, 3, 4, 5; L, telson.

Fig. 51. *Anoediceros hanseni mozambis* n. subsp. Female, holotype, 24 mm, St. 238. A, head; B, C, gnathopods 1, 2; D, E, F, pereopods 3, 4, 5; G, telson.



Anoediceros hanseni Pirlot, 1932
(Fig. 50)

Anoediceros hanseni Pirlot, 1932: 82-87, figs. 22-25.

Material:

St. 557, Great Australian Bight, 37°13′S 138°42′E, 680 m, clay, PGI 0.2, 6. XII. 1951. ?Male, 6.5 mm.

Remarks:

The present specimen appears relatively similar to PIRLOT's species but differs in several small respects which may be problems of drawing, mutilation of specimen and wear. The lateral head lobes of the present specimen project more than in PIRLOT's drawing. The 5th peduncular article of the second antenna bears 3 large spines, not drawn by PIRLOT but possibly broken off in his specimen. The outer plate of the second maxilla bears a stout but unfurcated spine, while PIRLOT showed a bifurcated one. Probably age or wear accounts for this discrepancy.

Anoediceros hanseni mozambis n. subsp.
(Fig. 51)

Anoediceros hanseni Pirlot, 1932: 82-87, figs. 22-25.

Material:

St. 238, off Kenya, 3°23′S 44°04′E, 3960 m, Globigerina ooze, HOT, 13. III. 1951. Holotype, female, 24 mm; and one female, 23 mm. Total: 2 specimens, white in life.

Diagnosis:

Differing from the typical subspecies by the slightly longer fifth article of gnathopods 1 and 2, its slightly less produced posterior lobe; the second article of the fourth pereopod is more expanded proximally. All other parts correspond with PIRLOT's drawings.

Remarks:

The telson of the new subspecies is slightly emarginate but this condition is not apparent in the same position as drawn by PIRLOT (fig. 25) when it is attached to the urosome. The spine defining the palms of both gnathopodal pairs is much shorter than for PIRLOT's material. The typical subspecies came from the Ceram Sea, Indonesia, 835 m.

Bathymedon Sars, 1895

The criterion separating *Bathymedon* from *Westwoodilla* Bate is relatively insignificant. It is based on the straight second mandibular palp article of *Bathymedon* as opposed to the curved condition in *Westwoodilla.* Not all specimens of a species have this article uniformly curved or uniformly straight and certain species seem to be intermediate. Most species of *Bathymedon* have lost the eyes or have them strongly reduced and the rostra are less robust or almost totally absent in contrast to most species of *Westwoodilla.* It is still useful to retain *Bathymedon* as a genus, representing deep sea species, although it is probable that it is polyphyletic and unnatural.

Key to Bathymedon

1. Epistome conically produced.. *covilhani* n. sp.
1. Epistome rounded in front.. 2
2. Article 6 of gnathopod 2 much longer than article 5.................................. *saussurei*
2. Article 6 of gnathopod 2 equal to or shorter than article 5.................................. 3
3. Telson distinctly emarginate.. 4
3. Telson apically rounded or truncate.. 6
4. Rostrum evanescent, blunt, not projecting beyond lateral lobes........................ *palpalis*
4. Rostrum acute, projecting well beyond lateral lobes.................................. 5
5. Eyes absent.. *acutifrons*
5. Whitish eyes present.. *longimanus*
6. Article 3 of first antenna 1.5 times as long as article 1, rostrum totally absent.......... *gorneri*
6. Article 3 of first antenna equal to or shorter than article 1, rostrum present................ 7
7. Head margin vertical below lateral corner.. 8
7. Head margin oblique below lateral corner.. 9
8. Palm of gnathopods longer than hind margin of article 6...................... *candidus* n. sp.
8. Palm of gnathopods shorter than hind margin of article 6........................ *langsdorfi*
9. Article 5 of gnathopod 1 with indistinct hind lobe.................................. 10
9. Article 5 of gnathopod 1 with distinct hind lobe.................................. 11
10. Article 6 of gnathopod 2 shorter than article 5.................................. *tilesii*
10. Article 6 of gnathopod 2 subequal to article 5.................................. *subcarinatus*
11. Article 7 of gnathopod 2 half as long as article 6.................................. *ivanovi*
11. Article 7 of gnathopod 2 nearly as long as article 6.................................. 12
12. Palm of gnathopod 1 shorter than hind margin of article 6, rostrum acute............ *nanseni*
12. Palm of gnathopod 1 as long as hind margin of article 6, rostrum blunt............ *obtusifrons*

Bathymedon candidus n. sp.
(Fig. 52)

Material:
St. 453, Makassar Strait, 3°56′S 118°26′E, 2000 m, greenish clay, ST 300, 24. VIII. 1951. Holotype, female, 6.5 mm. Unique.

Diagnosis:
Eyes absent, rostrum very small; peduncle of antenna 1 short, articles stout, articles 2 and 3 each shorter than article 1; article 5 of gnathopod 1 shorter than article 6, bearing a broad lobe which points slightly distally; article 5 of gnathopod 2 equal in length to article 6, hind lobe slightly more defined than on gnathopod 1 and similar in shape; palm of gnathopods longer than hind margin of article 6; coxa 1 not strongly produced forward; article 2 of pereopod 4 slender; pleon segment 4

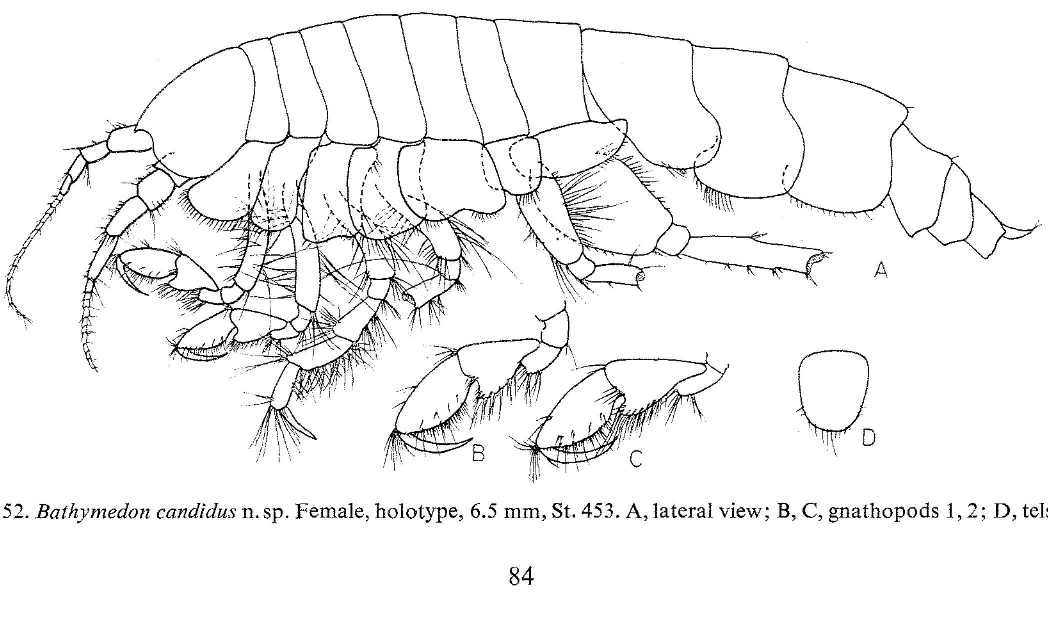
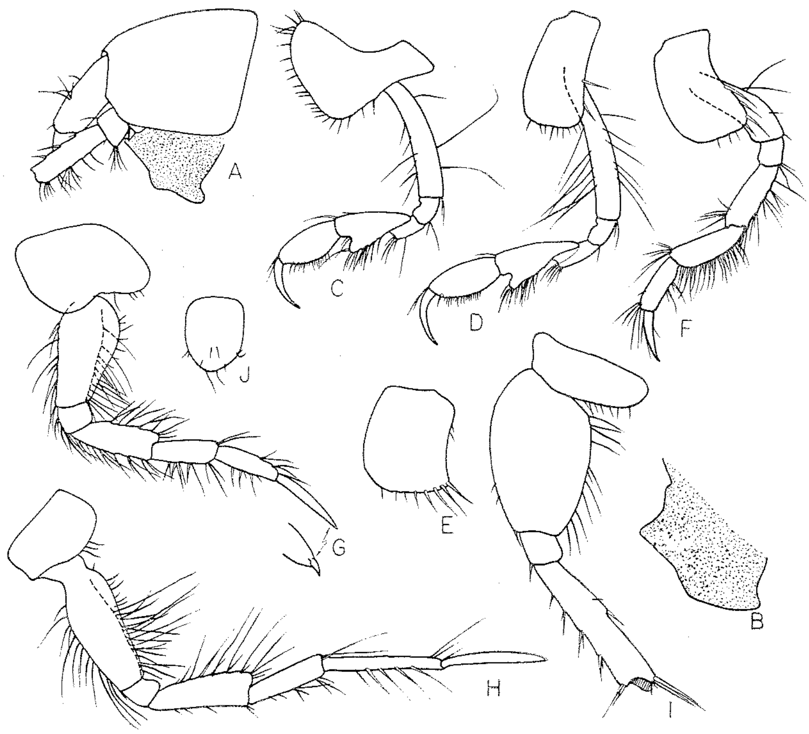


Fig. 52. *Bathymedon candidus* n. sp. Female, holotype, 6.5 mm, St. 453. A, lateral view; B, C, gnathopods 1, 2; D, telson.

Fig. 53. *Bathymedon covilhani* n. sp. ?Male, holotype, 6 mm, St. 745. A, head; B, epistome; C, D, gnathopods 1, 2; E, coxa 4; F, G, H, I, pereopods 1, 3, 4, 5; J, telson.



armed dorsally only with a seta; lower front edge of second pleonal epimeron strongly setose; telson apically rounded.

Mouthparts like *B. longimanus* (in SARS 1895: pl. 117).

Relationship:

Differing from *Bathymedon palpalis* K.H. Barnard, 1916, which it superficially resembles by many features: the stouter first antenna with shorter articles; the similarity of gnathopod 2 to gnathopod 1, whereas in *B. palpalis* gnathopod 2 has article 5 relatively longer than on gnathopod 1; the rounded, not emarginate telson; the lack of stout dorsal spines on pleon segment 4, and the setosity of the second pleonal epimeron.

Bathymedon candidus is related to *B. langsdorfi* Gurjanova, 1951 by the vertical anterior margin of the lateral head lobe but differs by the longer palms of the gnathopods and the smaller rostrum.

Bathymedon covilhani n. sp.
(Fig. 53)

Material:

St. 745, Gulf of Panama, 7°15′N 79°25′W, 915 m, green clay, ST 600, 16. V. 1952. Holotype, ?male, 6 mm. Unique.

Diagnosis:

Eyes absent; rostrum obsolete; epistome conically produced in front; coxa 1 markedly produced forward, first 3 coxae with stout spines on posterior edges; article 5 of gnathopods having the hind lobe detached distally from the hind margin; telson rounded apically.

Mouthparts and first 2 uropods typical of *Bathymedon longimanus* (in SARS 1895: pl. 117). Except for basal articles the antennae are missing. The third uropods are missing. The gnathopodal palms lack defining spines.

Relationship:

It is probable that this species should form the type of a new subgenus assignable to *Bathymedon*, for the produced epistome is unique, perhaps among all Oedicerotidae. Until a firmer base can be made for the distinction of *Bathymedon* from *Westwoodilla*, the writer hesitates in creating the new subgenus.

Superficially the new species resembles *B. palpalis* K.H. Barnard, 1916 by its blunt head but differs by the rounded, not emarginate telson. It resembles *B. gorneri* Gurjanova, 1951, but differs by the detached hind lobes on the fifth articles of the gnathopods.

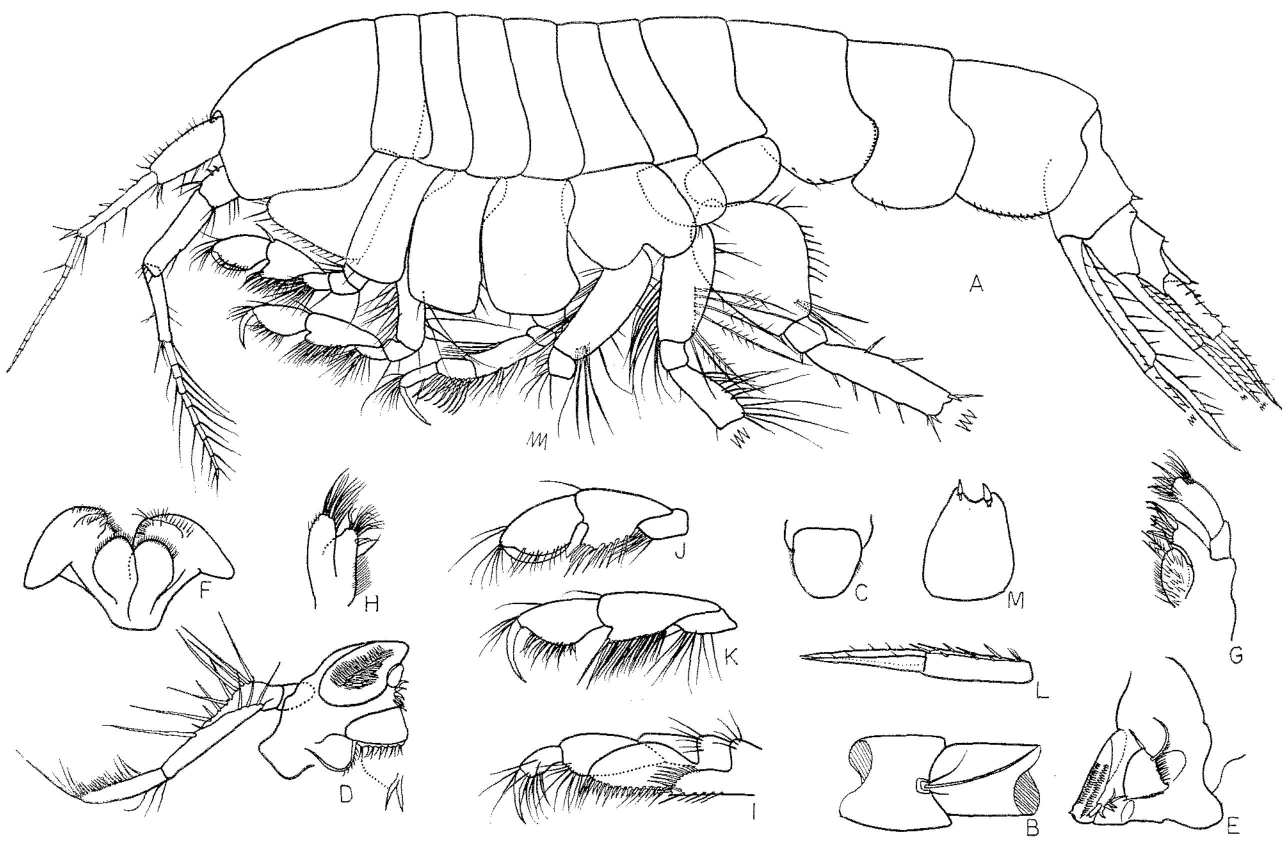


Fig. 54. *Bathymedon palpalis* K.H.Barnard. Female, 7 mm, St. 101. A, lateral view; B, accessory flagellum on antenna 1, enlarged; C, upper lip; D, E, mandibles; F, lower lip; G, H, maxillae 1, 2; I, maxilliped; J, K, gnathopods 1, 2; L, uropod 3; M, telson.

Bathymedon palpalis K.H.Barnard, 1916
(Fig. 54)

Bathymedon palpalis K.H.Barnard, 1916: 163-165, pl. 27, figs. 1-3.

Material:

St. 101, off Angola, 8°50′S 12°32′E, 990 m, greenish mud, ST 300, 12. XII. 1950. Figured female, ovigerous, 7 mm and 2 mutilated specimens; total 3 specimens.

Diagnosis:

Eyes absent, rostrum very small; peduncle of first antenna long, slender, article 2 subequal to article 1, article 3 much shorter than 1; article 5 of gnathopod 1 slightly longer than article 6, bearing a broad posterior lobe; article 5 of gnathopod 2 much longer than article 6, posterior lobe shallower than on first gnathopod, palm of gnathopods longer than hind margin of article 6; coxa 1 produced forward strongly; pereopods 3-4 with article 2 slender; pleon segment 4 with a pair of stout dorsal spines; telson emarginate, each lobe with a stout spine.

Remarks:

The present specimens fail to answer K.H.Barnard's description in the first antenna, where article 2 of the peduncle is as long as article 1, otherwise there is close agreement. The denticles of pleon segment 4 are described herein and the third uropod figured. Antenna 1 bears a very minute accessory flagellum, as drawn.

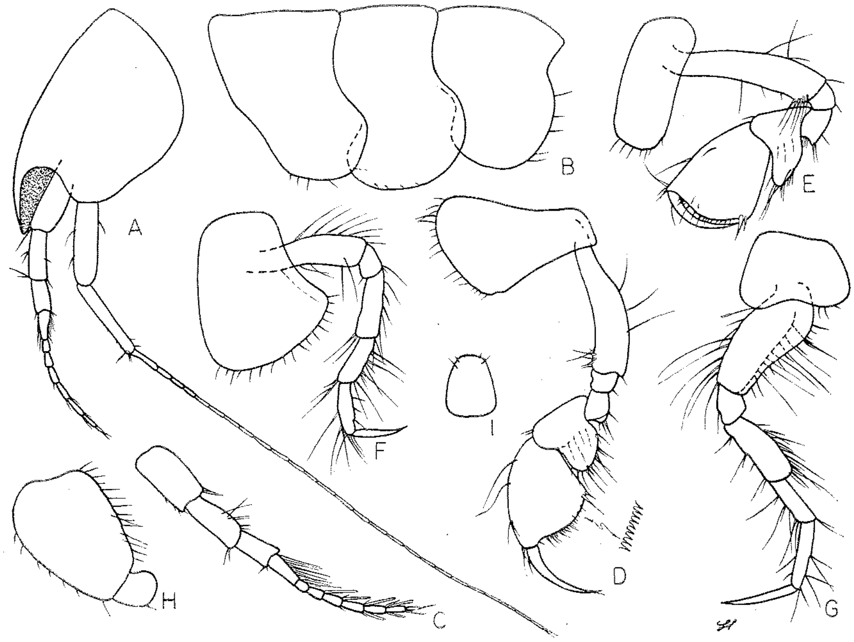
Distribution:

Recorded by K.H.Barnard from off Cape Point, South Africa, 650 fms (1190 m).

Monoculodes Stimpson, 1853

The type and most of the species of *Monoculodes* are distinguishable from *Oediceroides* by the fifth article of the second gnathopod which is slender and curved or geniculated distally to guard article 6; however, a few species, best represented by *M. latissimanus* Stephensen, 1931 have this lobe unmodified and short, not guarding the sixth article so that it is problematical as to what genus Stephensen's species might belong. However, all species

Fig. 55. *Monoculodes abacus* n. sp. ?Male, holotype, 4 mm, St. 626. A, head; B, pleon segments 1-3; C, antenna 1; D, E, gnathopods 1, 2; F, G, H, pereopods 2, 4, 5; I, telson.



of *Oediceroides* which the writer has been able to check microscopically or in the literature have uniform gnathopods and specific differences in gnathopods are of no value in that genus. On the other hand the gnathopods are of major importance in *Monoculodes* for specific criteria and because the variations are rampant it is the writer's belief that the atypical stout gnathopods of *M. latissimanus* represent evolution within the genus *Monoculodes* and not *Oediceroides*.

Monoculodes abacus n. sp.
(Fig. 55)

Material:

St. 626, Tasman Sea, 42°10'S 170°10'E, 610 m, Globigerina ooze, PGI 0.2, 20. I. 1952. Holotype, male ?, 4 mm.

Diagnosis:

Eyes absent, rostrum nearly straight, tapering acutely, reaching to end of first peduncular article of antenna 1; sixth or palmar articles of gnathopods very stout, broad, palms nearly transverse; lobe of fifth article on gnathopod 1 stout, short, blunt, reaching slightly more than halfway along article 6, lobe on gnathopod 2 more slender but reaching only halfway along article 6; article 7 of pereopods 1 and 2 as long as article 6; telson with apex slightly convex, spinules small. The uropods and pereopods are largely broken.

Relationship:

The differences between the genera *Oediceroides* and *Monoculodes* are strongly intergraded in some species such as *Monoculodes latissimanus* Stephensen, 1931, to which the new species *M. abacus* is most closely related; however, *M. abacus* more apparently belongs to *Monoculodes* because the lobe on the fifth article of gnathopod 2 projects slightly distalwards. The rostrum of *M. abacus* is slightly longer and much more conspicuous than in *M. latissimanus* and the telson is slightly convex and armed with small, not large spinules. This species might be keyed to *M. diamesus* Gurjanova (GURJANOVA 1951) but the head, rostrum, and shapes of articles 5 and 6 on gnathopods 1 and 2 are quite distinctive. In *M. diamesus* the lateral head lobes are quite acute and the lobes of the gnathopods are distinctly geniculate.

Genus **Oediceroides** Stebbing, 1888

Oediceroides Stebbing, 1888: 843.
Oediceropsoides Shoemaker, 1925: 27.

Diagnosis:

Mandible with projecting primary cutting teeth; mandibular molar bearing teeth and ridges; mandibular palp present; gnathopodal pairs of similar structure, subchelate, palms oblique, hind lobe of fifth article perpendicular to anterior surface, not guarding article 6; posterior corner of coxa 4 not

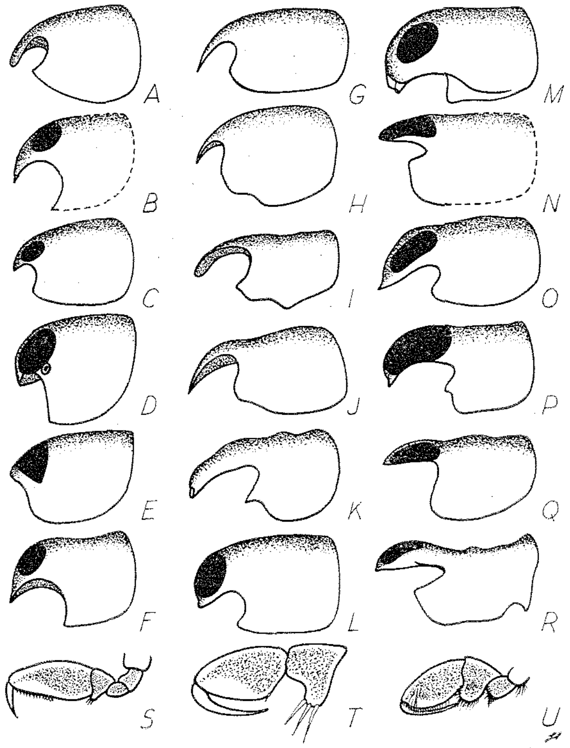


Fig. 56. Taxonomic illustrations of species in the genus *Oediceroides,* largely based on head morphology. Gnathopods of all species are like Fig. U except for *O. zanzabaricus* in Fig. T, and *O. microcarpus* in Fig. S.

Heads: A, *O. similis* Nicholls, 1938; B, *O. pirloti* Sheard, 1936; C, *O. calmani* Walker (CHEVREUX 1912); D, *O. cystifera* Schellenberg, 1931; E, *O. brevirostris* Schellenberg, 1931; F, *O. newnesi* (Walker, 1903); G, *O. weberi* Pirlot, 1932; H, *O. wolffi* n. sp.; I, *O. abyssorum* (Shoemaker, 1925); J, *O. limpieza* n. sp.; K, *O. rostratus* (Stebbing, 1888); L, *O. macrodactylus* Schellenberg, 1931; M, *O. ornithorhynchus* Pirlot, 1932; *O. cinderella* Stebbing, 1888; P, *O. apicalis* K. H. Barnard, 1931 (new figure); Q, *O. ornatus* (Stebbing, 1888); R, *O. emarginatus* Nicholls, 1938.

First gnathopods: S, *O. microcarpus* K. H. Barnard, 1931; T, *O. zanzabaricus* K. H. Barnard 1937; U, type common to all other species.

