AMPHIPODA

FROM DEPTHS EXCEEDING 6000 METERS

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CONTENTS

INTRODUCTION

The harvest of amphipods from the deep sea trenches brought back by the "Galathea" was comparatively rich, and i. a. establishes a new depth record for amphipods. A high percentage of the deep sea forms were previously unknown.

Thus the collection of fifteen species covered by the present report contains three genera and ten species new to science. Despite the comparatively great number of new forms, however, nothing essentially new is added to our knowledge of amphipod morphology and taxonomy, on the whole the hadal amphipods conform well with the structural patterns of the types found in ordinary abyssal depths. Some notes on the general morphology of the species dealt with will be found on p. 240.

One of the most difficult problems is to decide whether a species is pelagic or not. On the whole only such species which may be at least facultatively benthic are considered in the present survey, an exception being *Halice secunda* (STEBBING) (= *H. aculeata* CHEVR.) which is probably purely pelagic but was included because it came from a sample where benthic species were also present.

The writer is indebted to Dr. ANTON BRUUN and Mr. TORBEN WOLFF of the Zoological Museum, Copenhagen, for the permission to work on this unique collection and for the numerous ways in which they helped to make his work easier. My cordial thanks are also due to Dr. HANS KAURI, Lund, who helped me with translations of Russian literature and to my wife who made my drawings ready for publication.

SYSTEMATIC PART

FAMILY LYSIANASSIDAE

Genus **Hirondellea** Chevreux

syn. **Tetronychia** Stephensen.

Undoubtedly BARNARD (1930 p. 319) was right in making the genus *Tetronychia* Stephensen a synonym of *Hirondellea* Chevreux. This genus thus comprises six species, viz. *H. trioculata* Chevreux, *H. brevicaudata* Chevreux, *H. abyssalis* (Stephensen), *H. antarctica* (Schellenberg), *H. gigas* (Birstein and Vinogradov), and *H. dubia* n. sp., which is to be described below. *H. gigas* is also represented in the present collection.

Hirondellea dubia n. sp.

St. 656, Kermadec Trench, 35°20'S 178°55'W, type of bottom not noted, 7640-7680 m. 20. II. 1952. 1 specimen, 13 mm, probably ♂.

It is only with considerable hesitation that I refer the present specimen to a new species. Undoubtedly it is closely related to *H. brevicaudata* Chevreux, and the mutual relationship between the two becomes still more complicated through the present specimen being a male while the numerous specimens examined by CHEVREUX were probably all females. This might account for the differences in the structure of the antennula. On the other hand the absence of pigment and very poor development of the eyes, the different proportions of the segments of the first pereiopod, and the notably different palm of the same appendage as well as the broader and more deeply excavate fourth coxal plate of the present specimen combined to convince me that the specimen should at least provisionally be described as a new species. At least it seemed preferable to do so than to create a highly dubious synonym. As already pointed out, however, the different structure of the antennula and also that of the first gnathopod may be secondary sexual characters and consequently less significant than they appear to be. The specific name *H. dubia* refers to my doubts about its validity.

Description:

Body not carinate. No distinct eyes but the peculiar whitish band with yellowish dots which runs from the lateral lobes across the dorsal side of the head may represent rudimentary eyes. Lateral lobes prominent, very broadly rounded. Epistome broadly rounded, projecting in front of labrum.

First mesosome segment only slightly longer than subsequent segments.

First urosome segment with deep dorsal excavation, posterior margin slightly produced so that in the straight position assumed by the present specimen it completely covers the dorsal side of the second urosome segment which is extremely short. Posterior corner of third epimeral plate slightly produced but rounded.

Telson only little longer than broad, cleft to about one quarter of its length, lobes broad and terminally notched with two minute, subterminal setae in the notches.

First segment of antennular peduncle carinate along the dorsomedial margin and about three times as long as the combined length of the two distal peduncular segments. Flagellum with 16 segments, the first of these segments elongate. Accessory flagellum of 6 segments the first of which is dorsoventrally flattened and as long as the first flagellar segment.

Antenna with last segment of peduncle only slightly shorter than fourth segment, flagellum consisting of about 20 segments.

Mouth parts closely resembling those of *H. abyssalis* as drawn by STEPHENSEN (1923 fig. 8 p. 64) but mandibular palp inserted above anterior part of molar (not in front of molar as in *H. abyssalis)*, palp of maxillula with numerous terminal spines.

First coxal plate oval with posterior half (but not anterior corner) covered by second coxal plate. Basis of first gnathopod distinctly shorter than remainder of appendage, ischia and merus not notably short. Carpus broader than metacarpus and tapering distally, palm oblique and slightly sinuate, well defined and much shorter than dactylus. Second coxal plate slightly expanded distally, carpus of second gnathopod about twice the length of metacarpus. Distal corner of metacarpus somewhat produced so that the hand becomes intermediate between the subchelate and chelate types.

Fourth coxal plate about as broad as deep, deeply excavate behind. Fifth coxal plate with anterior and posterior lobes equally deep. Five posterior pairs of pereiopoda rather slender, P 6 longer than P 5 and P 7. Basis of last three pairs expanded but not very broad.