Heads not drawn were never figured originally; these and their probable shapes are: *O. antennatus* K. H. Barnard, 1937, probably like fig. G; *O. microcarpus* K. H. Barnard, 1930, like fig. G but bearing eyes; *O. plumicornis* K. H. Barnard, 1925, possibly like fig. H; *O. proximus* Bonnier, 1896, like fig. J but rostrum more horizontal; *O. zanzabaricus* K. H. Barnard, 1937, like fig. G, but rostrum even more deflexed.

drawn backwards into an acute tooth; uropod 2 reaching nearly the full length of uropod 3; dorsal surface of body relatively smooth, not multicarinate; first two pairs of pereopods bear a seventh article; when present the eyes are contiguous but separated by a distinct midline, not completely fused; outer plate of maxilla 2 lacks a stout spine differentiated from the normal setae.

Type species: *O. rostratus* (Stebbing).

Remarks:

SHOEMAKER did not discuss the relationship of *Oediceropsoides* to other genera in the family. One might presume that he erected it on the basis of eye loss, but in other respects it does not differ from the type of *Oediceroides* and a number of eyeless species have been described. No doubt *Oediceropsoides abyssorum* has a peculiar head morphology but of no greater extreme than some other species now referred to the genus.

Few criteria, except for the quantitative measure of head shapes, are available for interspecific diagnoses in the genus. One species, *O. antennatus* has a long second peduncular article of the first antenna, peculiar only to that species; another, *O. microcarpus,* has a very small fifth article on the gnathopods (Fig. 56S) and is unique in this respect; a third species *O. zanzabaricus* has the lobe on the fifth articles of the gnathopods occupying only the distal half of the article, and is distinctive for that; otherwise, only heads are useful, except for the rounded or emarginate telsonic apices, varying from species to species.

The following key to *Oediceroides* is based, where possible, on the above criteria. Heads of the species are redrawn from the literature in Fig. 56, except for those species where no figure has appeared. Such species are noted and their probable head shapes described in the caption for Fig. 56.

Key to Oediceroides

Letter figures refer to Fig. 56

1. Antenna 1, article 2 longer than 1	*antennatus*[1]
1. Antenna 1, article 2 equal to or shorter than 1	2
2. Back studded with tubercles	*ornatus*
2. Back relatively smooth, no tubercles, occasionally ridges are present	3
3. Article 6 of gnathopods 4 times as long as article 5	*microcarpus*

1. A poorly known species.

3. Article 6 of gnathopods never more than twice as long as article 5 4
4. Rostrum gibbous (fig. F) 11
4. Rostrum not gibbous 5
5. Rostrum not tapering evenly to an acute point 6
5. Rostrum tapering evenly to an acute point 15
6. Rostrum evanescent, shorter than article 1 of antenna 1 .... *brevirostris*
6. Rostrum equal to or much longer than article 1 of antenna 1, tapering to a blunt attenuated end 7
7. Rostrum with grossly attenuated point .... *rostratus*
7. Rostrum blunt apically, but often minutely attenuated 8
8. Rostrum very slender but blunt apically .... *abyssorum*[1]
8. Rostrum stout but often minutely attenuated ventrally 9
9. Telson rounded apically 10
9. Telson emarginate .... *emarginatus*
10. Rostrum minutely beaked ventrally .... *apicalis*
10. Rostrum not beaked, blunt apically .... *ornithorhynchus*
11. Rostrum defleced nearly at right angles, very attenuated, acute and long .... *pirloti*
11. Rostrum not strongly deflexed, less than 30°, not attenuated, or short 12
12. Eyes bearing lateral cyst .... *cystifera*
12. Eyes lacking lateral cyst 13
13. Rostrum very gibbous (fig. F) .... *newnesi*
13. Rostrum scarcely gibbous 14
14. Head corner produced, subacute .... *macrodactylus*
14. Head corner blunt, scarcely produced .... *calmani*
15. Rostrum extending only halfway along antenna 1, article 1 16
15. Rostrum extending to end of or beyond end of antenna 1, article 1 17
16. Gnathopods 1-2, hind lobe of article 5 occupying $^3/_4$ of hind margin of article 6 .... *wolffi* n.sp.
16. Gnathopods 1-2, hind lobe of article 5 occupying only half of hind margin of article 6 *zanzabaricus*[2]
17. Rostrum strongly deflexed (fig. O) 18
17. Rostrum not strongly deflexed 19
18. Gnathopod 2, lobe of article 5 slender, geniculate .... *similis*
18. Gnathopod 2, lobe of article 5 broad, straight .... *weberi*
19. Eyes present .... *cinderella*
19. Eyes absent 20
20. Dorsal surface of pleon minutely tuberculate, downy .... *proximus*
20. Dorsal surface of pleon smooth 21
21. Antenna 1 strongly set with plumose setae, telson rounded .... *plumicornis*
21. Antenna 1 poorly setose, telson emarginate .... *limpieza* n.sp.

1. SHOEMAKER, 1925, as *Oediceropsoides*.
2. A poorly known species.

cf. **Oediceroides apicalis** K. H. Barnard, 1931 (Fig. 57)

Oediceroides ornatus, CHILTON 1921: 66 (not STEBBING 1888).

Oediceroides apicalis K.H. Barnard, 1931: 121-122, fig. 2.

Material:

St. 626, Tasman Sea, 42°10′S 170°10′E, 610 m, Globigerina ooze, PGI 0.2, 20. I. 1952. Male, 20 mm; male, 12 mm. Total: 2 specimens.

Diagnosis:

Rostrum large, projecting cylindrically, reaching to end of article 2 on antenna 1, lower apex with small, sharp tooth; article 2 of peduncle on antenna 1 not longer than article 1; eyes covering rostrum but not pigmented; lateral lobe of head slightly produced and subacute; pereon segments slightly corrugated; telson entire, not emarginate; gnathopods normal.

Remarks:

The species is otherwise like *O. rostratus* (see

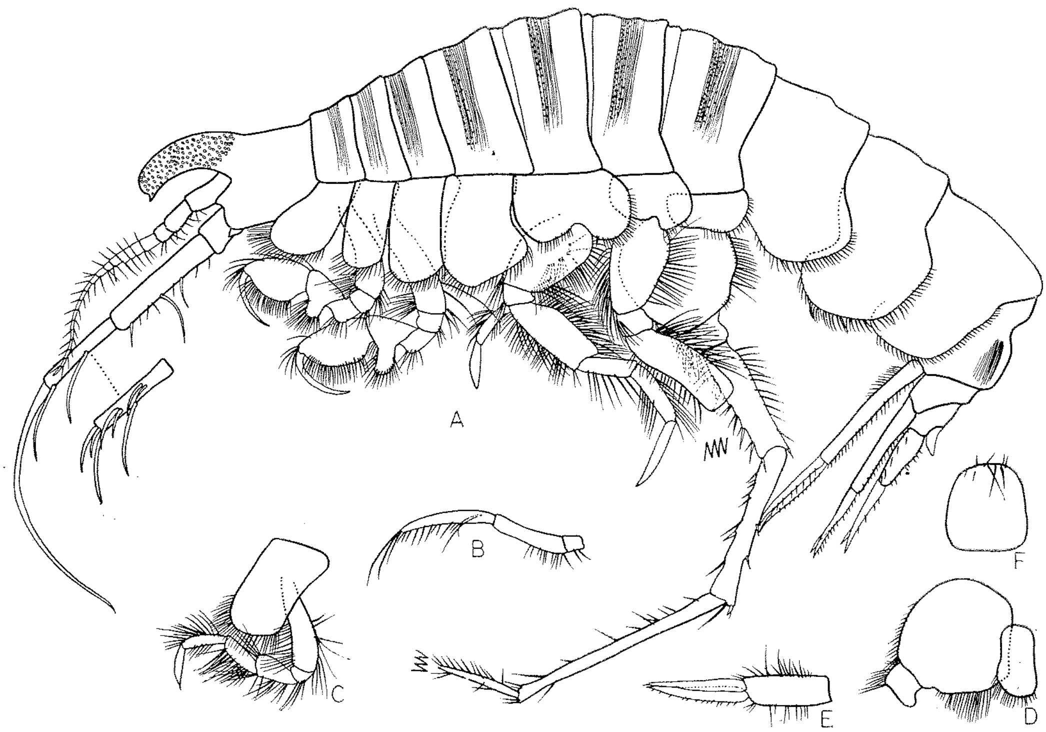


Fig. 57. *Oediceroides apicalis* K.H. Barnard. Male, 20 mm, St. 626. A, lateral view; B, palp of mandible; C, D, pereopods 1, 5; E, uropod 3; F, telson.

STEBBING 1888: pls. 60, 61) in mouthparts and other characters. *Oediceroides apicalis* differs from *O. rostratus* only by the smallness of the apical tooth on the rostrum, which in *O. rostratus* is a large attenuated piece and by the non-emarginate telson. K. H. BARNARD originally figured only the rostrum, so that the identification remains doubtful.

Distribution:

Coral Sea, northeast coast of Australia, 205 m; east slope of Bass Strait; Tasman Sea, west of New Zealand, 610 m.

Oediceroides limpieza n. sp.
(Fig. 58)

Material:

St. 626, Tasman Sea, 42°10′S 170°10′E, 610 m, Globigerina ooze, PGI 0.2, 20. I. 1952. Holotype, female, 13 mm; figured female, 12 mm. Total: 2 specimens.

Diagnosis:

Rostrum relatively straight, tapering evenly to a subacute apex, reaching to end of article 1 on antenna 1; dorsum of rostrum with a minute keel, disappearing at its base; lateral lobe of head blunt; eyes absent; article 2 of antenna 1 slightly shorter than article 1; peduncle of antenna 2 lacking large stout spines; body not tuberculate, either grossly or minutely; first four pereon segments with slight dorsolateral depressions bounded by low ridges; gnathopods with fifth articles large and broadly lobate; telson strongly emarginate.

Relationship:

See the preceding key to *Oediceroides*. The species is closely related to *O. proximus* Bonnier, 1896 and *O. plumicornis* K.H. Barnard, 1925, but has an emarginate telson, a poorly setose first antenna and no minute pleonal tubercles. It is also related to *O. cinderella* Stebbing, 1888, but has an emarginate telson and lacks eyes. It differs from *O. weberi* Pirlot, 1932 by the much longer rostrum and emarginate telson.

Oediceroides macrodactylus alcaldia n. subsp.
(Fig. 59)

Oediceroides macrodactylus Schellenberg, 1931: 140-142, fig. 74.

Material:

St. 556, Great Australian Bight, 37°18′S 138°43′E, 795 m, clay, PGI 0.2, 6. XII. 1951. Holotype, male, 8 mm, unique.

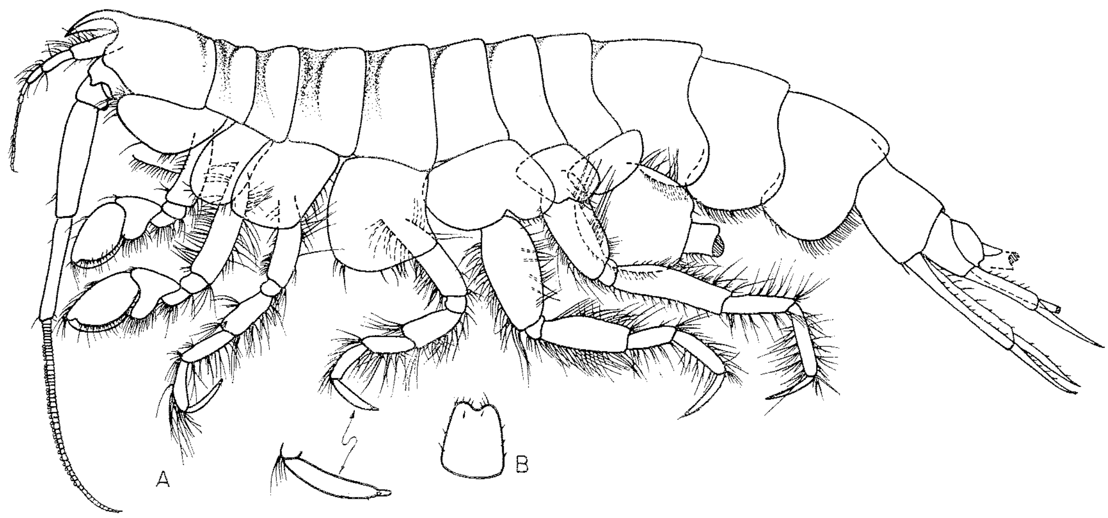


Fig. 58. *Oediceroides limpieza* n.sp. Female, 12 mm, St. 626. A, lateral view; B, telson.

Diagnosis:

Rostrum slightly gibbous, bearing a minutely attenuated point on the ventral apex; lateral head lobes slightly more blunt than in typical subspecies; eyes occupying most of rostrum; article 2 of peduncle on antenna 1 not longer than article 1; peduncle of antenna 2 not bearing large spines; article 5 of gnathopods not pointed as in the typical subspecies; article 7 of pereopods 3 and 4 with claw apically bubble-shaped; dorsal surfaces of pereon segments 1 to 7 with slight ridges and depressions; telson very slightly emarginate.

Mouthparts are like *O. cinderella* (Stebbing, 1888: pl. 62) except that article 3 of the mandibular palp is long, like *O. rostratus* (Stebbing, 1888: pl. 60).

Remarks:

The questions of identification in relation to other species lie in the gnathopods which are not as stout as in *O. cinderella* but more like those of *O. proxi-*

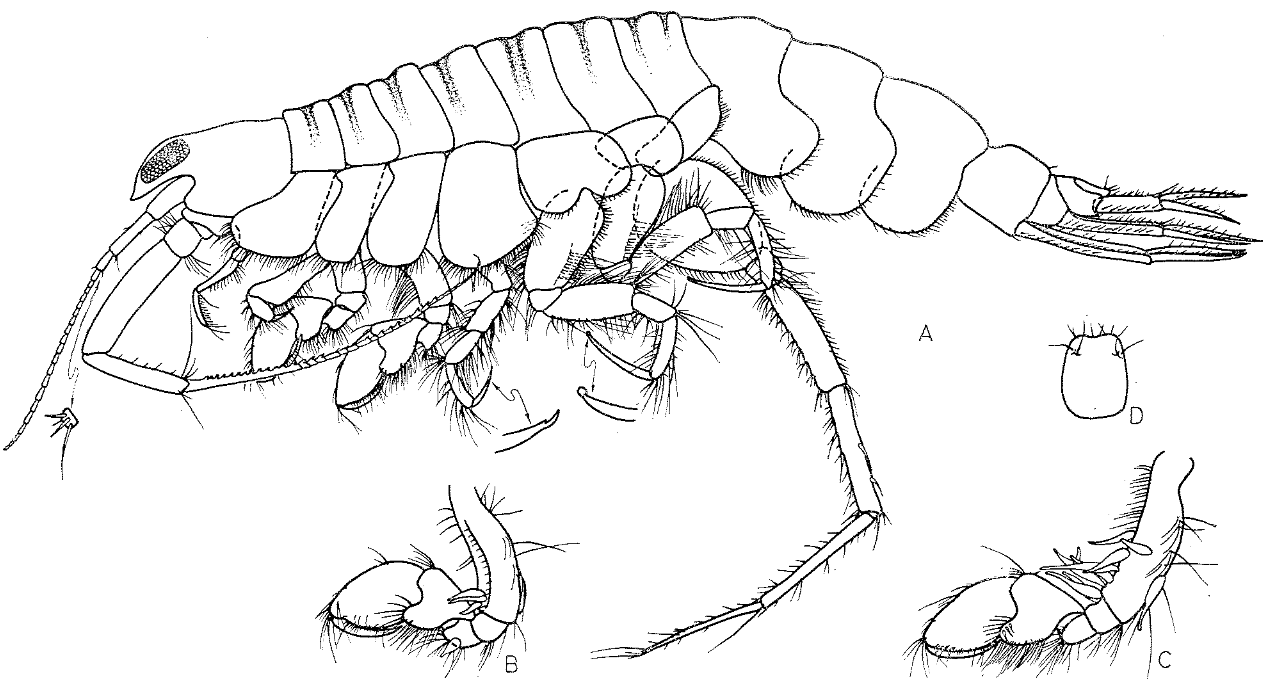


Fig. 59. *Oediceroides macrodactylus alcaldia* n.ssp. Male, holotype, 8 mm, St. 556. A, lateral view; B, C, gnathopods 1, 2, with attached Protozoa; D, telson.

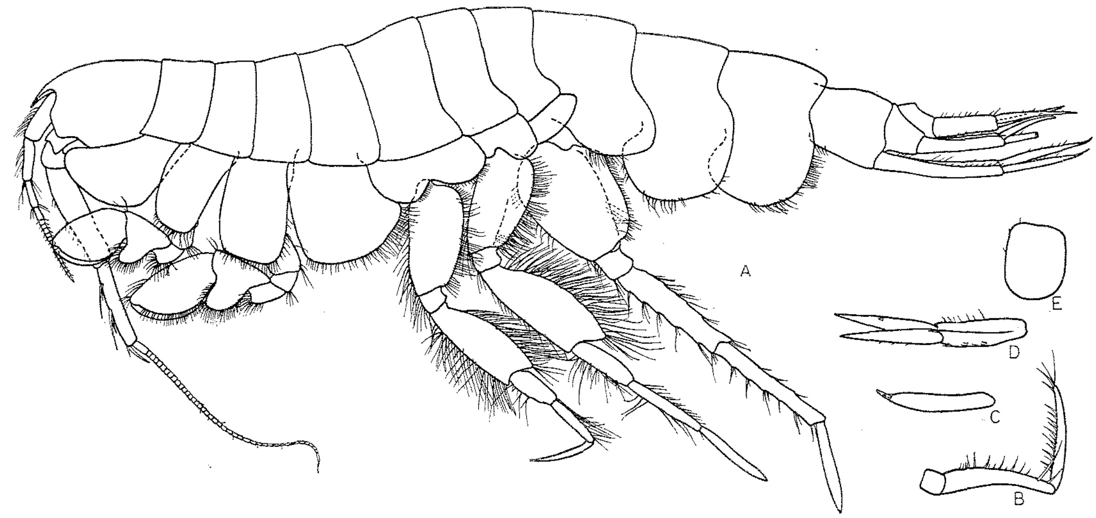


Fig. 60. *Oediceroides wolffi* n. sp. Male, holotype, 16 mm, St. 241. A, lateral view; B, palp of mandible; C, article 7 of pereopod 1; D, uropod 3; E, telson with distal edge at top.

mus, with the fifth articles asymmetrical and inclined distally. The rostrum seems stouter and longer than in STEBBING's small drawing of *O. cinderella;* the telson is slightly emarginate, and the first two pereopod pairs have the tip of article 7 clawlike and not bearing an apical bubble.

Oediceroides wolffi n. sp.
(Figs. 60, 61)

Material:

St. 241, off Kenya, 4°00′S 41°27′E, Globigerina ooze, 1510 m, HOT, 15. III. 1951. Figured male, holotype, 16 mm; two females, 21 and 18 mm; total specimens: 3.

St. 607, Tasman Sea, 44°18′S, 166°46′E, 3580 m, clay, HOT, 17. I. 1952. ?Sex, 6 mm.

Diagnosis:

Rostrum scarcely deflexed, nearly straight, small, acute, scarcely reaching half way along article 1 of antenna 1; lateral lobes of head square; article 2 of antenna 1 slightly shorter than article 1; body lacking tubercles; telson truncate; palp article 3 of mandible as long as article 2; gnathopods normal.

Relationship:

This species is very close to *O. weberi* Pirlot, 1932, but differs by the shorter, less deflexed rostrum. In *O. weberi* the rostrum would reach to the end of article 1 on antenna 1 if it were straightened, whereas the present species has the rostrum less than half as long as that article.

In other respects not described or figured the species is identical to *O. weberi.*

The new species is very closely related to *O. cinderella* Stebbing, 1888 (pl. 62); in fact the two species deserve close comparison. *O. wolffi* differs from *O. cinderella* in the long third palp article of the mandible, which in *O. cinderella* is only two thirds as long as article 2. The head is not as incised between the rostrum and lateral lobes in *O. wolffi* as in *O. cinderella.* In addition, the apices of the dactyls on the pereopods of *O. cinderella* are armed with minute, flat lobular claws which in *O. wolffi* are slender.

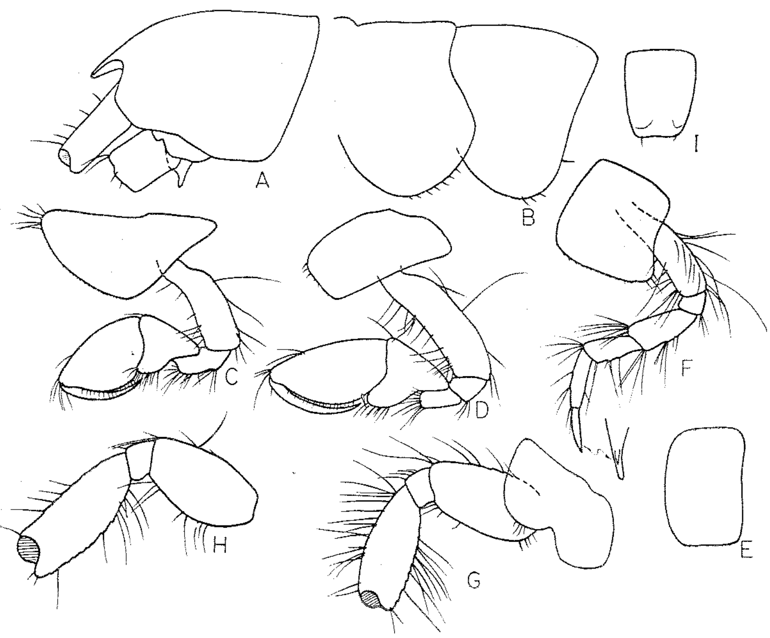
The small specimen from the Tasman Sea and the 3 large specimens cited below may represent a subspecies but because of the small size of the St. 607 specimen and the lack of small specimens from off Kenya, one cannot determine whether the slight differences are those of juvenility. The rostrum is very slightly shorter and less acute and the third pleonal epimeron is straighter behind. The St. 607 specimen is in poor condition, with most of its setae having been worn off, the last three pairs of pereopods broken and the uropods missing.

Doubtful material:

St. 601, Tasman Sea, 45°51′S 164°32′E, 4400 m, Globigerina ooze, HOT, 14. I. 1952. One head end belonging to a specimen probably 20 mm in length. It is like the *O. wolffi* of St. 607 above, having the shorter rostrum.

St. 663, Kermadec Trench, 36°31′S 178°38′W, 4410 m, brown sandy clay with pumice, HOT,

Fig. 61. *Oediceroides ?wolffi* n.sp. ?Sex, 6 mm, St. 607. A, head; B, pleon segments 2-3; C, D, gnathopods 1, 2; E, coxa ? F, G, H, pereopods 2, 3, 4; I, telson.



24. II. 1952. Two head ends 10 and 14 mm long of specimens probably 20 mm long. They are like the *O. wolffi* of St. 607 above, having the shorter rostrum.

These large specimens indicate that the short rostrum is a characteristic feature of south Pacific adult *O. wolffi;* however, the lack of complete specimens prevents perfect identification with the small St. 607 specimen, for the telsonic configuration must be confirmed.

Lopiceros n. subgen.

Diagnosis:

Rostrum evanescent, not projecting farther than lateral lobes of head; antenna 2 with bulbous base to flagellum; palp article 3 of mandible subfalcate; inner plate of maxilla 1 very large, translucent, unarmed; maxilla 2 with very broad inner plate, outer plate lacking a stout spine, bearing only slender setae; gnathopods 1 and 2 similar in structure, subchelate, sixth articles longer than fifth, hind lobes of fifth poorly developed, palms merging with hind margins.

Type species: *Oediceroides (Lopiceros) forensia* n. sp.

Relationship:

The discovery of this new subgenus raises several problems in the genera *Oediceroides, Anoediceros* and *Oediceropsis*. The characters used to define *Lopiceros* are of the same unimportance as the distinguishing features among the three named genera. *Oediceropsis* differs from *Oediceroides* by the presence of lateral eyes, while many species of *Oediceroides* lack any eyes. *Anoediceros* differs from *Oediceroides* primarily by the possession of a stout spine on the outer plate of second maxilla. Indeed, these are characters of dubious value. In the genus *Oediceroides* the species *O. microcarpus,* with its strikingly unique gnathopods justifiably could be segregated as a subgenus; perhaps *O. zanzabaricus,* with its aberrant gnathopods could also be made the type of another subgenus. If these changes were made, then *Anoediceros* probably should be reduced to subgeneric status.

On first inspection the new subgenus, *Lopiceros,* appears to belong more to *Anoediceros* than to *Oediceroides,* because of the evanescent rostrum. However, *Lopiceros* lacks the minor distinction of bearing a stout spine on the outer plate of the second maxilla and the inner plate of that organ is broader than in *Anoediceros*. In addition, the second articles of pereopods 3 and 4 are broader and the shape of the third mandibular palp article differs from the linear one of *Anoediceros*.

Only one species of *Oediceroides, O. brevirostris* Schellenberg, 1931 has a rostrum approaching the reduction seen in *Lopiceros forensia* and by this intergradation it would be possible to include *L. forensia* in the typical *Oediceroides. O. brevirostris* bears well developed eyes and well developed hind lobes on the fifth articles of the gnathopods, however.

In the final analysis, if *Lopiceros forensia* were

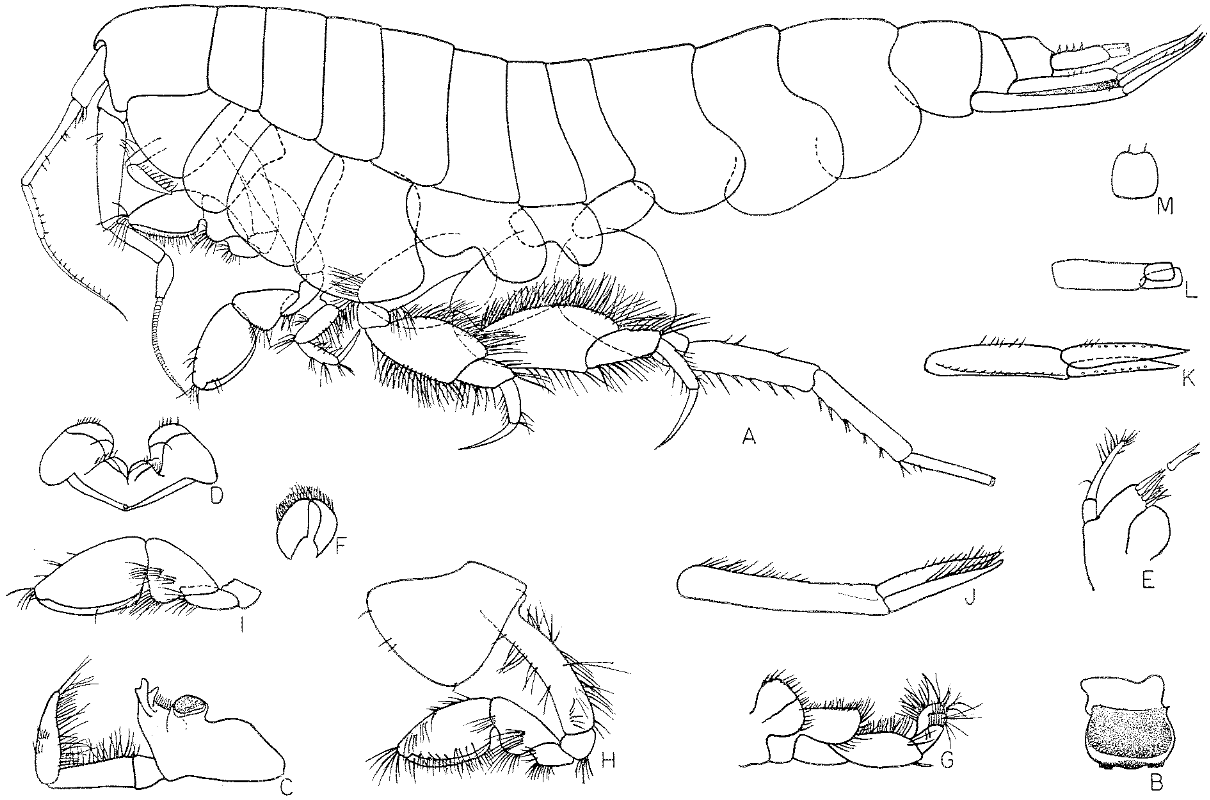


Fig. 62. *Oediceroides (Lopiceros) forensia* n. sp. Female, holotype, 16 mm, St. 607. A, lateral view; B, upper lip; C, mandible; D, lower lip; E, F, maxillae 1, 2; G, maxilliped; H, I, gnathopods 1, 2; J, K, L, uropods 1, 2, 3, the latter with broken rami; M, telson.

assigned directly to *Oediceroides,* its distinctive intergrading characters would be masked. They bear further study in terms of connecting relationships among the several genera concerned.

Unfortunately, only one specimen exists and the uniformity of the swelling on the basal antennal flagellum cannot be demonstrated, except that it exists bilaterally. This is the only qualitative feature by which *Lopiceros* can be distinguished. By assigning the subgenus to *Oediceroides,* rather than to *Anoediceros,* the importance of the spine character on the outer plate of the second maxilla in *Anoediceros* is retained, thus minimizing the quantitative intergradation of rostral evanescence which progresses from *Oediceroides* to both *Anoediceros* and *Lopiceros.* Otherwise, a key to genera might require the use of rostral evanescence, rather than features of qualitative value, minor as they are.

Oediceroides (Lopiceros) forensia n. sp.
(Fig. 62)

Material:

St. 607, Tasman Sea, 44°18′S 166°46′E, 3580 m, clay, HOT, 17. I. 1952. Holotype, female, 16 mm. Unique.

Diagnosis:

With the characters of the subgenus.

The inflated basal portion of the second antennal flagellum is the principal subgeneric character. Pereopods 3 and 4 have a lateral setose ridge on article 2, while article 4 folds into the slight pocket formed by this ridge. The epistome is rounded bulbously in front. Uropod 3 is broken.

Parhalimedon tropicalis n. sp.
(Fig. 63)

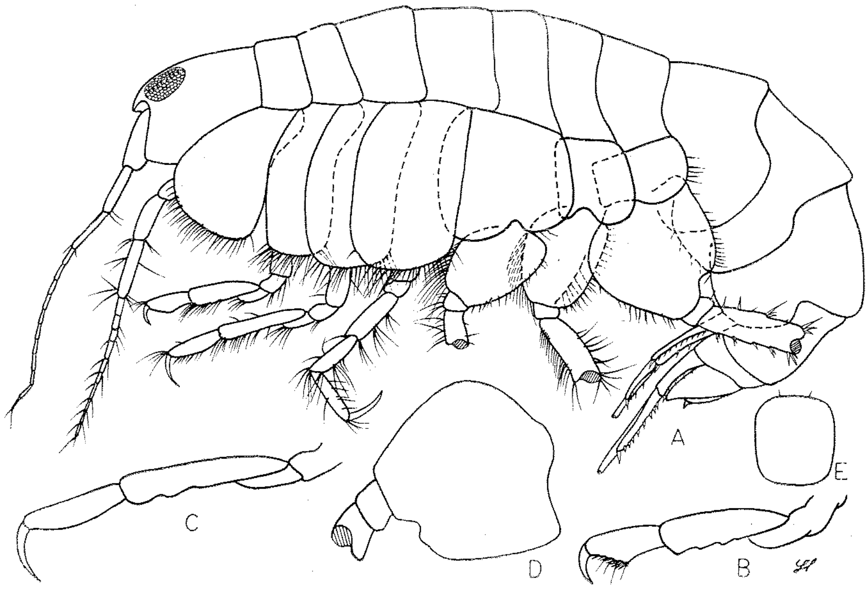
Material:

St. 548, Coral Sea, 30°00′S 154°34′E, 230 m, sand, PGI 0.2, 11. XI. 1951. Holotype, female, figured, 5 mm. Unique.

Diagnosis:

Head with short rostrum, eyes moderately large, occupying upper and forward surface of head just back of rostrum, well developed structurally and separated distinctly by a space on the dorsal surface which is about 1/6 of the eye width; lateral lobes of head with straight anterior edges and quadrate corners; first antenna as long as second; lower

Fig. 63. *Parhalimedon tropicalis* n. sp. Female, holotype, 5 mm, St. 548. A, lateral view; B, C, gnathopods 1, 2; D, pereopod 5; E, telson.



corner of third pleonal epimeron rounded, lacking a tooth; telson nearly square.

Relationship:

This species has only minor differences from its Antarctic relative, *P. turqueti* Chevreux, 1906 (p. 34), the type and only other species of the genus. These differences are detailed in the diagnosis, the larger, better developed eyes crowded near the rostrum, the long first antenna, the lack of a third pleonal epimeron tooth, and the telson with straight posterior border.

The genus *Parhalimedon* is distinctive also for the shortened outer rami of the first and second uropods, besides the features of the CHEVREUX' (1906) diagnosis. The mouthparts of the new species correspond exactly with those figured and described by CHEVREUX, including the large and setose inner plate of the maxilliped. The discovery of a second species of *Parhalimedon* reinforces the importance of the narrowed distal part of the second article on the fifth pereopod, a feature useful generically. Chevreux noted the resemblance of *Parhalimedon* to *Westwoodilla* and *Bathymedon,* distinguishing it from those by the inner plate of thc first maxilla, but an additional feature of equal importance, used by me in the generic key to the family, is the difference in mandibular primary cutting edges, which in *Parhalimedon* are projecting and toothed, in contrast to other genera mentioned.

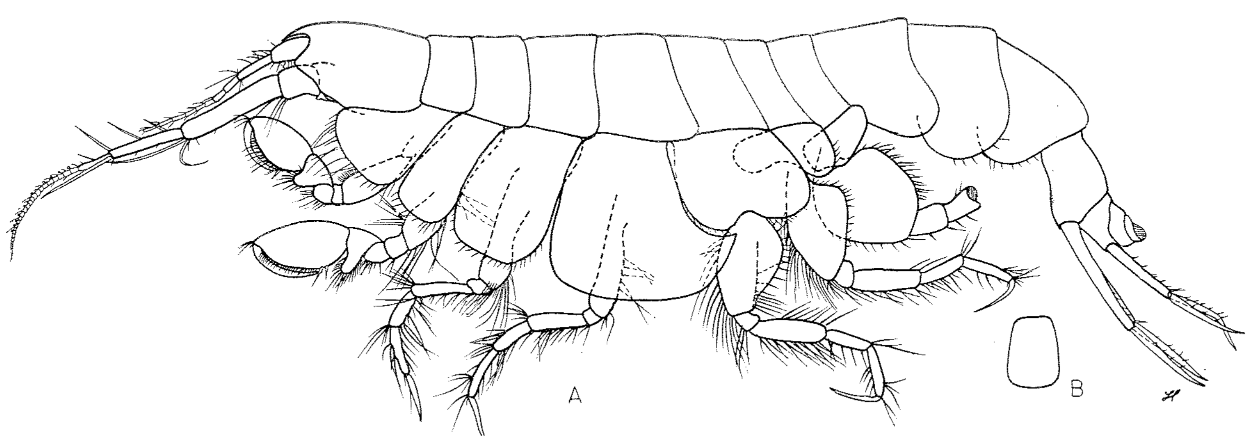


Fig. 64. *Paroediceroides trepadora* n. sp. Female, holotype, 5 mm, St. 729. A, lateral view, uropod 3 missing; B, telson, distal towards top.

Paroediceroides trepadora n. sp.
(Fig. 64)

Material:

St. 729, Gulf of Panama, 7°22′N 79°33′W, 875 m, green clay, PGI 0.2, 14. V. 1952. Holotype, female, 5 mm. Unique.

Diagnosis:

Head with slender acute rostrum reaching two thirds along article 1 of antenna 1; lateral lobes of head not projecting as far forward as rostrum, subacute; eyes absent; pereopods 1 and 2 with very slender articles; telson truncated.

Mouthparts similar to *Oediceropsis brevicornis* Liljeborg (see SARS 1895: pl. 114).

Relationship:

Prior to this, the genus *Paroediceroides* was monotypic, with *P.plumosa* Schellenberg, 1931, the type species. It may be questionable not to erect a new genus for the present species since the telson is truncated, not deeply emarginate, but other oedicerotid genera show variation nearly to the same extremes (such as *Monoculodes).* The distinctive feature of the genus is the acutely produced posterior lobe of coxa 4; otherwise the genus might be placed in *Oediceroides*. Nevertheless, it is convenient and perhaps natural to separate *Paroediceroides* from *Oediceroides* despite my belief that the two species now belonging to it probably had different origins, in view of the different heads, telsons and first two pereopods.

Parasite (fig. 65):

The brood pouch of this female contained one large egglike isopod parasite, which distended the coxae and legs. The 0.9 mm organism was sketched superficially. Isopod parasites of amphipods are probably common and little studied. The writer has seen them on a number of occasions, usually at the expense of eggs, for by their large size they occupy nearly the whole brood pouch. Whether the presence of the parasite delays molting of the host or whether it crowds out broods of young are questions of interest to be studied.

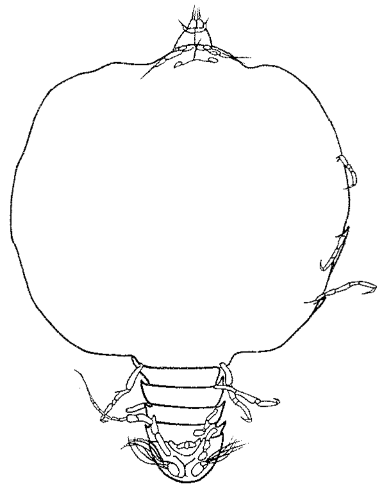


Fig. 65. Parasitic isopod enclosed in brood pouch of *Paroediceroides trepadora* n. sp. 0.9 mm long, ventral view.

FAMILY EUSIRIDAE

Genus **Eusirus** Krøyer

Key to Eusirus Females

1. Pleon segment 3 with a dorsal tooth 2
1. Pleon segment 3 lacking a dorsal tooth 7
2. Urosome segment 1 with a dorsal tooth 3
2. Urosome segment 1 lacking a dorsal tooth 4
3. Process on article 5 of gnathopods conical and slender .... *bathybius*
3. Process on article 5 of gnathopods blunt and broad .... *abyssi*
4. Pereon segments 5-7 with dorsal teeth .... *perdentatus*
4. Pereon segments 5-7 lacking dorsal teeth 5
5. Third pleonal epimeron serrate only on distal half .... *parvus*
5. Third pleonal epimeron serrate its full length 6
6. Telson cleft one-third its length .... *leptocarpus*
6. Telson minutely cleft, less than $^1/_{20}$th its length .... *biscayensis*
7. Posterior edge of third pleonal epimeron not serrate 8
7. Posterior edge of third pleonal epimeron serrate 10
8. Pleon lacking dorsal teeth, processes on fifth articles of gnathopods blunt, stout .... *laevis*
8. Pleon bearing dorsal teeth, processes on fifth articles of gnathopods slender, conical 9

9. Pereon segment 7 with small tooth, pleon segments 1-2 with small teeth......... *nevandis* n. sp.
9. Pleon segments 1-2 with large teeth.. *fragilis*[1]
10. Telson cleft a third of its length or more.. 11
10. Telson cleft less than one fifth of its length, often minutely and its lobes gape.............. 15
11. The conical lobe of article 2 on pereopod 5 reaching well below the end of article 3... *sp.* Pirlot
11. The lobe of article 2 on pereopod 5 rounded or not reaching beyond end of article 3........ 12
12. Article 4 of pereopods 1-2 twice as long as article 5.................................. 13
12. Article 4 of pereopods 1-2 1.5 times as long as article 5.............................. 14
13. Antenna 1, articles 1 and 2 equal in length.................................. *antarcticus*
13. Antenna 1, article 2 two thirds as long as 1................................. *propinquus*
14. Pereon segment 7 bearing dorsal tooth...................................... *cuspidatus*
14. Pereon segment 7 lacking dorsal tooth....................................... *longipes*
15. Anterior edges of articles 5-6 on gnathopod 1 equal in length....................... *microps*
15. Anterior edge of article 5 of gnathopod 1 almost twice as long as article 6................ 16
16. Pereon segment 7 lacking dorsal tooth....................................... *tjalfiensis*
16. Pereon segment 7 bearing dorsal tooth.. 17
17. Article 2 of antenna 1 half as long as 1....................................... *minutus*
17. Article 2 of antenna 1 as long as 1.. *holmi*

1. Birstein and Vinogradov, 1960.

Eusirus nevandis n. sp.
(Fig. 66)

Material:

St. 241, off Kenya, 4°00'S 41°27'E, Globigerina ooze, 1510 m, HOT, 15. III. 1951. Holotype, female?, 8 mm. Unique. The single specimen is badly damaged, lacking most articles of the antennae, pereopods and uropods.

Diagnosis:

Rostrum less than half as long as article 1 of antenna 1; eyes formed of indistinct cellular mass; gnathopods with upper edge of article 5 nearly twice as long as upper edge of article 6; hind lobes of fifth articles slender, conical; pereon segment 7 and pleon segments 1-2 with a minute dorsal tooth, pleon segments 3 and 4 lack dorsal teeth but bear slight keels; posterior edge of third pleonal epimeron with smooth, neither crenulate nor toothed edge; telson short, very broad, cleft less than a fifth of its length, the acute lobes gaping; article 5 of pereopods 1-2 nearly as long as article 4.

Relationship:

This species differs from *E. laevis* Walker, 1903 by the blunt processes on articles 5 of both gnathopods. Only the new species, *E. laevis* and *E. fragilis* Birstein and Vinogradov, 1960 in the genus have smooth third epimeral margins. The new species is so close to *E. fragilis* (of the Tonga Trench) as to defy separation; in their description Birstein and Vinogradov say that the teeth of pleon segments 1-2

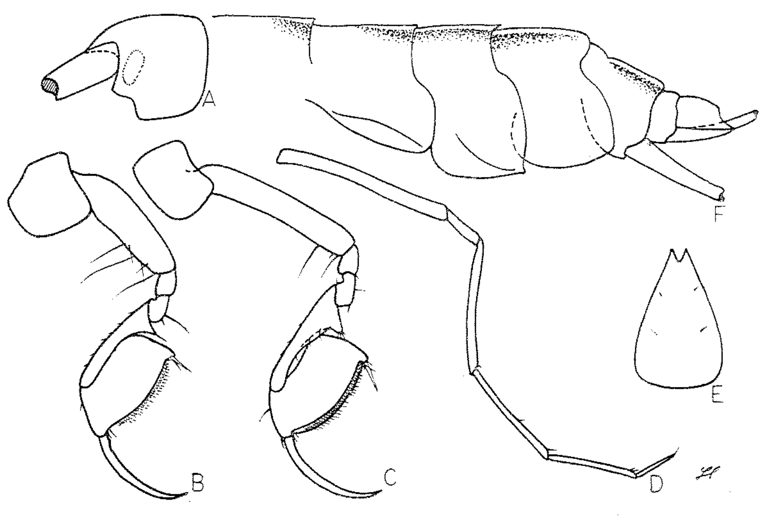


Fig. 66. *Eusirus nevandis* n. sp. ?Female, holotype, 8 mm, St. 241. A, head; B, C, gnathopods 1, 2; D, pereopod 2; E, telson; F, pleon.

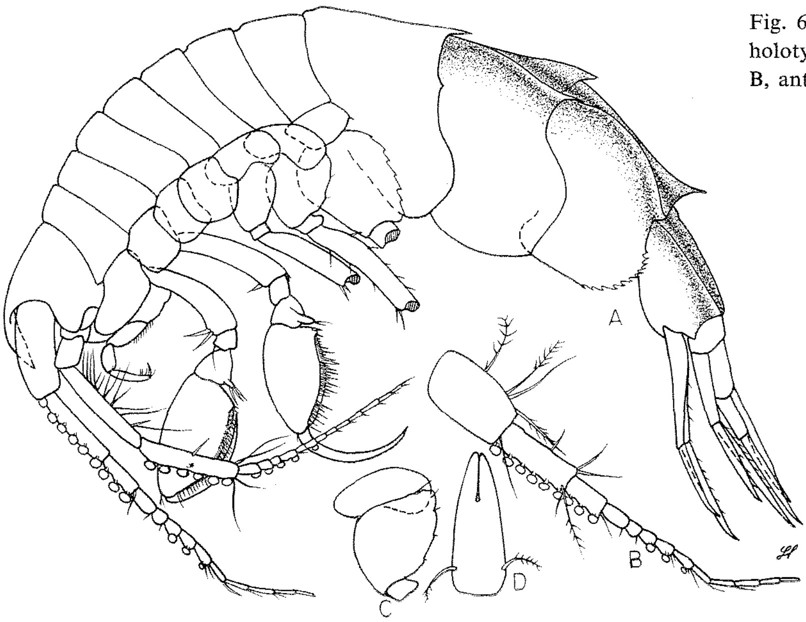


Fig. 67. *Rhachotropis levantis* n. sp. Female, holotype, 8 mm, St. 626. A, lateral view; B, antenna 1; C, pereopod 4; D, telson.

are large, whereas they are small in the new species and a tooth is present on pereon segment 7 in the new species, another possible difference. The wide geographic separation between Kenya and Tonga may be insignificant as eusirids are pelagic. The fragility of both the new species and *E. fragilis* contribute to the confusion and also indicate their close relationship as well as the fact that other imperfect specimens may be stored in museums. Until more comparisons can be made the writer believes in retaining the Tonga and Kenya collections as separate entities.

Rhachotropis levantis n. sp.
(Fig. 67)

Material:

St. 626, Tasman Sea, 42°10'S 170°10'E, 610 m, Globigerina ooze, HOT, 20. I. 1952. Holotype, female, 8 mm, figured; and 2 additional broken specimens. Total specimens: 3.

Diagnosis:

Rostrum deflexed, reaching two-thirds along article 1 of antenna 1; lateral lobes of head narrow and blunt; pereon lacks dorsal ridges or teeth; pleon segment 1 with an acute middorsal tooth and a small lateral one on each side, but lacking a lateral ridge; pleon segment 2 with a middorsal tooth, a long, acute lateral one springing from a lateral ridge; pleon segment 3 with a middorsal erect tooth, and a lateral ridge which ends bluntly; pleon segments 4-6 not ornamented middorsally, but segment 4 bearing an oblique lateral ridge; third pleonal epimeron with lower posterior edge rounded and toothed; pereopod 4, article 2 alate, telson cleft one-third its length; outer rami of uropods 1 and 2 much shorter than inner rami; rami of uropod 3 subequal in length.

Relationship:

A key to the genus *Rhachotropis* was written by J. L. Barnard, 1957. The present species keys out to couplet 20 where it is related to *R. grimaldii* (Chevreux). The new species differs in numerous ways from *R. grimaldii,* in the lack of large lateral teeth on pleon segments 1 and 3, the lack of a middorsal crest on pleon segment 4, in the broad, aliform second article of pereopod 4 and the apparently longer rostrum. *Rhachotropis flemmingi* Dahl, 1959, not in Barnard's key, is related to *R. hunteri* Nicholls, 1938 and *R. cervus* Barnard, 1957.

FAMILY LEPECHINELLIDAE

Lepechinella Stebbing, 1908

The following key shows the difficulty in defining precisely the three species in couplets 10 and 11, particularly in the separation of *L. sucia* n. sp. and *L. bierii* from *L. drygalskii.* Only by quantitative measures can this separation be made. Schellenberg (1926a) has not figured the pleon where the specific distinctions are likely to occur. See Dahl (1959) for a discussion of the genus.

Key to Lepechinella

The following key shows the difficulty in defining precisely the three species in couplets 10 and 11, particularly in the separation of *L. sucia* n. sp. and *L. bierii* from *L. drygalskii*. Only by quantitative measures can this separation be made. SCHELLENBERG (1926a) has not figured the pleon where the specific distinctions are likely to occur. See DAHL (1959) for a discussion of the genus.

1. Coxa 1 bifid 2
1. Coxa 1 not bifid 3
2. Pleon segments 1-3 each with 2 teeth .... *arctica*
2. Pleon segments 1-3 each with 3 teeth .... *chrysotheras*
3. Pereon segments lack dorsal teeth .... *cetrata*
3. Pereon segments bear dorsal teeth 4
4. Dorsal teeth of pereon vestigial 5
4. Dorsal teeth of pereon large, acute 6
5. Coxa 5 with long anterior lobe .... *pangola*[1]
5. Coxa 5 with short anterior lobe .... *ultraabyssalis*[1]
6. Pereon segment 1 bearing 1 dorsal tooth .... *monocuspidata* n. sp.
6. Pereon segment 1 bearing 2 dorsal teeth 7
7. Pereon with articulated spines 8
7. Pereon lacking articulated spines 9
8. Pleon segments 5-6 fused .... *echinata*
8. Pleon segments 5 and 6 separated .... *wolffi*[1]
9. Dorsal pleonal teeth immensely larger than pereonal .... *curvispinosa*
9. Dorsal pleonal teeth not larger than pereonal 10
10. Dorsal pereonal teeth thick, short .... *drygalskii*
10. Dorsal pereonal teeth slender, long 11
11. Dorsal tooth of pleon segment 4 oblique .... *sucia* n. sp.
11. Dorsal tooth of pleon segment 4 vertical .... *bierii*

1. *L. pangola* J. L. Barnard 1961; *L. ultraabyssalis* Birstein and Vinogradova, 1960; *L. wolffi* Dahl, 1959. Other references in J. L. BARNARD (1958).

Lepechinella monocuspidata n. sp.
(Fig. 68)

Material:

St. 241, off Kenya, 4°00'S 41°27'E, 1510 m, pure Globigerina, HOT, 15. III. 1951. Holotype, sex?, 8 mm. Unique.

Diagnosis:

Coxa 1 not bifid, relatively short; processes of head long; pereon segment 1 with only one erect tooth, each remaining pereon segment and pleon segments 1-4 with a dorsal tooth; the teeth are erect on pereon segments 2-4 and oblique on pereon segments 5-7 and pleon 1-4; pleon segments 5-6 fused, bearing a posterior tooth.

The accessory flagellum is uniarticulate and the mouthparts are like *L. chrysotheras* Stebbing, 1908. The mandibular palps are broken and missing.

Relationship:

The single tooth of pereon segment 1 is distinctive, all other known species having two teeth or none. BARNARD (1957) erred in his key to *Lepechinella,* assigning one dorsal tooth on pereon segment 1 for *L. drygalskii,* whereas two are present. The differences of *L. drygalskii, L. bierii* and *L. sucia* n. sp. are minor and are discussed under the latter heading.

Lepechinella sucia n. sp.
(Fig. 69)

Material:

St. 607, Tasman Sea, 44°18'S, 166°46'E, 3580 m, clay, HOT, 17. I. 1952. Holotype, male, 11 mm. Unique.

Diagnosis:

Coxa 1 not bifid, relatively short; head with medial, nearly horizontal rostral process, lower lateral process of head smaller than upper lateral process; pereon segment 1 with 2 dorsal processes, remaining segmental processes increasing slightly in size and

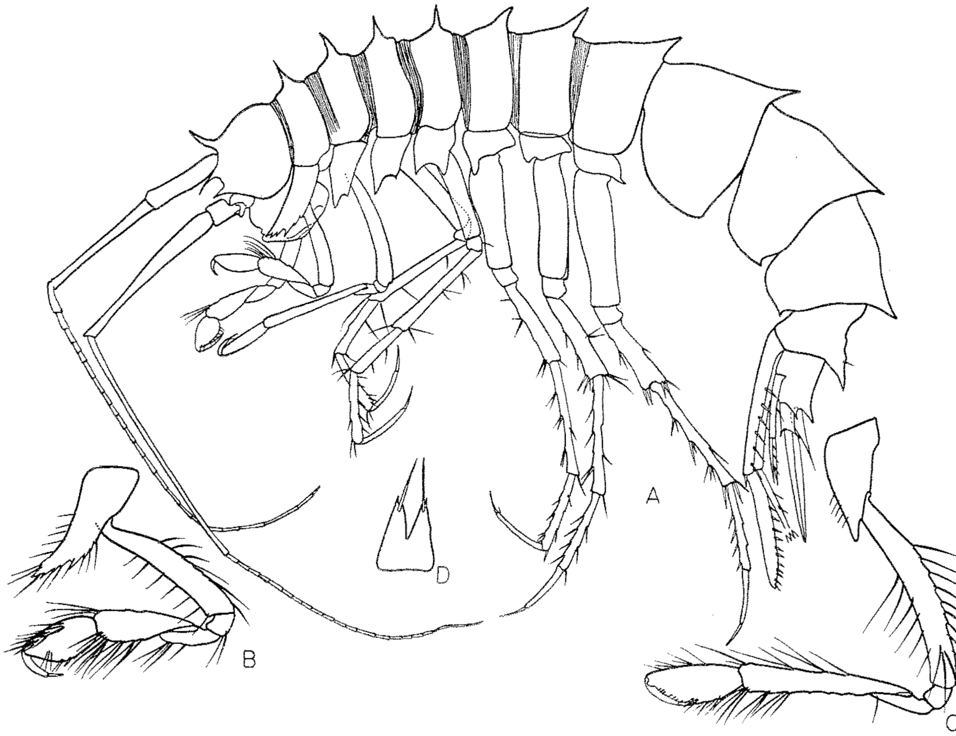


Fig. 68. *Lepechinella monocuspidata* n. sp. ?Sex, holotype, 8 mm, St. 241. A, lateral view; B, C, gnathopods 1, 2; D, telson.

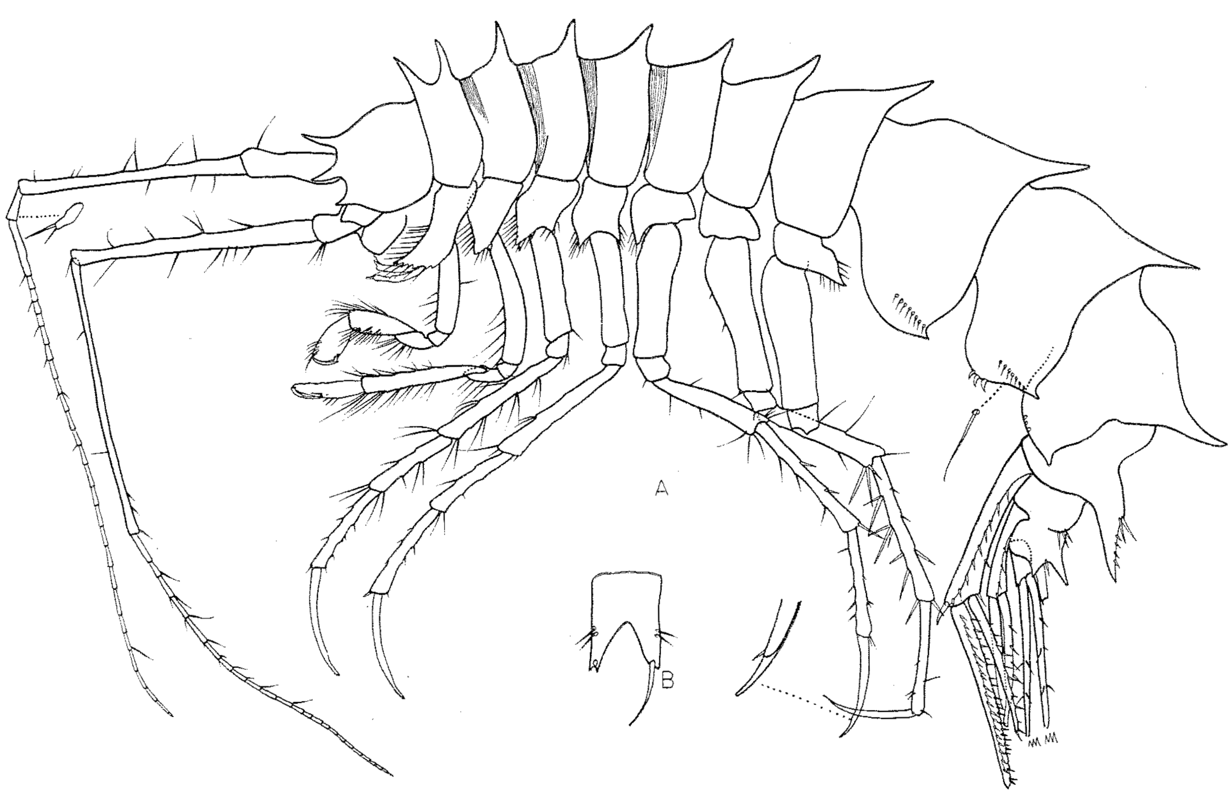


Fig. 69. *Lepechinella sucia* n. sp. Male, holotype, 11 mm, St. 607. A, lateral view; B, telson.

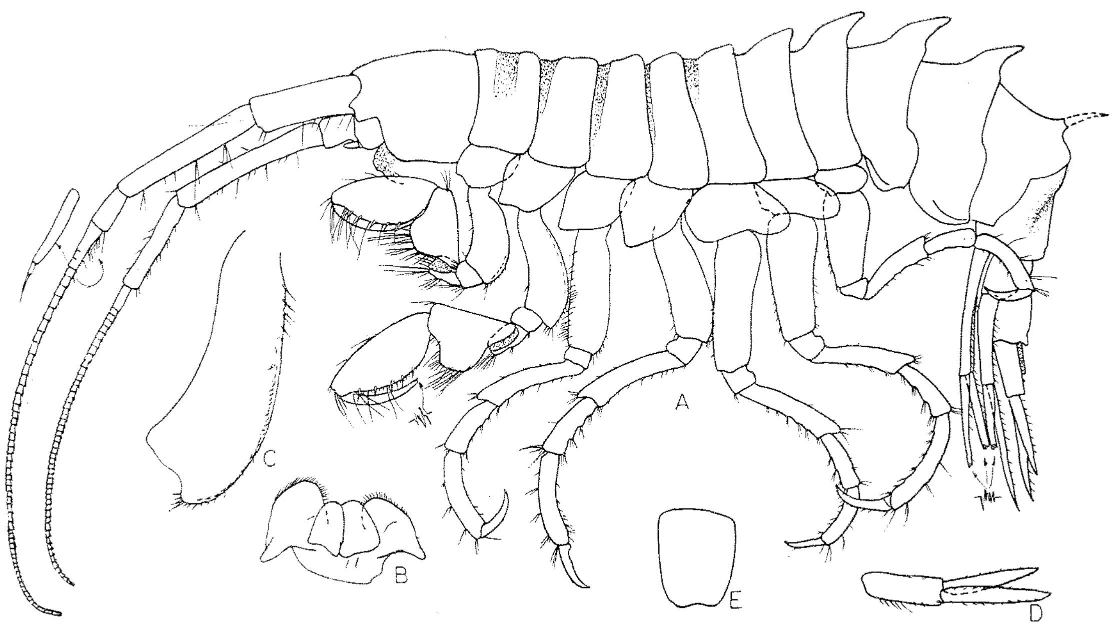


Fig. 70. *Amathillopsis grevei* n. sp. Male, holotype, 13 mm, St. 607. A, lateral view; B, lower lip; C, article 2 of gnathopod 2, right side; D, uropod 3; E, telson.

becoming oblique on pleon; pleon segments 5-6 nearly fused and bearing a moderately large tooth.

Mouthparts similar to *L. chrysotheras,* with the exceptions noted for *L. bierii* Barnard, 1957. Pereopod 5 and uropod 3 incomplete.

Relationship:

This species is very closely related to its eastern Pacific counterpart, *L. bierii* Barnard, 1957 from which it differs essentially only by the process of segment 6 being well developed and some minor points as follows: slightly larger dorsal processes of pleon; less sharply pıoduced forward coxal margins; less sharply attenuated and upturned lower posterior corners of pleonal epimera; the shorter palms of the gnathopods; and the shorter apical claws of the pereopods.

The new species is related to *L. drygalskii* Schellenberg, 1926a (p. 345, fig. 50) from the Antarctic, but differs by the more slender dorsal processes of the pereon segments, the shorter palm of gnathopod 1 and probably the process of pleon segment 6, not mentioned by Schellenberg.

These three species, *L. sucia, L. bierii* and *L. drygalskii* seem to form the extremes in a Rassenkreis and may permit designation only as subspecies.

FAMILY AMATHILLOPSIDAE

Amathillopsis grevei n. sp.
(Fig. 70)

Material:

St. 607, Tasman Sea, 44°18′S 166°46′E, 3580 m, clay, HOT, 17. I. 1952. Holotype, male, 13 mm. Unique. Field color notes: head and body light green, mouthparts pink, the two anterior pairs of legs very pale bluish red.

Diagnosis:

Eyes absent; dorsal teeth reaching maximum length on pereon segment 7, pleon segments 1 and 2 and possibly 3 (broken); dorsal teeth commencing as rudiments on pereon segment 3 and increasing progressively in size through pereon segment 6; anterior corners of first 4 coxae angular but not very sharp and not attenuated, coxae relatively short and quadrate; hind lobes on sixth articles of gnathopods blunt, not attenuated; hind margin of article 2 on gnathopod 2 slightly but not grossly lobate and bearing small marginal spines; this condition slightly developed on gnathopod 1; teeth on lower corners of second and third pleonal epimera scarcely evident; posterior end of pleon segment 6 with a small medial tooth; telson broad, short, apically emarginate.

Accessory flagellum composed of a single slender article tipped with 2-3 spines.

Relationship:

This species bears a remarkable resemblance to *Amathillopsis (= Acanthopleustes) annectens* (Holmes, 1908) of California, and is distinct from it only by the broad, emarginate telson. The first four coxae of *A. annectens* are more sharply pointed than in the new species but the dorsal teeth and gnathopods are identical.

Amathillopsis grevei differs from *A. australis* Stebbing, 1888 (from the Coral Sea) by the blunter fifth article of gnathopod 2 and the shorter, quadrate, not acutely pointed, third and fourth coxae; the telsons of the two species are identical.

The new species differs from *A. atlantica* Chevreux, 1908a (from the Azores) by the shorter dorsal teeth, especially of pereon segment 6, the scarcely produced hind distal margin of article 2 on gnathopod 1 and the less attenuated anterior corner of coxa 2.

From *A. pacifica* Gurjanova, 1955 (from the Okhotsk Sea) the new species differs by the relatively poorly produced hind lobes on the second articles of the gnathopods and the short tooth of pereon segment 6, which in *A. pacifica* is as long as that on the seventh pereonal segment.

A. spinigera Heller (see STEBBING 1906) has dorsal teeth commencing on pereon segment 1 and *A. affinis* Miers (see STEBBING 1906) lacks any hind lobes on article 5 of the gnathopods.

FAMILY PARAMPHITHOIDAE

Diagnosis:

Mouthparts not developed for piercing and sucking nor drawn downward in a bundle; first three coxae pointed and attenuated; antenna 1 lacks more than a vestigial accessory flagellum; mandible with 3 palp articles and molar; maxillipeds with plates and palp of normal development; eyes lateral, when present; coxa 4 excavate behind.

Remarks:

In all genera the first 3 coxae are quite pointed and attenuated, except for the genus *Oradarea* Walker, transferred from the Calliopiidae to the Paramphithoidae by PIRLOT (1934), and *Parepimeriella* Schellenberg, 1931. On the basis of STEBBING's (1906) key to the Gammaridea, *Oradarea* might better be put in the Pleustidae, except that the lower lip of pleustids is characteristic (see BARNARD and GIVEN 1960). The writer does not believe that the Paramphithoidae should be emended to accept *Oradarea* and that the Calliopiidae remains a logical place for it. The genus *Parepimeriella* has the characteristic lower lip and probably should be transferred to the Pleustidae.

Key to Paramphithoidae

1. Body dorsally covered with articulated spines .... *Uschakoviella*
1. Body lacking articulated spines 2
2. Molar of mandible only a setose lamina 3
2. Molar of mandible well developed, large, ridged 4
3. Pereopod 5 as long or longer than pereopod 4 .... *Eclysis*
3. Pereopod 5 shorter than pereopod 4 .... *Epimeriella*
4. Maxillipedal palp bearing only 3 articles 5
4. Maxillipedal palp bearing 4 articles 6
5. Lower lip with inner lobes .... *Parepimeria*
5. Lower lip lacking inner lobes .... *Metepimeria*
6. Coxae 4-5 together forming a crescentic curve below .... *Epimeria*
6. Coxae 4-5 together not forming a crescentic curve below 7
7. Article 5 of gnathopods shorter than article 6 .... *Paramphithoe*
7. Article 5 of gnathopods much longer than article 6 .... *Actinacanthus*

Epimeria Costa, 1851

Three species of *Epimeria* have a broad ventral edge on coxa 4, whereas the remaining species of the genus have the lower edge pointed. As a result, the crescentic curve formed with coxa 5 is less pronounced in the three species, *E. inermis*, *E. monodon* and *E. robusta*.

Key to Epimeria

1. Pereon segments lacking dorsal carinae 2
1. Some or all pereon segments bearing dorsal carinae 9
2. Coxa 5 strongly and acutely produced posteriorly 3
2. Coxa 5 not produced posteriorly 5
3. Pleon segment 1 lacking tooth, coxa 4 relatively short .... *longispinosa*
3. Pleon segment 1 bearing small tooth, coxa 4 attenuated 4
4. Rostrum long, eyes present .... *pacifica*
4. Rostrum short, eyes absent .... *glaucosa* n. sp.
5. Article 2 of pereopod 3 with posterior jagged notch .... *robusta*
5. Article 2 of pereopod 3 smooth posteriorly 6
6. Dorsal carina starting on pleon segment 1 .... *puncticulata*
6. Dorsal carina borne only or starting on pleon segment 3 7
7. Coxa 4 broadly rounded below .... *monodon*
7. Coxa 4 acutely pointed below 8
8. Rostrum reaching end of article 2 on antenna 1 .... *semiarmata*
8. Rostrum not reaching end of article 1 on antenna 1 .... *pelagica*[1]
9. Third pleonal epimeron bearing accessory tooth above lower corner 10
9. Third pleonal epimeron lacking accessory tooth above lower corner 14
10. Coxa 5 projecting acutely 11
10. Coxa 5 not projecting acutely 12
11. Dorsal carina starting on pereon segment 4 .... *victoria*[2]
11. Dorsal carina starting on pereon segment 6 .... *cornigera*
11. Dorsal carina starting on pereon segment 1 .... *loricata*
12. Article 2 of pereopod 3 with posterior jagged notch .... *excisipes*
12. Article 2 of pereopod 3 smooth posteriorly 13
13. Coxa 4 broadly rounded below .... *inermis*
13. Coxa 4 acutely pointed below .... *tuberculata*
14. Article 2 of pereopod 3 with posterior jagged notch .... *georgiana*
14. Article 2 of pereopod 3 smooth posteriorly 15
15. Coxa 5 acutely produced 16
15. Coxa 5 not acutely produced 17
16. Pereon segments 3 to 7 with long, sharp dorsal teeth .... *macrodonta*
16. Pereon segments 3 to 7 with low carinae .... *parasitica*
17. Pereopods 4 and 5 with posterior edge of article 2 lobate .... *intermedia*
17. Pereopods 4 and 5 with posterior edge of article 2 not lobate .... *bruuni* n. sp.

1. Birstein and Vinogradov, 1958.
2. Hurley, 1957.

Epimeria bruuni n. sp.
(Fig. 71)

Material:

St. 665, Kermadec Trench, 36°38′S 178°21′E, 2470 m, grey clay, HOT, 25. II. 1952. Holotype, male, 7 mm. Unique.

Diagnosis:

Dorsal carinae borne on pereon segments 6-7 and pleon segments 1-3, terminating in blunt teeth, except on pereon segment 6 and poorly on pleon segment 3; pleon segment 4 with a blunt, erect carina; pleon segment 6 with a dorsal bump; coxa 4 strongly attenuated and geniculate, apex blunt but narrow; coxa 5 not produced strongly, lower posterior corner angular; posterior edges of second articles on pereopods 3-5 lacking notches; third pleonal epimeron lacking tooth at lower posterior corner or accessory tooth; eye-bulges on head lacking pigment or ommatidea; rostrum large; outer ramus of uropod 2 shortened.

Relationship:

This species is unique in the genus for its third pleonal epimeron which has the posterior edge bowed and the lower corner rounded.

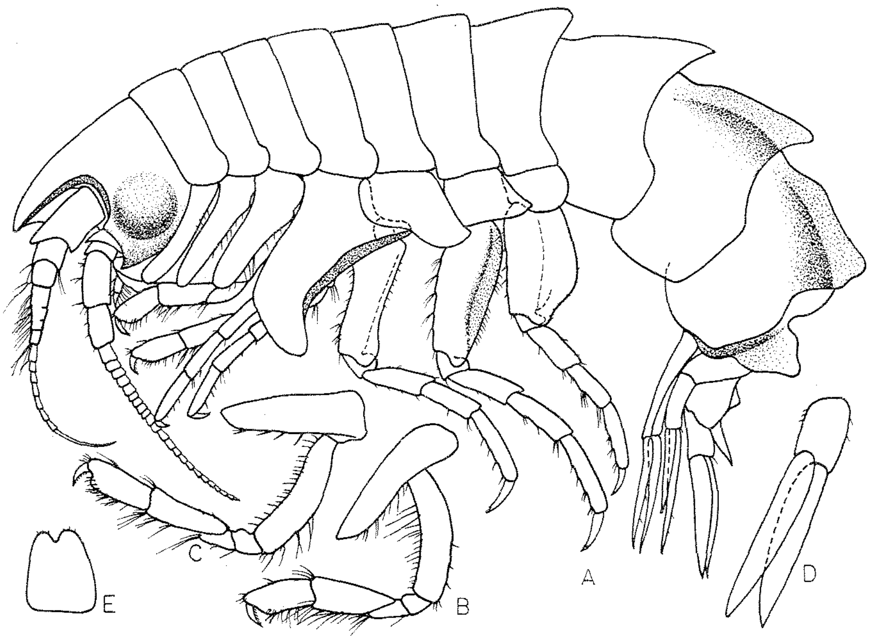


Fig. 71. *Epimeria bruuni* n. sp. Male, holotype, 7 mm, St. 665. A, lateral view; B, C, gnathopods 1, 2; D, uropod 3; E, telson.

Epimeria glaucosa n. sp.
(Fig. 72)

Material:

St. 575, Tasman Sea, 40°11′S 163°35′E, 3710 m, pteropod ooze, SOT, 19. XII. 1951. Holotype, female, 22 mm, with hatched juveniles; figured ovigerous female, 19 mm. Total: 2 specimens.

Diagnosis:

Eyes absent, rostrum of medium size, extending to end of first antennal article 1; coxa 4 recurved, attenuated, acute below; coxa 5 acutely produced at lower posterior corner; pereon segments lack carinae; pleon segments 1-4 bear acute dorsal carinae and teeth, pleon segment 4 with a shallow notch anterior to the carina; telson scarcely emarginate; third pleonal epimeron with sharp, slightly produced lower corner and a slight, obtuse process midway on the posterior margin; pereopods 3 and 4 with straight posterior edges on second articles; article 2 of pereopod 5 narrowing distally but not abruptly.

Relationship:

This species is related to *E. pacifica* Gurjanova, 1955 (p. 191-194, figs. 12, 13) but differs by the shorter rostrum, lack of eyes, shorter process of coxa 5, the less abruptly narrowing second article of pereopod 5, and the posteromedial marginal process of the third pleonal epimeron.

The hatched juveniles of the holotype differ from the adults in the poorly developed process of the third pleonal epimeron; otherwise they are identical.

FAMILY CALLIOPIIDAE

Metaleptamphopus Chevreux, 1911

Metaleptamphopus Chevreux, in Chevreux 1912: 144.

Diagnosis:

Body lacking dorsal teeth; antenna 1 longer than antenna 2, lacking accessory flagellum; upper lip rounded below, not incised; lower lip lacking inner lobes; inner plate of maxilla 1 setose along inner edge; outer plates of maxilliped larger than inner plates; gnathopods subchelate, article 5 slightly shorter than article 6, articles of gnathopods not greatly elongated; telson apically rounded, smooth; outer ramus of uropod 3 hardly shorter than inner ramus.

Type species: *Metaleptamphopus pectinatus* Chevreux.

Relationship:

This genus differs from *Amphithopsis* Boeck only by the longer outer ramus of uropod 3, the lack of an accessory flagellum and the shortness of article 5 on the gnathopods.

It differs from *Leptamphopus* Sars by the stouter, less linear gnathopods and the subequal rami of uropod 3.

From *Calliopius* Liljeborg it differs by the lack of inner lobes on the lower lip.

The genus is closely related to *Bouvierella* Chevreux, 1900 differing only by gnathopod 2 which has

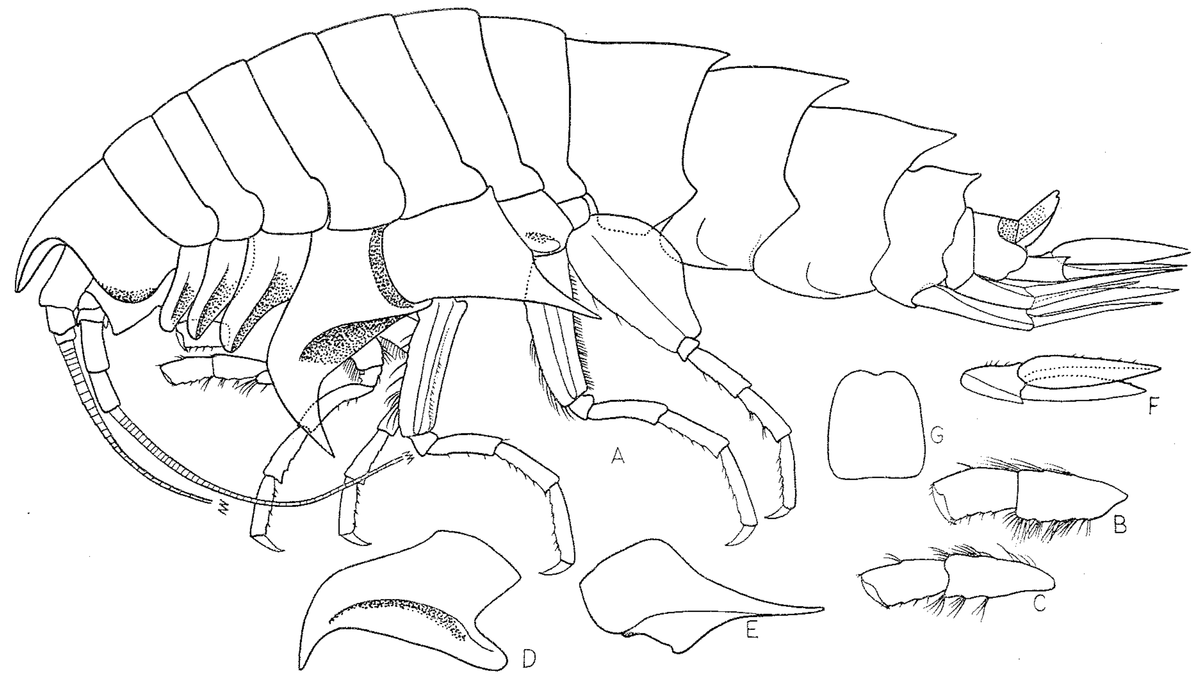


Fig. 72. *Epimeria glaucosa* n. sp. Female, holotype, 19 mm. St. 575. A, lateral view; B, C, gnathopods 1, 2; D, E, coxae 4, 5; F, uropod 3; G, telson.

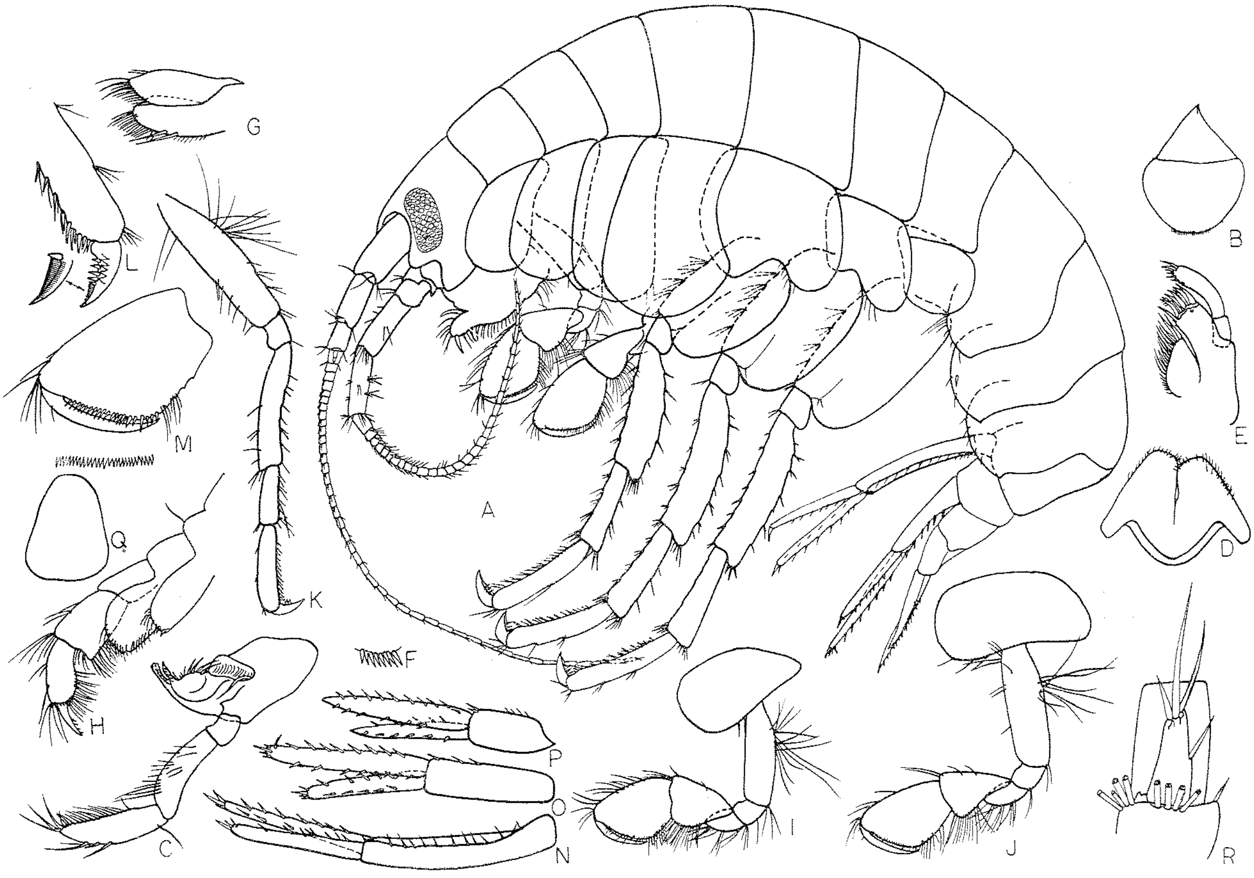


Fig. 73. *Metaleptamphopus membrisetata* n. sp. Female, 9 mm, St. 137. A, lateral view; B, upper lip; C, mandible; D, lower lip; E, G, maxillae 1, 2; F, spines on apex of first maxillary palp; H, maxilliped; I, J, gnathopods 1, 2; K, pereopod 1; L, apex of all pereopods; M, end of gnathopod 2; N, O, P, uropods 1, 2, 3; Q, telson; R, accessory flagellum on antenna 1.

article 5 shorter than 6 and by the rounded apices of both the telson and upper lip, which are incised slightly in *Bouvierella.*

In assigning the following new species to *Metaleptamphopus* it must be stated that several discrepancies exist. The new species bears a minute, uniarticulate accessory flagellum; its second maxilla has slightly more slender lobes; the maxillipedal palp is stouter and the female gnathopods are stouter, more like the male of the type species. It is probable that the new species should be made the type of a new genus, but the writer is reluctant to perform this operation until a third species, if it lives, is discovered and its relationship to the two, now known, determined. Of particular interest is the fact that the pereopodal dactyls are pectinate posteriorly in *M. pectinatus* and anteriorly in the new species.

Metaleptamphopus membrisetata n. sp.
(Fig. 73)

Material:

St. 137, off SW Africa, 20°04'S 11°56'E, 537 m, ST 300,23. XII. 1950. Holotype, female, 10 mm; figured female, 9 mm. Total: 2 specimens.

Diagnosis:

Accessory flagellum present; article 7 of pereopods 1-5 bearing anterior pectinations in the form of short spines and a distal membrane of closely packed setules; female gnathopods with stout sixth articles; maxillipedal palp stout and lobes of maxilla 2 more slender than in the type species.

The lower corner of the third pleonal epimeron in the figured female has a slight tooth but in the holotype the corner is quadrate.

FAMILY PONTOGENEIIDAE

Revival of the genus Dautzenbergia Chevreux, 1900

In the course of this research it has been brought to my attention that the species *Sympleustes grandimanus* (in CHEVREUX, 1900) is improperly classified. It was recently noted by BARNARD and GIVEN (1960) that this species and *S. dentatus* Chevreux, 1927 are atypical in their lower lips, which are more like those of Calliopiidae or Pontogeneiidae. In fact, *S. megacheir* Walker (see CHEVREUX 1927) also should be mentioned in this regard. Their lower lips, are not composed of tilted, oval outer lobes astride gaping fused inner lobes but instead are normal amphipod lower lips, composed of outer lobes with pointed mandibular processes and small inner lobes which do not separate the outer lobes greatly. On this basis, it is unwise to retain these three species in the Pleustidae. In addition, each species has a slightly cleft telson, about one third its length; this is not characteristic of pleustids. By removing such species from the Pleustidae, the diagnosis of that family may be narrowed and its members more easily recognized.

The condition of the telsons in these "sympleustids" requires them to be assigned to the Pontogeneiidae, rather than the Calliopiidae, a point of view not taken before. Once this is effected it seems clear that the species are indeed pontogeneiids, with their cleft telsons; that of *S. grandimanus* is formed into a v-shaped excision by the oblique apices and is reminiscent of many pontogeneiid genera, but never pleustids.

A prior generic name is available for these species, *Dautzenbergia* Chevreux 1900, with type species *Amphithopsis grandimanus,* the original name of "*Sympleustes*" *grandimanus* (see STEBBING 1906). The movements of the type species have been from *Amphithopsis* to *Sympleustes* to *Dautzenbergia* (by CHEVREUX 1900) and back to *Sympleustes* by SEXTON (1909) with the reduction of *Dautzenbergia* to *Sympleustes.*

In the Pontogeneiidae, *Dautzenbergia,* with its three species *D. grandimanus, D. dentatus* and *D. megacheir,* is closest to the genus *Bovallia* Pfeffer because the gnathopodal structure is not linear or sublinear and because of the short, lobed, fifth articles on the gnathopods and the short, scale-like accessory flagellum (see key to Pontogeneiidae in SCHELLENBERG 1929). *Dautzenbergia* has distinct inner lobes on the lower lip and much larger gnathopods than in *Bovallia.*

FAMILY LILJEBORGIIDAE

Liljeborgia mojada n. sp.
(Fig. 74)

Material:

St. 200, off Natal, 29°39'S 37°01'E, 5090-4880 m, Globigerina ooze, HOT, 17.II.1951. Male holotype, 20 mm. Unique.

Diagnosis:

Eyes absent, lateral lobes of head narrow and blunt; antenna 1 short, reaching only slightly beyond end of article 4 on antenna 2; antenna 2 long; pleon segments 1 and 2 each with a tiny single dorsal tooth;

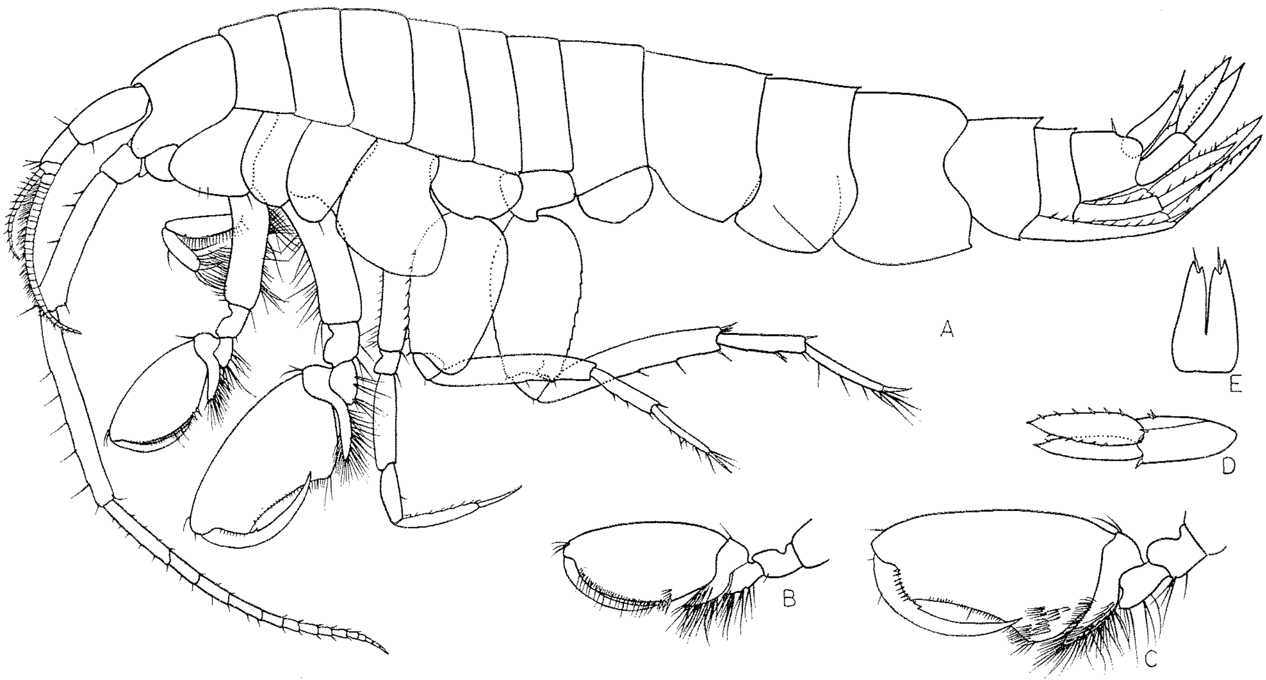


Fig. 74. *Liljeborgia mojada* n.sp. Male, holotype, 20 mm, St. 200. A, lateral view; B, C, gnathopods 1, 2; D, uropod 3; E, telson.

pleon segment 3 lacking a dorsal tooth; pleon segments 4 and 5 each with a medium-sized dorsal tooth; third pleonal epimeron convex posteriorly and bearing a small distal tooth; article 7 of gnathopod 1 lacking marginal notches but gnathopod 2 bearing 4 small notches; palm of gnathopod 2 excavate; telson cleft for two thirds of its length; epistome rounded in front; pereopods 3 and 4 (5 is missing) with ovate second articles, weakly serrate on posterior margins.

Relationship:

This species differs from another deep-sea one, *Liljeborgia zarica* J.L. Barnard, 1961 by the lack of a dorsal tooth on pleon segment 3. It differs from *L. consanguinea* Stebbing, 1888 (pl. 91) in the same respect. From *L. macronyx* Sars, 1895 (pl. 188, fig. 2) the new species differs by the more convex posterior margin of the third pleonal epimeron and the poorly developed notches on the gnathopodal fingers.

Liljeborgia mojada differs from *L. caeca* Birstein and Vinogradova, 1960 by the excavate palm of gnathopod 2 and the convex hind border of the third pleonal epimeron.

FAMILY GAMMARIDAE

Key to marine Gammaridae

Only those genera of Gammaridae with marine representatives are included in this key. Some generic pairs, such as *Maeropsis-Paraceradocus* and *Ceradocus-Ceradocoides* have not been separated by firm criteria and I am unable to provide distinctions between them. Other genera are cited twice in the key, where their structures are intergrading or variable.

1. Telson entire 2
1. Telson cleft 6
2. Telson not emarginate 3
2. Telson emarginate 4
3. Rami of uropod 3 long .... *Weyprechtia*
3. Rami of uropod 3 short .... *Parapherusa*
4. Inner ramus of uropod 3 longer than outer .... *Amathillopsis*
4. Inner ramus of uropod 3 shorter than outer 5
5. Pereon and pleon segments carinate .... *Gammarellus*
5. Pereon and pleon segments not carinate .... *Falklandella*

6. Accessory flagellum 1 or 2-articulate 7
6. Accessory flagellum 3 or more articulate 16
7. Inner ramus of uropod 3 scale-like and much smaller than outer 8
7. Inner ramus of uropod 3 nearly as large as outer 11
8. Outer ramus of uropod 3 biarticulate 9
8. Outer ramus of uropod 3 uniarticulate 10
9. Maxilla 2, inner edge of inner plate lined with setae .... *Eriopisa*
9. Maxilla 2, inner edge of inner plate unarmed .... *Eriopisella*
10. Uropod 3 extending well beyond the end of uropod 1 .... *Melita* (in part)
10. Uropod 3 not extending beyond end of uropod 1 .... *Melitoides* (in part)
11. Rami of uropod 3 foliaceous, oval, apically rounded .... *Megaluropus*
11. Rami of uropod 3 lanceolate or apices truncated, not foliaceous 12
12. Mandibular palp article 2 shorter than article 1 .... *Parelasmopus*
12. Mandibular palp article 2 longer than article 1 13
13. Gnathopod 1 subchelate .... *Anelasmopus*
13. Gnathopod 1 simple 14
14. Female gnathopod 2 simple .... *Cheirocratus*
14. Female gnathopod 2 subchelate 15
15. Antenna 1 nearly as long as antenna 2 .... *Cheirocratella*
15. Antenna 1 reaching only to end of peduncle of antenna 2 .... *Casco*
16. Pereon segments carinate .... *Gammaracanthus*
16. Pereon segments not carinate 17
17. Urosome with all 3 segments bearing bundles of spines; except one species of *Anisogammarus* bearing a tooth only on segment 2 18
17. Urosome occasionally with scattered spines not on all segments and not arranged in bundles, spines usually absent 20
18. Some segments anterior to pleon segment 4 bearing dorsal spines .... *Echinogammarus*
18. No segments anterior to pleon segment 4 bearing dorsal spines 19
19. Gnathopod 1 larger than 2, both gnathopodal palms bearing chisel-shaped spines *Anisogammarus*
19. Gnathopod 1 smaller than 2, palms not bearing chisel-shaped spines .... *Gammarus*
20. Inner ramus of uropod 3 scale-like, very small 21
20. Inner ramus of uropod 3 nearly as long as outer 22
21. Uropod 3 extending well beyond end of uropod 1 .... *Melita* (in part)
21. Uropod 3 not exceeding end of uropod 1 .... *Melitoides* (in part)
22. Rami of uropod 3 foliaceous, oval, apices rounded .... *Quadrivisio*
22. Rami of uropod 3 lanceolate, square or apices truncate 23
23. Maxilla 2, inner edge of inner plate not lined with setae 24
23. Maxilla 2, inner edge of inner plate lined with setae 26
24. Palp of maxilliped with 3 articles .... *Maerella*
24. Palp of maxilliped with 4 articles 25
25. Mandibular palp article 3 stout, falcate .... *Elasmopus*
25. Mandibular palp article 3 slender, not falcate .... *Maera*
26. Palm and hind margin of article 6 on gnathopod 2 not separated, article 7 of gnathopod 2 nearly as long as article 6, rami of uropod 3 equal to peduncle in length .... *Pherusa*
26. These characters not combined 27
27. Lower lip lacking inner lobes .... *Ceradocopsis*
27. Lower lip bearing inner lobes 28
28. Maxilla 1, inner edge of inner lobe not lined with setae 29
28. Maxilla 1, inner edge of inner lobe lined with setae 31
29. Outer ramus of uropod 3 bearing minute article 2 .... *Maeracunha* (in part)
29. Outer ramus of uropod 3 lacking second article 30
30. These genera probably identical .... *Maeropsis*

30. These genera probably identical.. *Paraceradocus*
31. Palm of gnathopod 1 transverse.. *Bathyceradocus*
31. Palm of gnathopod 1 oblique.. 32
32. Outer ramus of uropod 3 bearing minute second article.. 33
32. Outer ramus of uropod 3 lacking second article.. 34
33. Gnathopod 2 stouter than 1.. *Maeracunha* (in part)
33. Gnathopod 2 more slender than 1.. *Metaceradocoides*[1]
34. Male gnathopod 2 much stouter than gnathopod 1................ *Ceradocus & Ceradocoides*
34. Male gnathopod 2 not stouter than gnathopod 1.. 35
35. Gnathopod 2, palm indistinct.. *Metaceradocus*
35. Gnathopod 2, palm distinct, nearly transverse.. *Metaceradocoides*[1]

1. Birstein and Vinogradova 1960 (in part).

Bathyceradocus stephenseni Pirlot, 1934
(Figs. 75, 76)

Bathyceradocus Stephenseni Pirlot, 1934: 224-229, figs. 97-99; Dahl 1959: 239, fig. 20.

Material:

St. 232, Madagascar-Mombasa, 9°03'S 49°22'E, 4930 m, no sediment, HOT, 8. III. 51. One specimen, sex?, 14 mm, white in life.

St. 726, Gulf of Panama, 5°49'N 78°52'W, 3670-3270 m, clay, HOT, 13. V. 1952. Specimens removed from sunken tree trunk. 25 specimens. Figured specimen is 21 mm long; Largest is 36 mm.

St. 443, Mindanao Sea, 8°48'N 124°09'E, 1500 m, mud, many fragments of plants, ST 300, 16. VIII. 1951. Female, 15 mm, juvenile, 7 mm.

Remarks:

If the identifications are correct it would appear that this species ranges the Indo-Pacific Ocean abyss from Panama westward to Madagascar. Pirlot's specimen came from the Moluccas Strait, 1165-1264 m and Dahl's from the Banda trench, 7290-7250 m. The species is obviously benthic, both by its phylogenetic position and by its removal from a sunken log, where it was feeding on the rotting wood. The stomach of one specimen was analyzed and found to contain comminuted woody material similar to that seen in isopod and amphipod wood-borers of the genera *Limnoria* and *Chelura*.

Considerable variation occurs in the pleonal teeth of the present material as compared to that of Pirlot. The variations are not consistent at the Panamanian locality, indicating no need at this time for subspecific segregation. The single Madagascar spe-

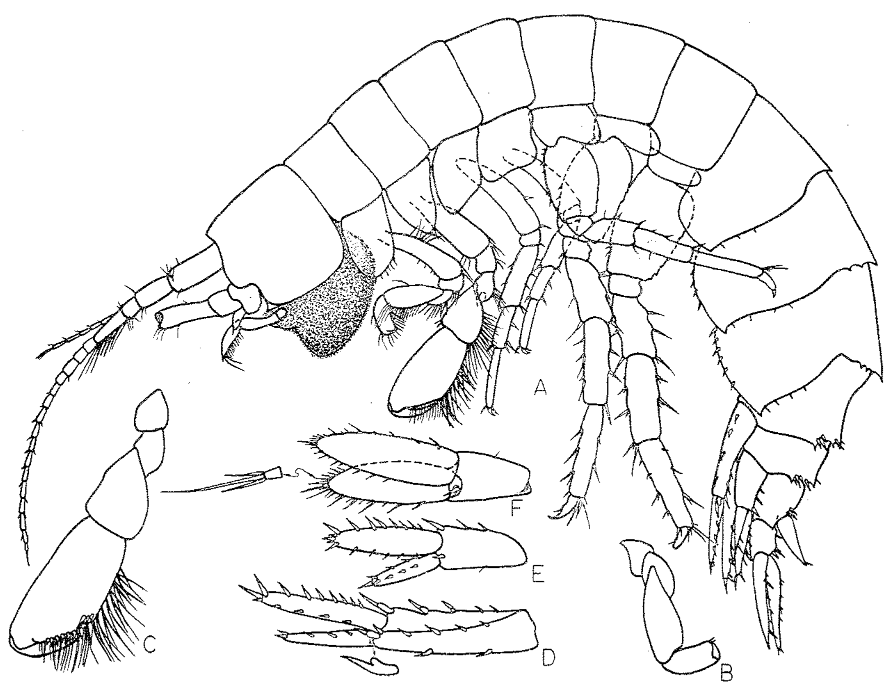


Fig. 75. *Bathyceradocus stephenseni* Pirlot. ?Sex, 14 mm, St. 232. A, lateral view, mouthparts covered with fuzzy growth of Protozoa; B, C, gnathopods 1, 2; D, E, F, uropods 1, 2, 3.

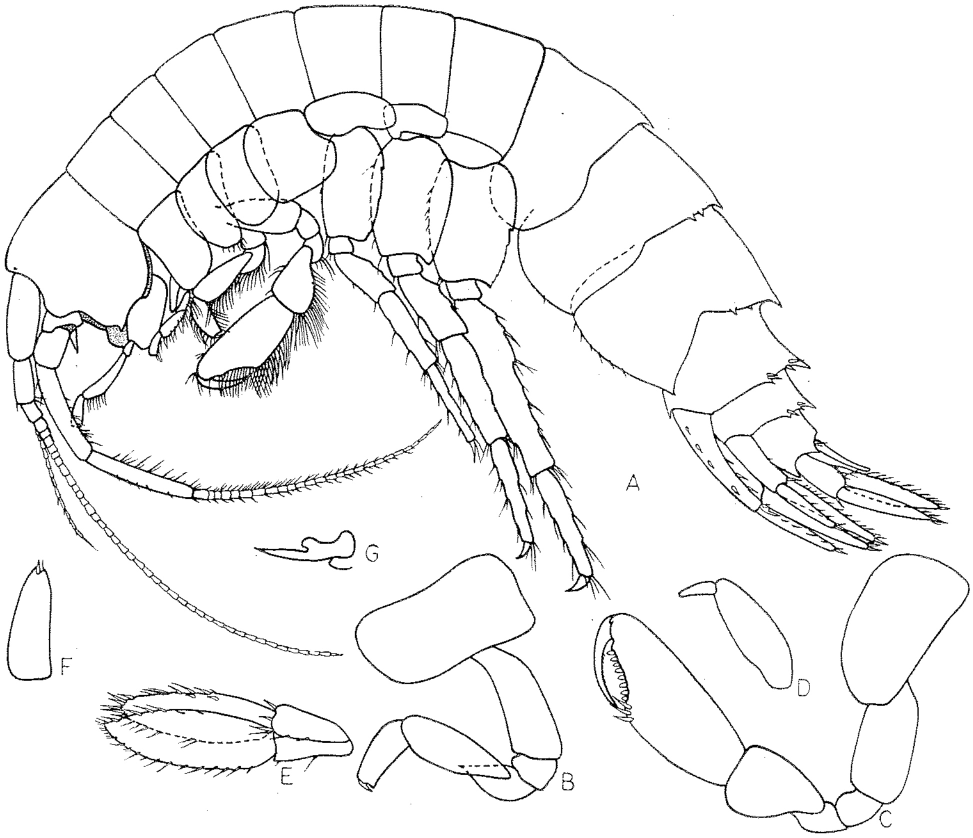


Fig. 76. *Bathyceradocus stephenseni* Pirlot. Male, 21 mm, St. 726. A, lateral view; B, C, gnathopods 1, 2; D, articles 3 and 4 of maxillipedal palp, setae not drawn; E, uropod 3; F, half of telson; G, peduncular spine of uropod 1.

cimen also differs from either the Moluccas or Panamanian representatives.

The Panamanian specimens are larger than PIRLOT's, with the second gnathopod better developed and similar to DAHL's figure of a large specimen. In every respect they appear similar to PIRLOT's figures, even to the peculiar spines on the distal ends of the first uropodal peduncles, except that pleon segment 1 lacks the dorsolateral accessory tooth. These might be considered a subspecies, considering the geographic separation, but the largest male, 36 mm, is aberrant in other respects. Pleon segments 2-3 also lack accessory teeth and pleon segments 4-5 bear only one accessory tooth instead of two. The third pleonal epimeron is not prolonged behind and scarcely toothed. Article 6 of gnathopod 2 is relatively shorter and stouter. The disto-lateral spine of the first uropodal peduncle is a normal, unnotched spine whereas the inner one is notched in the usual way. The lateral lobes of the head are poorly defined and the lower corner of the head is evenly rounded-quadrate. The maxillipedal palp is much more conspicuous than normally and projects as far forward as the mandibular palp. It appears, therefore, that age and phenotypy may have a bearing on the taxonomic features so that the writer hesitates to segregate these specimens as a subspecies.

The Madagascar specimen differs slightly from others in the species by its pleonal tooth formula, given in the table below. Coxa 4 also has a slightly different shape as seen in the figures. The third uropod has been drawn, since it was missing on PIRLOT's specimen. It has a minute second article on the outer ramus.

Of the Mindanao specimens, the adult female, 15 mm, shows a tooth formula identical to the type from Moluccas. The poorly developed formula of

Table 1. Accessory teeth on pleon segments of *Bathyceradocus stephenseni* in several different collections.

Pleon segment	1	2	3	4	5	6
PIRLOT 1934, Moluccas, 12 mm	1	2	2	2	2	0
Mindanao Sea, 15 mm	1	2	2	2	2	0
Mindanao Sea, 7 mm	0	0	0	2	1	0
Panamanian, normal, 21 mm	0	2	2	1	1	0
Panamanian, aberrant male, 36 mm	0	0	0	1	1	0
Madagascar, 14 mm	0	2	3	2	2	0

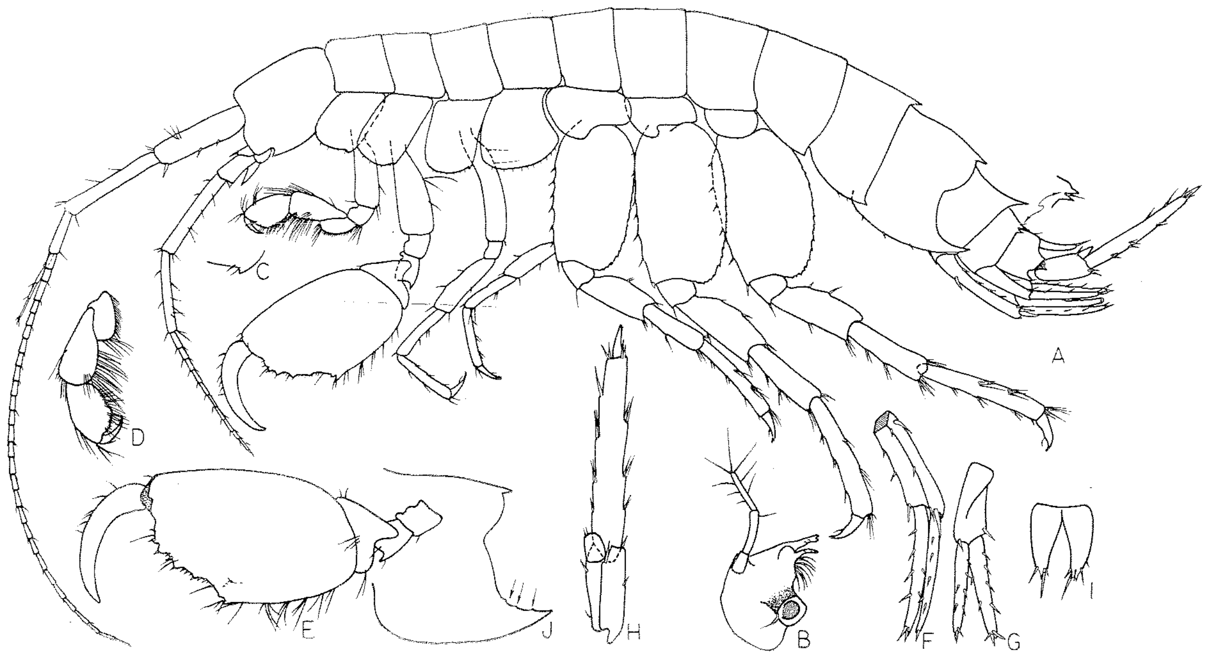


Fig. 77. *Melita lignophila* n.sp. Male, holotype, 6 mm, St. 745. A, lateral view; B, mandible; C, lower corner of coxa 1; D, E, gnathopods 1, 2; F, G, H, uropods 1, 2, 3; I, telson; J, third pleonal epimeron, arrows denoting minute serrations.

the juvenile indicates that advanced age and size are correlated with a higher formula.

DAHL (1959) shows a much more chelate first gnathoped than in any other specimens now assigned to the species and it may serve to identify hadal specimens as separate populations.

Distribution:

Gulf of Panama, 3670-3270 m; Strait of Moluccas, 1165-1264 m; Banda Trench, 7290-7250 m; Madagascar, 4930 m.

Melita lignophila n. sp.
(Fig. 77)

Material:

St. 745, Gulf of Panama, 7°15′N 79°25′W, 915 m, green clay, ST 600, 16.V.1952, on sunken tree trunk. Holotype male, 8 mm. Unique.

Diagnosis:

Eyes absent, lower corner of head with a sharp tooth below the lateral lobe; pleon segments 2, 3, and 4 with a posterior dorsal tooth, pleon segment 5 with 2 pairs of dorsolateral teeth, one pair on each side; third pleonal epimeron with a long slender tooth, which bears 3 poorly defined dorsal serrations; palm of gnathopod 2 irregularly and minutely sculptured, with a small defining tooth; mandibular palp very slender, mouthparts otherwise like *Melita palmata* (in SARS 1895: pl. 179).

Relationship:

This species differs from *Melita* (?) *solada* n. sp. by the dorsal teeth of pleon segments 2 and 3. It differs from *Melita dentata* (in SARS 1895: pl. 181, fig. 1) by the lack of eyes and the lack of accessory dorsal pleonal teeth. It differs from *M. abyssorum* Stephensen, 1944 and *Melitoides makarovi* (in GURJANOVA, 1951, by the presence of dorsal metasomal teeth. The species is most closely related to *Melita richardi* (in CHEVREUX, 1900) and differs only by the absence of a dorsal tooth on pleon segment 1.

Melita ? solada n. sp.
(Fig. 78)

Material:

St. 626, Tasman Sea, 42°10′S 170°10′E, 610 m, Globigerina ooze, PGI 0.2, 20.I.1952. Holotype, female, 12 mm, figured.

Remarks on genus:

The present unique specimen lacks the third uropods and for this reason is not firmly assignable to any genus in the Gammaridae. By ignoring the immediate use of uropods in the previous key to the Gammaridae the species might be placed in *Cera-*

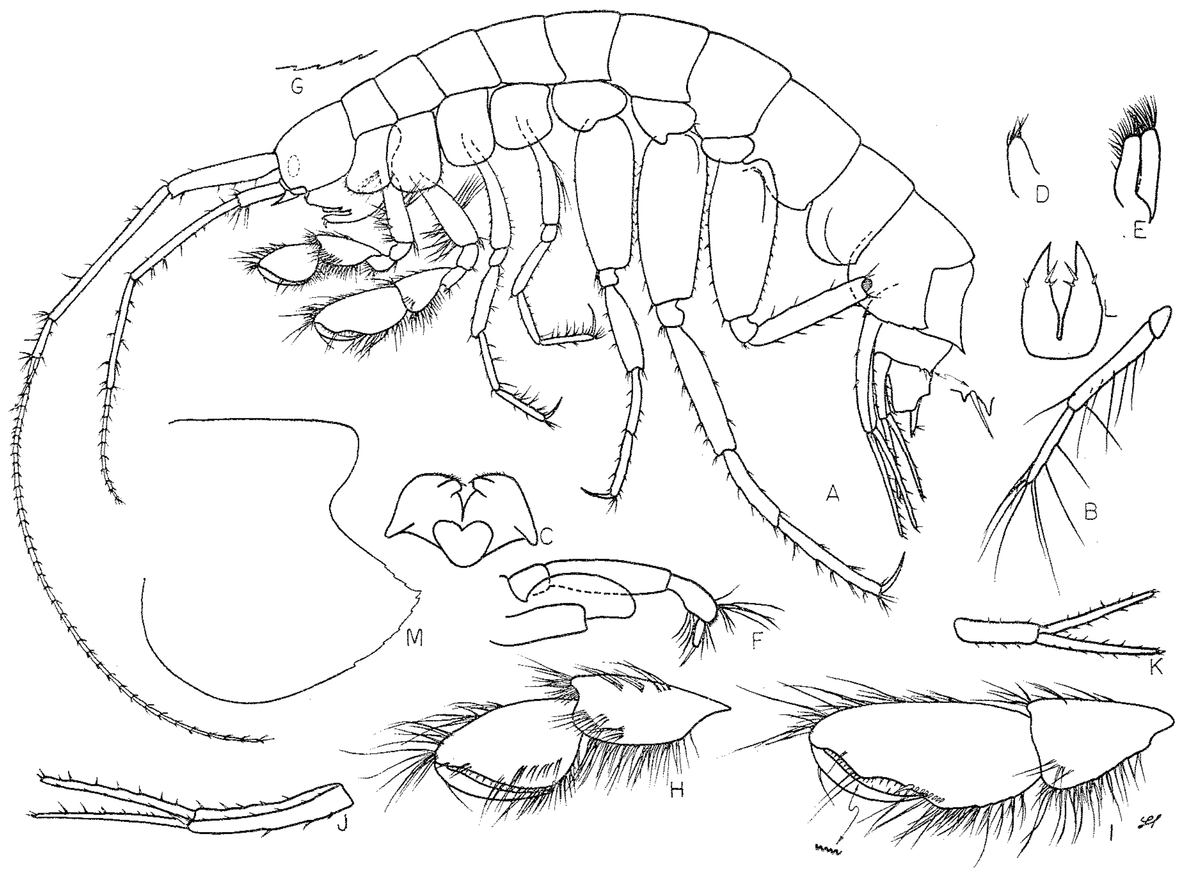


Fig. 78. *Melita? solada* n.sp. Female, holotype, 12 mm, St. 626. A, lateral view; B, palp of mandible; C, lower lip; D, inner plate of maxilla 1; E, maxilla 2; F, maxilliped, armature of plates not drawn; G, lower edge of coxa 1; H, I, gnathopods 1, 2, medial views; J, K, uropods 1, 2; L, telson; M, third pleonal epimeron.

docopsis Schellenberg, 1926a, especially for the lack of discernable inner lobes on the lower lip. The setae of the inner plate of maxilla 1 are not dense enough or placed properly for assignment to *Ceradocus* and its allies. The peculiar telson is the best indication that the species is a *Melita,* with the gaping lobes and the medial proximal notches on each lobe, characteristic of many *Melitas*. In this respect the species also fits the genus *Melitoides,* which differs from *Melita* largely by the short third uropod. The absence of both uropods in the present specimen, suggests, however, that it has very long ones, easily subject to loss.

The species might be assigned to *Maera,* particularly because of the poorly setose inner plate of maxilla 1 and will be distinguished from species in that genus in paragraphs below.

Diagnosis:

Eyes poorly represented, outlined by a nearly colorless mass of amorphous tissue; article 2 of second antenna 1.5 times as long as article 1; antennae long; gnathopod 2 of little taxonomic value because the animal is female, palm excavate on proximal half, distally bearing a low mound; no pereon or metasome segments carinate or toothed; pleon segment 4 (urosome segment 1) bearing a dorsal erect tooth; urosome segment 2 bearing two small lateral teeth on each side, enclosing a spine; third pleonal epimeron with lower and hind edges minutely but sparsely serrate, lower corner produced into a small tooth.

Relationship:

In its dorsal pleonal armature the species is much like *M.palmata* (see Sars 1895: pl. 179) but the first gnathopod of the female is quite different, not having a transverse palm. The new species differs from other blind or nearly blind bathyal species by the dorsal armature of the pleon segments or by the palms of the female gnathopods: *M.abyssorum* Stephensen, 1944 has a large defining tooth on the female palm; *M.richardi* Chevreux, 1900 has dorsal teeth on the metasome; *Melitoides makarovi* Gur-

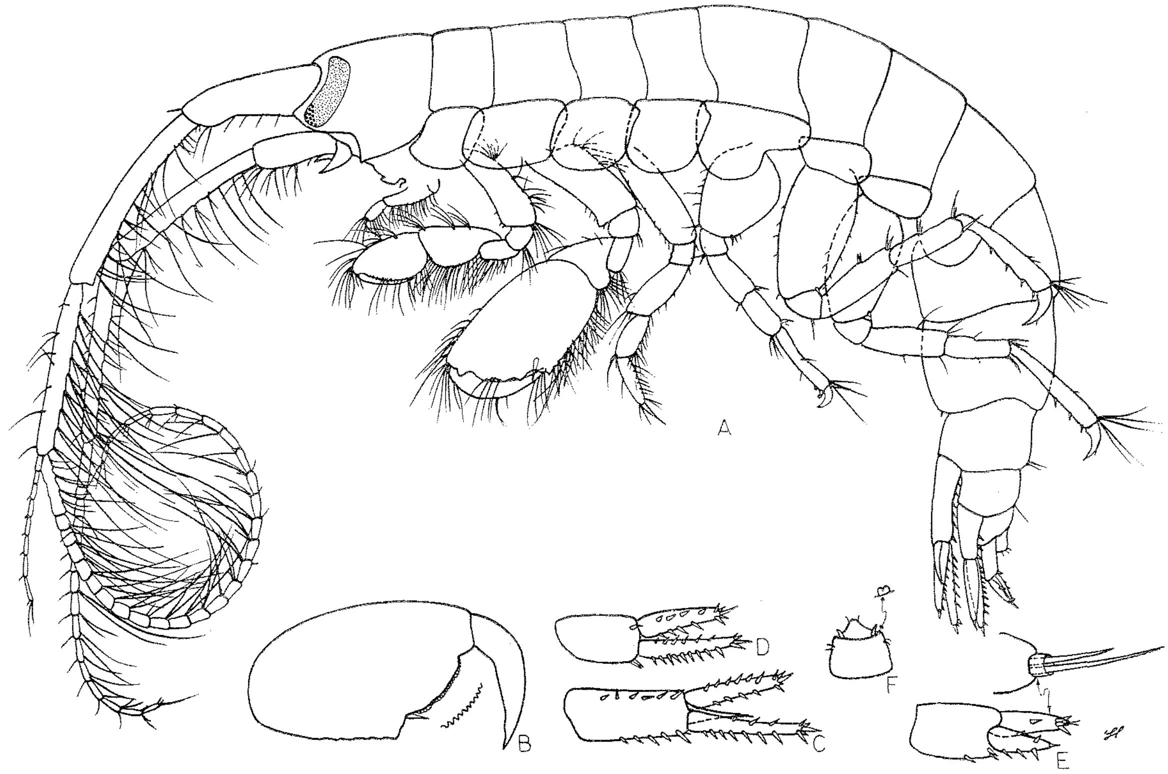


Fig. 79. *Eurystheus afer* (Stebbing). Male, 8 mm, St. 196. A, lateral view; B, gnathopod 2; C, D, E, uropods 1, 2, 3; F, telson.

janova (GURJANOVA, 1951) has a large dorsal tooth on pleon segment 5; *M.pallida* Sars (SARS, 1885) has dorsolateral teeth on the metasome segments; *M. quadrispinosa* Vosseler (GURJANOVA, 1951) has a middorsal tooth on pleon segment 5 as well as two laterals.

This species poses a special problem in its relationship to *M.orgasmos* K.H.Barnard, 1940, which it resembles closely. The dorsal pleonal armature is identical to that of *M.orgasmos* and the ventral serrations of the third pleonal epimeron also are mentioned by K.H.BARNARD, although he did not mention the posterior ones. The difficulty lies in BARNARD's statement that the female gnathopods are like *M.palmata* which, if using SARS (1895: pl. 179), are quite different than in the present specimen, the female first gnathopod bearing a transverse palm. Otherwise the present specimen would be assigned to that species.

Only three species of *Maera* bear a dorsal tooth on pleon segment 4. These are *Maera insignis, M. subcarinatus* and *M.odontoplax*. The new species differs from all by the lack of eyes and the presence of serrations on the third pleonal epimeron.

FAMILY PHOTIDAE

Eurystheus afer (Stebbing, 1888)
(Fig. 79)

Gammaropsis afer Stebbing, 1888: 1097, pl. 113.
Eurystheus afer, STEBBING 1906: 612; STEBBING 1908: 87; ?K.H.BARNARD 1916: 249-250, pl. 28, fig. 11; K.H.BARNARD 1937: 165-166, fig. 12.
Not *Eurystheus afer,* CHILTON 1912: 510-511, pl. 2, figs. 30-34.

Material:

St. 196, off Durban, 29°55′S 31°20′E, 430 m, sandy mud with stones, ST 300, 14.II.1951. Two males, 8 mm, female, 9 mm.

Diagnosis:

Lateral lobes of head not strongly produced forward; eyes oblong, lower part more clearly seen than upper; gnathopod 2 with oblique palm, not deeply excavated or toothed, minutely castellate; dorsal edges of pleon segments smooth; third pleonal epimeron with posterior edge slightly convex, lower corner rounded.

Remarks:

STEBBING (1908) and BARNARD (1916) infer that *E. afer* and *E. atlanticus* (Stebbing, 1888) may be the same species but the writer believes not, for the lateral lobes of the head and the structure of the eyes are distinctive. BARNARD (1916) figured the male second gnathopod and again in (1937); the latter is more like the original description in the ameliorated cusp defining the palm. The present male specimens are more like the original description and figures than other references cited above.

Distribution:

Gulf of Suez and South Africa, surface to 430 m.

FAMILY COROPHIIDAE

The Corophiidae are a mixture of basic amphipod types, characterized essentially only by the dorsal body depression. Some have gnathopod 1 larger than 2 and vice versa; some are more dorsally depressed than others; some bear hooked spines on the telson; in most of them the third uropods are reduced to one ramus and the second antenna is as long as the first and often stouter. Thus, *Camacho* and the new genus *Aorcho* to follow are not typical of Corophiidae, except in the depression of the body and bear better resemblance to Aoridae or Photidae, especially to genera with a short second antenna. The circular telson is also an indication of this relationship. What should be remembered however, is that zoologists are not always able to categorize families precisely, for evolution often leaves intergrades and intermediates. See J. L. BARNARD (1958 a) for a key to the family.

Aorcho n. gen.

Diagnosis:

Antenna 1 bearing a 4-articulate accessory flagellum; article 3 of peduncle as long as article 1; uropod 3 with equal sized rami which are longer than the peduncle; telson nearly circular; both pereon and pleon dorsally depressed, more markedly so than shown in accompanying figures for the pleon is especially tall; mouthparts of the general aorid-photid-corophiid type, identical to those of *Camacho* Stebbing, 1888 (pl. 127); gnathopods nearly equal in size, the first pair slightly stouter than the second.

Type species: *Aorcho delgadus* n. sp.

Remarks:

The writer hesitates in assigning the present genus and species to a family. It poses the same problem that some other corophiids do in their remarkable similarity to Photidae and Aoridae. For instance, the genus *Camacho* Stebbing, 1888 might easily be placed in the Photidae except that its body and especially urosome are distinctly depressed. Yet the genus *Bonnierella* Chevreux, 1900 placed in the Photidae and otherwise closely related to *Camacho* might be placed in the Corophiidae. *Aorcho* is very difficult to place because the gnathopods are so much alike. It would be difficult to choose between the Aoridae or the Photidae, if it were to be placed in either. If assigned to Aoridae it keys out to *Lembos,* but it is obviously not in that genus because its first gnathopods are not distinctly large although it bears close similarity to *L. longidigitans* Bonnier, 1896. In addition it has article 3 of antenna 1 as long as article 1, not typical of *Lembos*. If assigned to the Photidae it might be called *Eurystheus* but this genus almost invariably has gnathopod 2 distinctly larger than gnathopod 1.

Aorcho bears resemblance to *Paradryope* Stebbing, 1888 in the Aoridae by the long third article of antenna 1 but differs by the rami of uropod 3 which are longer than the peduncle whereas the reverse is the case with *Paradryope*.

Aorcho is distinct from *Bonnierella* which has gnathopod 2 distinctly larger than 1 and has a rudimentary accessory flagellum.

It differs from *Camacho* by the equal rami of uropod 3, whereas the inner ramus in *Camacho* is much smaller than the outer. It and *Camacho* should be placed together in the same family. No matter in which family it is placed, Corophiidae, Aoridae or Photidae, the genus represents a new one.

Aorcho delgadus n. sp.
(Fig. 80)

Material:

St. 626, Tasman Sea, 42°10'S 170°10'E, 610 m, Globigerina ooze, PGI 0.2, 20. I. 1952. Holotype, male, 7 mm. Figured specimen, male, 7 mm. Five other specimens, total 7.

Diagnosis:

With the characters of the genus.

Descriptive features:

The eyes are a transparent mass containing a few

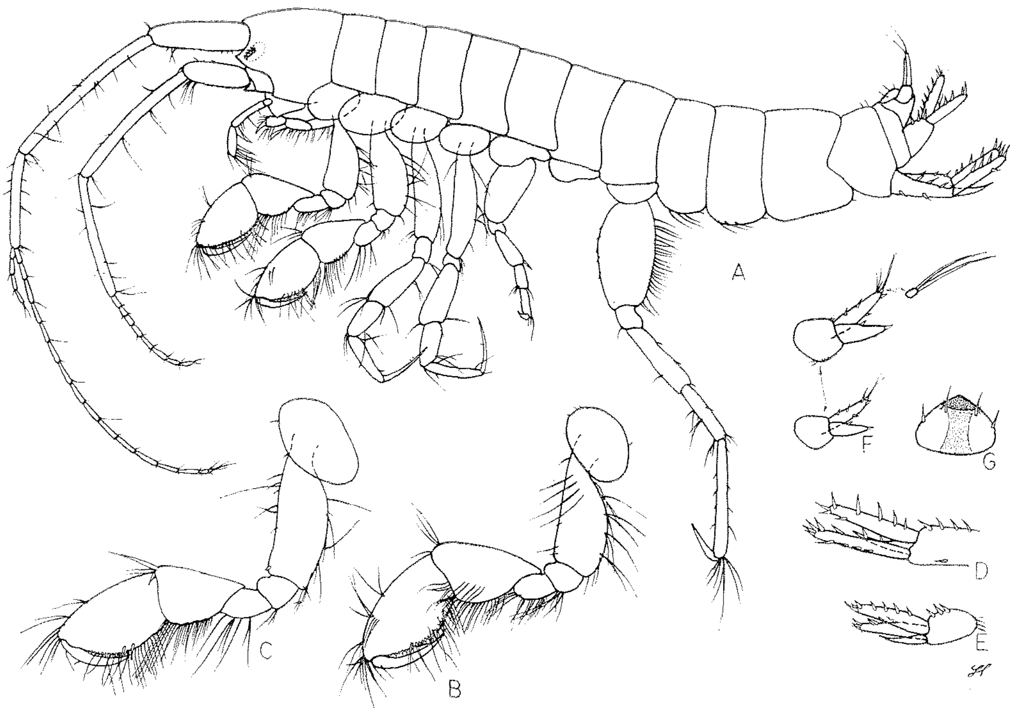


Fig. 80. *Aorcho delgadus* n. gen., n. sp. Male, holotype, 6 mm, St. 626. A, lateral view; B, C, gnathopods 1, 2; D, E, F, uropods 1, 2, 3; G, telson.

cellular globs. The female is identical to the male except for possessing brood plates. The peduncle of the pleopods is not expanded medially. The accompanying figures should suffice for a specific diagnosis, until another species is discovered in the genus, for which comparison may be made.

Camacho bathyplous Stebbing, 1888 (Figs. 81, 82)

Camacho bathyplous Stebbing, 1888: 1179, pl. 127; STEBBING 1906: 665; STEBBING 1908a: 87-88; HURLEY 1954: 459.

Material:

St. 626, Tasman Sea, 42°10'S 170°10'E, 610 m, Globigerina ooze, PGI 0.2, 20.I.1952. Figured, sex?, 8 mm, and 7 other specimens. Total: 8 specimens.

St. 665, Kermadec Trench, 36°38'S 178°21'E, 2470 m, grey clay, HOT, 25.II.1952. Figured male, 13 mm.

St. 668, Kermadec Trench, 36°23'S, 177°41'E, 2640 m, clay, HOT, 29.II.1952. Male, 13 mm.

Remarks:

The figured specimen from St. 626 is complete in at least one set of parts and is redrawn completely except for the mouthparts which correspond to STEBBING's (1888) figures. STEBBING (1908a) added more information to his original description and I am able to add a figure of antenna 1 which has a 4-articulate accessory flagellum. Uropod 3 has a second minute article on the outer ramus. The eyes are poorly developed and consist of a bundle of translucent globs. The lower corner of the head is acutely produced, not always visible, because of damage or bending. The fifth articles of gnathopods 1 and 2 are shorter than in the type specimen.

The figured specimen of St. 665 is in better condition, having pereopods 3-5 intact and figured in place. The animal is more heavily chitinized and the eyes are not visible; the lower corner of the head is much less produced than in the other specimen; for these two reasons it is more like the type specimen described by STEBBING.

Distribution:

This is a eurybathic species ranging in depth from 77 m on Agulhas Bank, off South Africa through 421 m off Lion's Head, New Zealand, and 610 m in the Tasman Sea through 2011 m off the east coast of New Zealand to 2640 m in the Kermadec Trench. It is a distinctly benthic species, both by its phylogenetic position and the silty materials found in the gut of the specimen from St. 665.

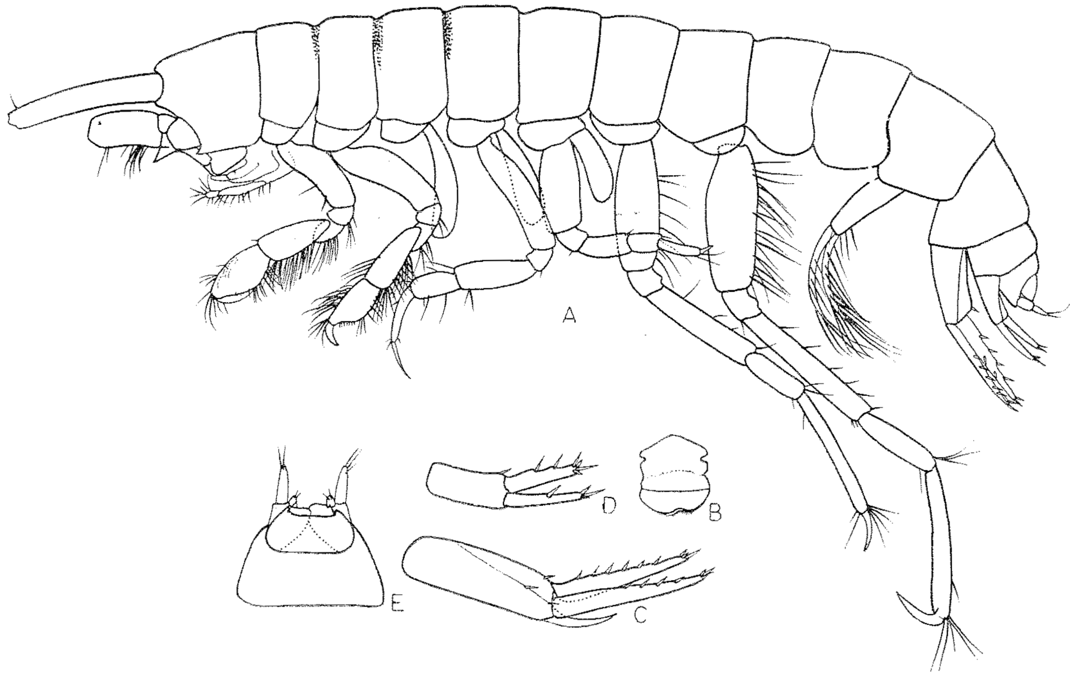


Fig. 81. *Camacho bathyplous* Stebbing. Male, 13 mm, St. 665. A, lateral view; B, upper lip; C, D, uropods 1, 2; E, dorsal view of pleon segment 6, telson and third uropods.

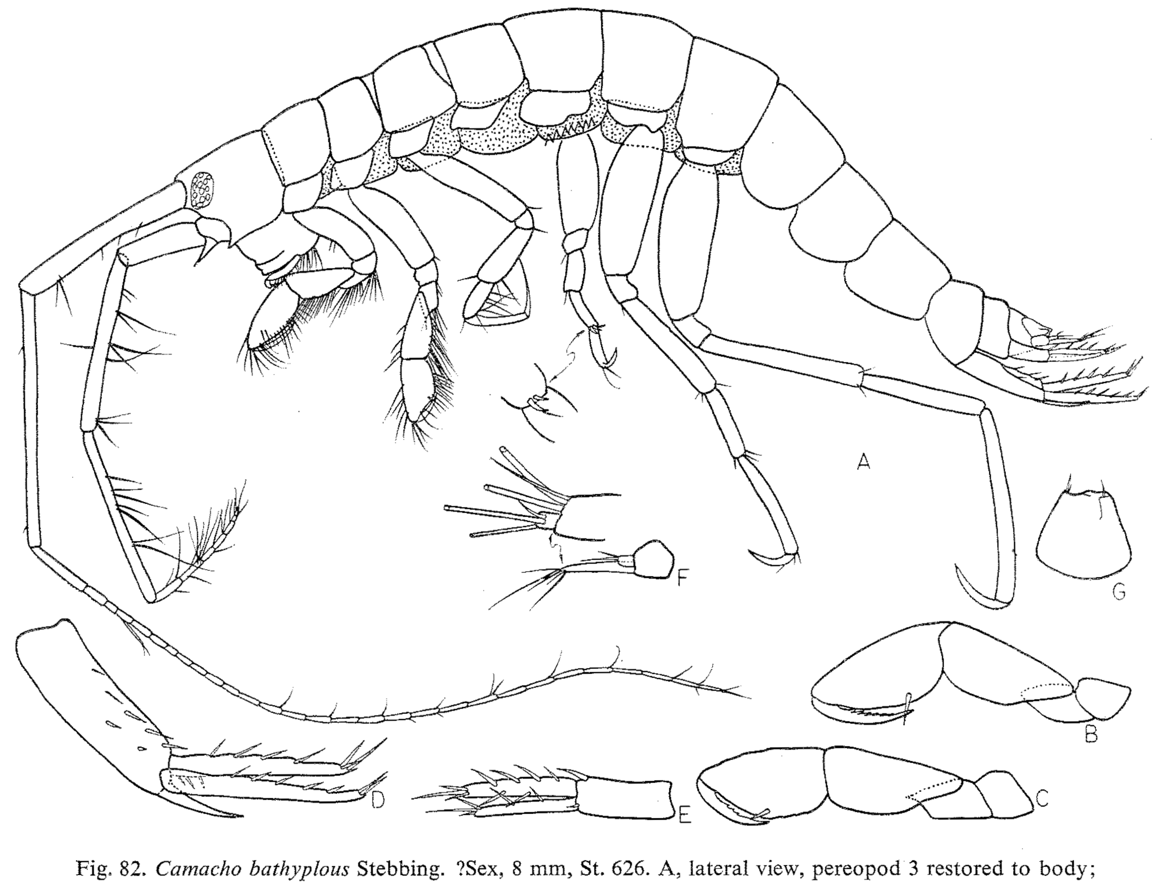


Fig. 82. *Camacho bathyplous* Stebbing. ?Sex, 8 mm, St. 626. A, lateral view, pereopod 3 restored to body; B, C, gnathopods 1, 2; D, E, F, uropods 1, 2, 3; G, telson.

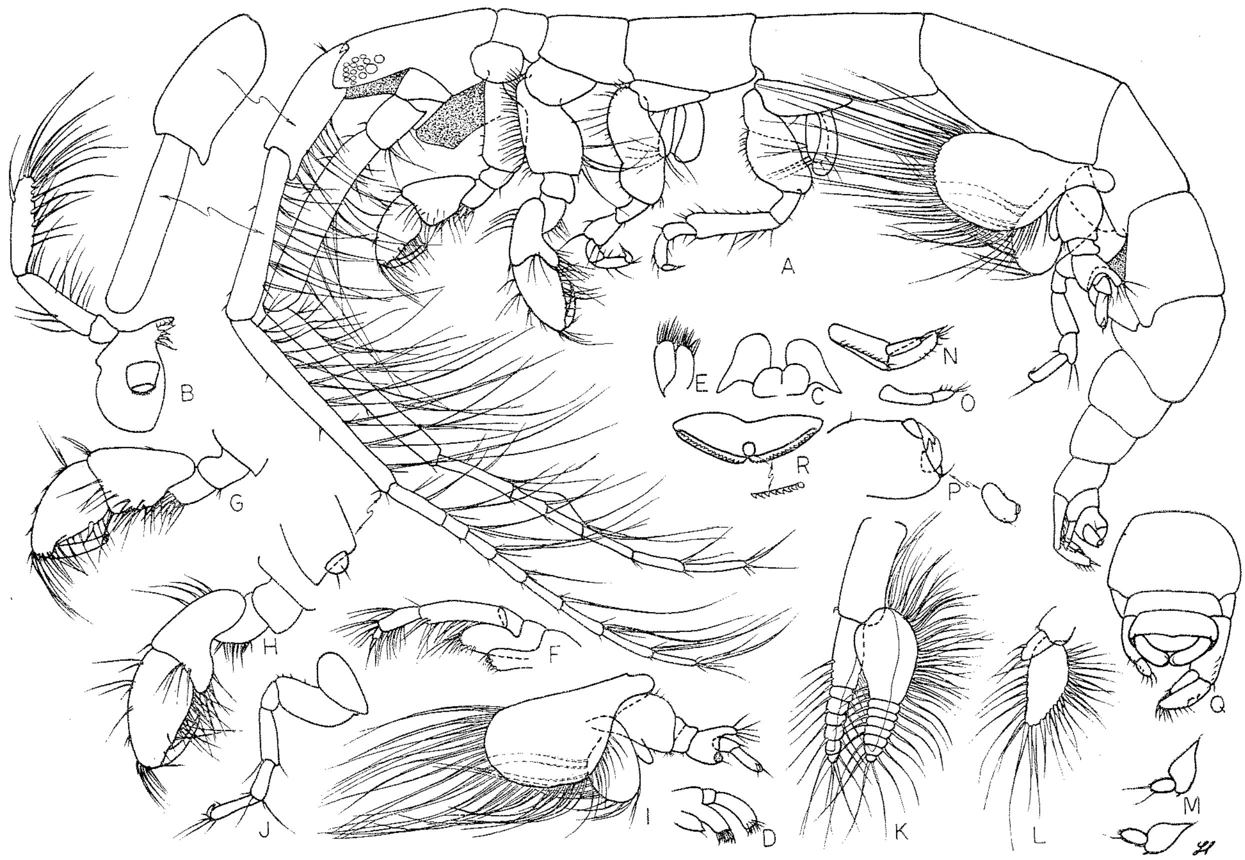


Fig. 83. *Runanga coxalis* n. gen., n. sp. Female, holotype, 5.5 mm, St. 626. A, lateral view; B, mandible; C, lower lip; D, E, maxillae 1, 2; F, maxilliped; G, H, gnathopods 1, 2; I, pereopod 3; J, pereopod 5; K, L, M, pleopods 1, 2, 3; N, O, P, uropods 1, 2, 3; Q, dorsal view of urosome; R, telson.

Cerapus abditus Templeton, 1817

Cerapus abditus Templeton, Pirlot 1938: 349-352, figs. 157-158 (with literature).

Material:

St. 196, off Durban, 29°55'S 31°20'E, 430 m, sandy mud with stones, ST 300, 14.II.1951. Two females, 7 mm.

Distribution:

South Africa, Arabia, India, Indonesia, Australia, 13 to 430 m.

FAMILY PODOCERIDAE

Runanga n. gen.

Diagnosis:

Antennae subequal in length; antenna 1 bearing a vestigial, scale-like accessory flagellum; pleon bearing 6 distinct segments; three pairs of uropods are present, the first biramous, the second uniramous, the third essentially only a peduncle with vestigial, microscopic remnants of two rami, the inner ramus scale-like, the outer bearing two hooks; pleopods progressively vestigiate, the first normal, with two large rami, the second with the inner ramus shortened, the third apparently with only a single, minute ramus (it is possible, in dissection that an outer ramus was broken off; these organs are very fragile); coxa 5 foliaceous and densely setose; third mandibular palp article as long as second article.

Type species: *Runanga coxalis* n. sp.

Relationship:

This remarkable genus bears no distinct relationship to any of the known Podoceridae. It has the same general appearance as *Xenodice* Boeck and *Neoxenodice* Schellenberg but differs from them by the uniarticulate second uropod, among many other characters.

Runanga has a number of interesting morphological characters. The third, fourth and fifth pereon segments are unusually elongated; coupled with the smallness of the brood lamellae it might seem difficult for the animal to retain its ova in a brood pouch. It appears that some of this difficulty is ameliorated through the greatly setose, foliaceous expansion of the fifth coxa into a false brood lamella. The structure and size reduction of the last two pairs of pleopods is also worthy of note, features uncommon to marine amphipod genera. The gills and true brood lamellae are divorced from the basal attachment of the pereopods.

Runanga coxalis n. sp.
(Fig. 83)

Material:

St. 626, Tasman Sea, 42°10'S 170°10'E, 610 m, Globigerina ooze, PGI 0.2, 20.I.1952. Holotype, female, 5.5 mm.

Diagnosis:

With the characters of the genus.

First antennal article bearing a distal tooth, seen more clearly in flattened view, as drawn; article 2 of the second gnathopod with anterior edge greatly setose and prolonged proximally; article 4 of pereopod 2 more than twice as long as its counterpart on pereopod 1; head with minute rostrum, lateral lobes subacute, bearing scattered large and small ommatidea; posterior edge of telson armed with small hooked beads.

THE DISTRIBUTION OF ABYSSAL BENTHIC AMPHIPODS

Statistical Information

Barnard (1961)[1] presented a summary of known abyssal and hadal Amphipoda. With the addition of the *Galathea* analyses new totals are now necessary. A total of 272 species has now been reported from abyssal depths or greater. Of these 106 are definitely pelagic species and many may prove to live only in bathyal[2] waters which are fished by the abyssal hauls. Until open-closing nets are used extensively these species may not be sorted out. Another 7 species are probably abyssopelagic, rather than benthic. Sixteen species are inquilinous forms, of which only four are known to be definitely benthic in habitat, the others possibly inhabiting pelagic hosts, such as tunicates or medusae. A total of 81 definitely benthic species is known. Another 78 species are probably benthic, rather than pelagic, although this list includes some known demersals such as six species of *Rhachotropis*.

The 272 abyssal[2] species are distributed among 136 genera, of which 43 are known to be pelagic, 37 are known definitely to be benthic, 43 are suspected of being benthic, and the remaining 13 are problematical. Of the 136 total genera, 28 are abyssally endemic, but only 6 of these are known to be benthic (Table 7), although a few others are certainly good candidates for demersal behaviour. The distribution of the 37 benthic genera is partitioned among 6 abyssally endemic, 11 endemic to bathyal and greater depths (200 m), while the remaining 20 genera are primarily sublittoral, with an average of 23 species each, of which only 2.7 species per genus have been recorded abyssally. Thus, half of the species in the abyssal fauna belong to sublittoral genera, for 42 of the 81 known benthic species belong to the 20 sublittoral genera, and 19 more belong to primarily bathyal genera, leaving 20 species belonging to 14 primarily abyssal genera.

Barnard (1961) has shown that monotypism is quite high (92 %) in endemic abyssal amphipod genera. This includes pelagic genera as well as benthic. Nevertheless, the species in endemic abyssal genera comprise only 30 % of the total endemic abyssal species, the remaining 70 % belonging to genera found also in the bathyal and sublittoral.

The total number of bathyal monotypic genera is 47, of which 21 are benthic, leaving 125 monotypic sublittoral genera, most of which are benthic. Thus, as one progresses downward into the deep-sea, the number of monotypic genera decreases, but what is more striking is that the ratio between pelagic and benthic monotypic genera increases. Only 24 % of the abyssal monotypic genera are definitely benthic (perhaps 50 % including demersals when so determined in the future).

Regional endemism

Two extremes of opinion must be resolved concerning the distribution of abyssal faunas: the first is the belief that the species should be largely cosmopolitan

1. Paper in press.
2. The writer defines marine benthic zones according to arbitrary depths, regardless of temperatures, as follows: *sublittoral* – 0-200 meters, *bathyal* – 200-2000 meters, *abyssal* – 2000-6000 meters, *hadal* – 6000 + meters. See Hedgpeth, 1957, Classification of Marine Environments, Chapt. 2, Treatise on Marine Ecology and Paleoecology, Geol. Soc. Amer., Mem. 67, vol. 1 : 17-28.

Table 2. List of Arctic-North Atlantic abyssal benthic species; all are eurybathic except those marked with asterisks, which are largely unique records.

Dulichia abyssi	**Melita abyssorum*
Dulichia nordlandica	*Melita pallida*
Haploops setosa	**Melita richardi*
Haploops similis	*Neohela monstrosa*
Harpinia amundseni	**Orchomenella abyssalis*
Hippomedon holbolli	*Sympleustes megacheir*
Hippomedon longimanus	*Unciola laticornis*
**Ischyrocerus tenuicornis*	**Westwoodilla abyssalis*
Leptophoxus falcatus	*Urothoe elegans*
Liljeborgia fissicornis	*Unciola petalocera*

because of the uniform abyssal environment, the second that regional endemism exists and can be proved to be correlated with barriers formed by continental and undersea topography, or with distance, because of low dispersal rates.

The most extreme continental barrier today is the separation of middle Atlantic and the middle Pacific faunas at the Panamanian isthmus, but a comparison of abyssal Amphipoda is not possible because of the lack of study. Another striking barrier is formed by the shallow straits of the Polar Sea between the North Pacific and North Atlantic oceans. Here surface temperatures approximate abyssal temperatures, but there is little evidence that abyssal amphipods have used this as an interconnecting pathway. The abyssal benthic amphipods of the North Pacific still remain to be described for the papers of BIRSTEIN & VINOGRADOV have been concerned with abyssal pelagic amphipods. Although a number of bathyal amphipods of the Polar Sea have been recorded by GURJANOVA (1951) none has been recorded from the abyssal Atlantic, indicating little emergence or submergence of amphipod faunas with isotherms. Most of the abyssal benthic amphipods recorded from the Norwegian and northeastern Atlantic basins have been optimally sublittoral types which have strayed into abyssal depths.

The evidence for regional endemism must be based, for the present on admittedly incomplete faunal analyses of various neighbouring and widely separated abyssal basins. The most striking aspect of the evidence supporting regional endemism is the high rate of recovery of new benthic species by each abyssal expedition and the low recovery of previously described species from other regions.

Even if undersea topographic barriers were ineffective then distance alone would be a barrier to dispersal provided that dispersal rates were low among obligatorily benthic amphipods. The fact that no proven stenobathic abyssal obligatorily benthic amphipod has yet been discovered with a wide, ocean-to-ocean distribution indicates that some kind of barrier exists to prevent the successful population of all abyssal regions with a few common types. Of the four species in Table 6, only *Neoxenodice caprellinoides* is a legitimate candidate for the category of abyssal ubiquity, but it has not been recovered in the northern Hemisphere. Species of the genera *Onesimoides* and *Bathyceradocus* are associated with wood and may be transported with it. The species we are interested in are those which must be dispersed by their own benthic saltation and "population pressure".

Harpinia excavata and its varieties of the bathyal and abyssal regions in the eastern Atlantic represent an obligatorily benthic species with interbasin distribution but the species is eurybathic. When denoting "eurybathy" one usually thinks of a species that is relatively unrestricted in its dispersal mechanisms, for it is able to occupy wide ranges of depth and temperature. It is intriguing to suggest that *Harpiniopsis sanpedroensis* J. L. Barnard, 1960 a is an eastern Pacific subspecies or variety of *Harpinia excavata.* If more eastern Pacific materials can be examined and this thesis proved, then systematists must take a closer look at bathyal faunas in search of species widely dispersed among the several oceans. The writer has already mentioned herein the similarities of several species of bathyal *Ampelisca,* which may prove to be merely interocean races or varieties.

The *Galathea* collections, by the addition of 22 new abyssal and 38 new bathyal species to the world fauna and the low recovery of previously known obligatorily benthic amphipods in these depths, demonstrate that high diversity and regional ende-

Table 3. List of benthic abyssal species known from one record

Anoediceros hanseni mozambis	*Leptophoxoides molaris*
Bathymedon candidus	*Leucothoe panpulco*
Bogenfelsia incisa	*Liljeborgia caeca*
Bonnierella angolae	*Liljeborgia mojada* (1800 m)
Byblis ceylonica	*Liljeborgia zarica* (1800 m)
Haploops abyssorum	*Metaceradocoides vitjazi*
Haploops lodo	*Onesimoides carinatus*
Harpinia curtipes	*Oediceroides forensia*
Harpinia wandichia	*Oediceroides zanzabaricus*
Hippomedon antitemplado	*Paradryope orguion*
Hippomedon concolor	*Paronesimoides lignivorus*
Hippomedon tasmanae	*Photis coecus*
Lembos lobata	*Podoceropsis lapisi*
Lepidepecreum clypodentatum	*Urothoe simplignathia*

Table 4. List of benthic abyssal species known from two or more records but from only one basin or region

Ampelisca byblisoides	*Hippomedon serratipes*
Byblisoides arcillis	*Leucothoe rostrata*
Carangolia mandibularis	*Orchomenella affinis*
Harpinia brevirostris	*Orchomenella cheuvreuxi*
Harpinia cinca	*Orchomenella dilatata*
Harpinia laevis capensis	*Urothoe rotundifrons*
Harpinia pacifica	*Urothoe vemae*
Harpinia spaercki (hadal)	

mism exist, discounting demersal and pelagic species.

As new records of abyssal benthic amphipods are collected the trend appears to suggest that more and more species are widely distributed and that ubiquity is the rule, but this is not the case. It would appear that widely separated captures of benthic amphipods concern those that are eurybathic or those that are dispersed by special mechanisms. For instance, *Camacho bathyplous*, captured again by the *Galathea* appears to be eurybathic, and *Bathyceradocus stephenseni* now known from Panama west to Madagascar is greatly eurybathic, ranging from bathyal to hadal depths; probably, it is aided in its dispersal by its association with wood. The same statement is true of *Onesimoides chelatus*. Other species such as *Pseudonesimus abyssi*, though belonging to the Gammaridea, nevertheless probably are bathy- and abyssal-pelagic which conditions themselves are partially synonymous with ubiquity.

The distinctly benthic amphipods are in the families Ampeliscidae, Haustoriidae, Phoxocephalidae, Oedicerotidae, Liljeborgiidae, Photidae, Aoridae, and Corophiidae. Some of the male Phoxocephalidae swarm in upper water layers, but so far no blind abyssal species has been found at the surface. These benthic amphipods plus two or three genera of other families known to be benthic have been arranged into five groups in Tables 2 to 6. The last four groups (Tables 3 to 6) are composed of species known from low latitudes, as contrasted with Table 2, which concerns species known from the high north-Atlantic and Arctic basins, most of which are eurybathic. I have temporarily restricted the use of the term eurybathic in these cases to abyssal species which range up into bathyal depths shallower than 1200 m. Many of the Arctic and sub-Arctic abyssal species are known from depths shallower than 500 m and some are as shallow as the sublittoral. With the exception of *Orchomenella abyssorum* no Arctic-north Atlantic species is found in low latitudes of the abyss, which certainly is an exception to the idea that the cold abysses of the world are populated by species evolving in the rich, shallow cold Arctic and sub-Arctic. Indeed, the eurybathic abyssal faunas of the Norwegian and Polar Basins are unique to those areas. Some of the eurybathic Arctic genera, such as *Dulichia, Ischyrocerus, Leptophoxus, Sympleustes,* and *Unciola* are not found in other abyssal regions. Except for *Neohela,* the writer believes that most of the species in the Arctic genera are optimally sublittoral and bathyal. They stray into abyssal depths but have been unable to migrate into low latitudes by this pathway.

Tables 3-6 list 58 abyssal amphipod species, outside the Arctic-north Atlantic regime, largely from low latitudes, of which 50 are known from a single record, a single basin or a single region of two or three basins. Only 8 of the species are widely distributed, and of these 4 are eurybathic, with records in the shallow bathyal. This would indicate a relatively high degree of regional endemism in abyssal depths.

Collections of abyssal and hadal amphipods have been widely scattered through the ocean basins. SVERDRUP, JOHNSON and FLEMING (1942, Chart 1) listed 45 major basins and 17 trenches. On the basis of the work by the *Vema* (BARNARD 1961) each neighbouing basin of the south Atlantic had a relatively high number of endemic amphipods. The writer presumes that any one basin might have at least the following endemic specific composition: 2 ampeliscids, 2 phoxocephalids, 2 haustoriids, 2 corophiid-photids, one liljeborgiid, 2 lysianassids, and one other species, for a total of 12 species per basin. This would indicate that a minimum total of 540 abyssal benthic amphipod species exist in the 45 major basins, of which expeditions have now captured about 61 (including the writer's estimate of legitimate Arctic species). Perhaps the estimate is too high and it will be found that some species range through two or three neighbouring basins or that some species now known only by captures in

Table 5. List of benthic abyssal species which are eurybathic, occurring both at abyssal depths and shallower than 1200 m. Asterisks indicate species limited to a basin or region.

**Ampelisca abyssicola*	*Harpinia excavata & var.*
**Ampelisca gibba*	*?Leucothoe tridens*
**Byblis serrata*	*Mesopleustes abyssorum*
Camacho bathyplous	**Metaphoxus "typicus"*
**Haploops vallifera*	**Onesimoides cavimanus (hadal)*
**Harpinia abyssi*	

Table 6. List of stenobathic abyssal species which are widely distributed, but not occurring shallower than 1200 m. Asterisk denotes deep bathyal to hadal distribution, hence eurybathic in depths greater than 1200 m.

**Bathyceradocus stephenseni*	*Onesimoides chelatus*
Neoxenodice caprellinoides	*?Oediceroides wolffi*

the deep bathyal will be found to be abyssal also; outside of the Arctic region, however, the latter case will be of rare occurrence, for the amphipods of bathyal regions are poorly studied.

One of the difficulties in using amphipods for biogeographic studies is that their habitats are poorly known. BARNARD (1961) listed 69 potentially benthic abyssal amphipods, beside those definitely known to be benthic. The writer believes that 4 species of *Hippomedon*, 4 of *Orchomenella* and 3 of *Leucothoe* from the inquilinous list be added to the distinctly benthic list. Nine new potentially benthic species are added in this report, for a total of 67 probable benthic species. It is now recognized that some of the 67 species are undoubtedly demersals of strong pelagic character such as species of *Andaniotes* and *Pseudonesimus*. These are genera or species widely distributed because of their primarily pelagic habits, but they often feed on the bottom. Probably all species of *Lepechinella* should be transferred to a list of demersals, except that they are more oriented to the benthic than to the pelagic. The term demersal as applied to amphipods would have a spectrum ranging in extreme from species nearly obligatorily benthic to those nearly obligatorily pelagic. It appears that species of *Lepechinella* are regionally endemic, for none has been found to be widely distributed. Counting one new species described herein there are now four species of abyssal *Lepechinella*. The remaining eight lepechinellids are bathyal but again regionally endemic. If the lepechinellids and the other 63 potentially benthic abyssal species were added to Tables 2-6 they would be distributed as follows: Arctic 17, one record 29, one region 14, eurybathic 4, and widely distributed stenobathic 3. Thus, only seven of the 67 species are widely distributed, which is good evidence that many of them are really benthic, and so not as widely dispersed as are pelagic organisms.

The origin of abyssal benthic amphipods

Two pairs of viewpoints concern the origin of abyssal amphipods: first, whether abyssal species originate in cold polar seas and submerge in low latitudes in the abyss or whether the faunas of each abyssal basin are more closely related to the bathyal and sublittoral areas nearby; second, whether the degree of specialization of abyssal faunas in terms of specific and generic endemism is a measure of the relative age of abyssal faunas. These points are related to but not quite synonymous to the other two extremes stated at the beginning of this discussion.

In the first case, it has already been mentioned that the benthic amphipod species known from abyssal polar areas have not been collected from the abyss in low latitudes and that most of the Arctic genera have not dispersed elsewhere. In the southern Hemisphere there is one interesting case, as reported herein, of three closely related species in the genus *Byblisoides*, which show submergence in low latitudes, with the Antarctic species at about 200 m, the temperate species at 600 m and the tropical species at 1600-2000 m. Perhaps other examples will be discovered, especially among those species not as yet proved to be benthic.

The development of endemic abyssal benthic genera has been quite low. BARNARD (1958) listed 516 marine gammaridean genera, of which only 28 are known to be abyssally endemic, but only 6 of these are definitely benthic. Among these the genus *Leptophoxoides* is closely related to the polar *Leptophoxus*, whereas the other four genera are indistinctly related to any shallow water genera, as now known.

Determining the closest relative of any individual abyssal species is a difficult job and often open to argument among taxonomists. One of two alterna-

Table 7. List of endemic abyssal benthic amphipod genera, 2000 + meters.

Bogenfelsia	*Neoxenodice*
Leptophoxoides	*Paradryope*
Metaceradocoides	*Paronesimoides*

List of endemic bathyal-abyssal benthic amphipod genera, 200 + meters.

Including only those genera with both abyssal and bathyal species. The writer's interpretation is that the genera *Bathymedon*, *Leptophoxus* and *Oediceroides* are normally bathyal or deeper, but that eurybathic strays occur in the Arctic and Antarctic sublittoral.

Anoediceros	*Carangolia*
Bathymedon	*Leptophoxus*
Bathyceradocus	*Mesopleustes*
Bonnierella	*Neoxenodice*
Byblisoides	*Oediceroides*
Camacho	

Table 8. List of genera with abyssal benthic species.

	No. of species		
	Abyssal	Bathyal	Sublittoral
Ampelisca	3	21	68
Anoediceros	1	1	–
Bathymedon	2	8	5
Bathyceradocus	1*	–	–
Bogenfelsia	1	–	–
Bonnierella	1	2	–
Byblisoides	1	2	–
Byblis	2	8	11
Carangolia	1	1	–
Camacho	1*	–	–
Haploops	6	3	4
Dulichia	2	6	9
Harpinia	10	14	13
Hippomedon	7	8	12
Lembos	1	1	26
Ischyrocerus	1	7	17
Lepidepecreum	1	3	6
Leptophoxus	(1)	1	–
Leptophoxoides	1	–	–
Leucothoe	4	2	16
Liljeborgia	3	3	18
Melita	3	2	30
Mesopleustes	1*	–	–
Metaceradocoides	1	–	–
Neoxenodice	1	–	–
Onesimoides	3*	–	–
Neohela	1*	–	1
Oediceroides	4	10	9
Orchomenella	5	4	21
Paradryope	1	–	–
Paronesimoides	1	–	–
Photis	1	1	33
Podoceropsis	1	2	9
Sympleustes	1	4	11
Unciola	2	1	12
Urothoe	4	1	17
Westwoodilla	1	1	7
Totals	81	117	355

() = record of bathyal in abyssal.
* = eurybathic.

tives is the objective: whether an abyssal species is more closely related to a geographical neighbor in the bathyal-sublittoral or whether it is more closely related to another abyssal species in another geographic area. The second alternative would support the thesis that abyssal species evolve from one precursor already adapted to the abyssal environment and that radiation took place only at abyssal depths; this would mean that special morphological characteristics borne by the precursor have been carried over into the descendent species and are recognizable as unique determinants. Little evidence of this is present in amphipods. The answer to the alternatives has to be based on polymorphic genera with numerous shallow water species and more than one abyssal species. All abyssal species that are unique to their genera naturally will have no abyssal relatives for comparison. Only six cases of multispeciation are known at present, as seen in Tables 2-6, in the genera *Ampelisca* with 3 abyssal species, *Haploops* with 5, *Hippomedon* with 7, *Harpinia* with 10, *Liljeborgia* with 3, and *Urothoe* with 4.

None of the three species of abyssal *Ampelisca* is at all closely related to the other two (see key in J. L. Barnard 1960). *Ampelisca byblisoides* is a unique species in terms of its fifth pereopod and is unrelated to any shallow water species; *Ampelisca abyssicola* of the Caribbean is also unusual, its closest relative being the new species *A. hermosa*, described herein, which is a bathyal geminate from the Pacific side of the Panamanian Isthmus; *Ampelisca gibba* of the North Atlantic is more closely related to the sublittoral *Ampelisca brevicornis* than to any other species.

Because of their long dorsal setae and humped fourth pleonal segments, *Haploops setosa, H. vallifera* and *H. similis* form a close complex with the shallower *H. robusta* in the north Atlantic. *Haploops lodo* n. sp. from the Pacific, is closer to the Atlantic *H. robusta* than to other shallow species because of the spines on the third article of the fifth pereopod. Here is a complex of 4 abyssal species all related to the shallow water *H. robusta* but also closely related to each other. *Haploops abyssorum* stands alone, having no distinct relative.

Harpinia abyssi and *H. brevirostris,* both of the north Atlantic are more closely related to each other than to any other species. *H. abyssi* is eurybathic.

Harpinia curtipes of the abyssal north Atlantic is most closely related to its sublittoral north Atlantic relative *H. laevis.*

Harpinia amundseni is most closely related to its sublittoral neighbor *H. plumosa,* as well as to a bathyal neighbor, *H. galerus.* The direction of relationship in this complex is unknown as yet. The relationship of *H. pacifica* is unclear to the writer but it is a unique species only in an accessory head process, a probable aberration. *Harpinia excavata* of the eastern Atlantic forms a complex with two other species known from the bathyal, *H. latipes* of the north Atlantic and *H. sanpedroensis* of the eastern Pacific. Actually *H. excavata* and *H. sanpedroensis* may be paired subspecies with a parent species that was close to *H. latipes*. *Harpinia spaercki* Dahl, 1959 of the Banda Trench stands close to the shallow water Atlantic *H. laevis* and the shallow Galapagan *Harpiniopsis* sp. D of BARNARD (1960a). Because males have not been worked out for *H. spaercki* and *Harpiniopsis* sp. D, the precise relationships are unknown. *H. spaercki* is a species with very simple, unspecialized morphology.

The south Atlantic subspecies *Harpinia laevis capensis* J.L. Barnard (BARNARD 1961) is really closer to *H. spaercki* of the Banda Trench than to its sublittoral relative *H. laevis*, especially in the third pleonal epimeron, and certainly affirms the direction of relationship between *H. spaercki* and *H. laevis*. This is indeed an interesting situation, but as in the case of all south Pacific abyssal species, the sublittoral and bathyal relationships are poorly known because of the lack of exploration. Actually there may be a geographically closer shallow water relative of *H. spaercki* as yet undescribed.

Harpinia cinca J.L. Barnard, 1961 of the south Atlantic is related to the bathyal *H. latipes* and slightly more distantly to its abyssal neighbor, *H. excavata*. *Harpinia wandichia* J.L. Barnard, 1961 of the south Atlantic is most closely related to a bathyal eastern Pacific species, *H. profundis* J.L. Barnard, 1960a. The two species form a very closely related pair, each from a different ocean, suggesting the common distribution of an ancestor.

Relationships among the several abyssal species of *Hippomedon* are difficult to trace, because the taxonomic characteristics used to identify the species seem to be randomly assorted. Many of the species differ from two or three relatives by only one respective character, a situation which obscures relationships.

As in the genus *Hippomedon* no direction of relationship can be made for the abyssal species of *Liljeborgia*.

Urothoe elegans is an eurybathic north Atlantic species. Only *Urothoe vemae* J.L. Barnard, 1961 of the other Urothoes is even distantly related to *U. elegans* but there is no morphological evidence of a common ancestor. *Urothoe simplignathia* J.L. Barnard, 1961 forms a unique component of the genus *Urothoe* with no close relative. Although *U. rotundifrons* J.L. Barnard, 1961 is related to the Magellanic *U. falcata* and the Pacific *U. orientalis*, both shallow water species, there is no question that their affinities are quite distant.

From these opinions, the writer believes that the evidence is mounting for a strong case of regional endemism among abyssal benthic Amphipoda, and that a high percentage of the species are related closely to regional sublittoral neighbors indicating either recent population of the abyss or very slow rates of evolution and dispersion.

The age of abyssal faunas

The problem of the age of abyssal faunas has been brought into sharp focus recently by the papers of BRUUN (1956 and 1957) and MENZIES and IMBRIE (1958) as opposed to the concepts of ZENKEVITCH and BIRSTEIN (1960). On the one hand, BRUUN, MENZIES and IMBRIE give evidence and conclusions that the abyssal fauna is of late origin, that few ancient relicts are preserved in the deep sea, and that this was brought about by cooling of the deep sea in the Cenozoic. On the other hand ZENKEVITCH and BIRSTEIN dispute the evidence of paleotemperatures and show that the percentage of ancient groups is much higher in the abyss than in shallow waters, thus indicating a long, monotonous, uninterrupted history of deep cold waters with uniform environment, in which relicts and primitive groups have been preserved alive.

Both sides of the question rely heavily on evidence from paleontology, but more than a third of the species so far collected from the abyss belong to groups with little or no paleontological record and perhaps more than half of the abyssal animals will prove to belong to unfossilizing groups when more study is made of small crustaceans and tubeless worms.

As already seen the benthic abyssal amphipod fauna is largely composed of genera with diverse sublittoral representatives to which a number of abyssal species bear close relationship; none of the species in these genera is a likely candidate for relictness. There is no endemic abyssal benthic family of Amphipoda and only one endemic abyssal pelagic family, the Vitjazianidae supporting one species; this family is scarcely unique, being simply a variation on a theme interwoven among a number of closely related families.

ZENKEVITCH and BIRSTEIN point out that a mark of relictness is observable in phylogenetic groups where diversity increases with depth. The only gammaridean amphipod family to show this increase in diversity with depth is the Pardaliscidae, with 6 sublittoral and neritic species, 11 bathyal and 11 abyssal species. The family is split among pelagic and benthic species and is not necessarily primitive in any respect, since it has specialized mandibles lacking molars and some of the species are undoubtedly semiparasitic, a mark of specialization.

The abyssal uniformity theory calls for a relatively high percentage of abyssal relictness, especially with the preservation of ancient groups not now living in shallow waters. The abyssal cooling theory suggests that the abyssal fauna would have a low percentage of relicts and a high percentage of recently evolved forms with close relationship to shallow water faunas. Discounting pelagic species among the amphipods, the facts fit the supposition for a recently evolved abyssal fauna closely related to shallow water representatives, with a lack of ubiquity except among a few benthic species with special means of dispersal, a lack of evidence specially relating abyssal faunas to cold shallow seas, the lack of any markedly primitive forms in the abyss, and the very low development of endemic abyssal genera. All these facts point to some late change in abyssal environments.

The bathyal fauna

In contrast with the known benthic abyssal fauna the bathyal depths (200 to 2000 meters) reveal a number of unique and morphologically unusual amphipods, as the genus *Runanga* herein, and others such as *Uschakoviella, Byblisoides, Carangolia, Onesimoides, Actinacanthus,* and *Lepechinella.* Some of these genera have abyssal species, but primarily they are bathyal. These unusual bathyal species are only a small part of the bathyal fauna and the sublittoral remains the habitat of most of the unusual, highly specialized amphipods. One concludes that specialization decreases with depth and this would be a perfect argument in favor of preservation of relicts of unspecialized nature in the abyss, except for the fact that the unspecialized components of the abyss are clearly related to the unspecialized components of the sublittoral now living. It has been the very diverse, common, morphologically unspecialized genera of the sublittoral that have penetrated the abyss.

Because marine explorations have either concentrated in the accessible coastal sublittoral bottoms or the vast abyssal expanses, the narrow bathyal zone has not been well sampled. As a result we are unable to determine whether the percentage of unique organisms is significantly high in the bathyal. If the abyssal cooling theory is correct one may propose that some of the relict abyssal species formerly living in the warmer abyss are now preserved in bathyal depths having the same temperature regime as the old abyss. Whether we can point to some of the genera cited above as relicts of the old abyss is problematical for our knowledge of primitiveness in amphipods is poor not only because of a lack of knowledge in comparative morphology and development but the lack of a fossil record. The genera mentioned above are unique for unusual morphological features; whether these specializations are remnants of an ancient fauna can be argued from two directions. Nevertheless, the bathyal benthic fauna is richer in relict candidates than is the abyssal, but whether this can be used as evidence for abyssal cooling will depend on a future analysis of the relative percentages of unique forms in relation to the sublittoral. An unusually high percentage of unique amphipods in the bathyal would suggest that the fauna is one of relictness, with the newly evolved abyssal fauna reflecting a recently changed abyssal environment. MENZIES and IMBRIE (1958) reiterate the evidence that relict forms in cheilostomes and crinoids are abundant in the bathyal but not in the abyss.

Conclusions

Although the writer believes the position taken by ZENKEVITCH and BIRSTEIN is based on a firm foundation of knowledge and theory that the deep sea has been a relatively uniform environment for a long period of time and that there is a high percentage of relict preservation in the abyss, this concept is not easily extended into an interpretation of the present-day relationships and distribution of the Amphipoda in the deep sea. The writer disagrees with MENZIES and IMBRIE not so much on their conclusions but on their methods of analysis which ZENKEVITCH and BIRSTEIN have shown to be only partially applicable.

A part of the "uniformity" theory, whether ZENKEVITCH and BIRSTEIN clearly extol it or not, is that the great age of the uniform abyss permits time in which the faunas might disperse almost uniformly throughout it. This is not true of non-pelagic Amphipoda, nor of many other groups.

This brings up the question of undersea barriers and whether topography alone offers a mechanism of restriction. So far, in the study of amphipods, regional abyssal endemism appears to be the case. The present abyssal species appear more related to nearby shallow species than to cold-water shallow species and thus appear to be recent evolutes. In this respect, one cannot dismiss the Amphipoda as a group of late origin considering the tremendous specific diversity based on a limited morphological expression, unless mutation rates in the group have been quite high. After all, the order Amphipoda comprises more than 4300 species, a number comparable to many phyla and classes. This diversity must have required a great length of time to develop.

If abyssal environments have been perpetually uniform through the geologic ages, then one must suppose that disperal rates of benthic amphipods are low and that barriers exist under which regional evolution operates; otherwise, one might consider that the abyssal fauna is quite young and composed of recent evolutes which have not had time to surmount barriers and disperse widely. If the ancient abyss had temperatures similar to the bathyal of today then present day stenothermic abyssal species are of late origin. The idea of late abyssal cooling suggests that some of the former abyssal species may have been displaced upward into the bathyal and live there today. If so, they should be subject to even greater topographical barriers than in the abyss and former ubiquitous species might now be regionally subspecific. Perhaps the species and subspecies pairs *Harpinia excavata* (eastern Atlantic) and *H. sanpedroensis* (eastern Pacific); *Ampelisca hermosa* (eastern Pacific) and *A. abyssicola* (western Atlantic) represent the results of this environmental change, but bathyal subspeciation may also be explained in the accepted way of low interregional dispersion rates and isolation, without having to resort to postulating a former ubiquitous abyssal fauna now restricted to the bathyal. To fit the present distribution and interspecific relationships of Amphipoda into the abyssal uniformity theory requires that the group be considered of late origin, with little time both to populate the abyss and form ubiquitous species. If indeed the group is ancient and the abyss has remained uniform, then some kind of dispersal and mutative stagnation occurs to prevent ubiquity and diversity into abyssal monotypes.

To fit the present status of amphipod faunas into a theory of recent abyssal cooling requires little supposition. The present day distributional patterns can be related easily to the idea of some recent change in environment of abyssal depths. Few abyssal monotypes occur; most of the abyssal species are closely related to nearby shallow water representatives; the occurrence of regional endemism indicates either a recently evolved abyssal fauna or a very strong restriction by undersea topographic barriers.

SUMMARY

1. The *Galathea* collections from depths of about 400 to 6000 meters comprise 85 species, of which 60 are new. Eight new genera are described.
2. Abyssal species number 35, including 22 new, using the depths of 2000 to 6000 meters to define abyssal. The remaining species are bathyal, from 200 to 2000 meters.
3. The continuing discovery of new amphipods indicates a relatively high diversity in the abyss and reinforces previous statements by BARNARD (1961) that regional endemism, not ubiquity, prevails in abyssal Amphipoda.
4. Most abyssal benthic amphipods belong to genera predominantly sublittoral. A total of 81 distinctly benthic abyssal species is now known; of these 46 belong to primarily sublittoral genera and another 21 belong to genera primarily bathyal. The remaining 14 species belong to genera primarily abyssal.
5. Only 6 abyssally endemic benthic amphipod genera are known. Each of these is monotypic. None displays a primitiveness.
6. No polar abyssal or polar sublittoral-bathyal species have been recovered in the abyss of low latitudes, contrary to the idea that cold polar seas provide preadapted species which spread into all abyssal regions.
7. Eleven benthic abyssal species are eurybathic. Seven of these occur in the subarctic regions.
8. No abyssally endemic highly diversified amphipod genus has been discovered.
9. Most of the abyssal species in diversified genera have close relatives in the neighbouring sublittoral and bathyal.
10. These facts point to a relatively recent origin of abyssal amphipod faunas and the suggestion is made that if the great depths of the ocean have cooled down considerably in late geologic time then previous abyssal species may have been displaced upward into the bathyal where similar ancient abyssal temperatures now prevail and that biologists should seek for relicts of abyssal faunas there. Indeed, a number of unusual monotypic genera now resides in the bathyal.

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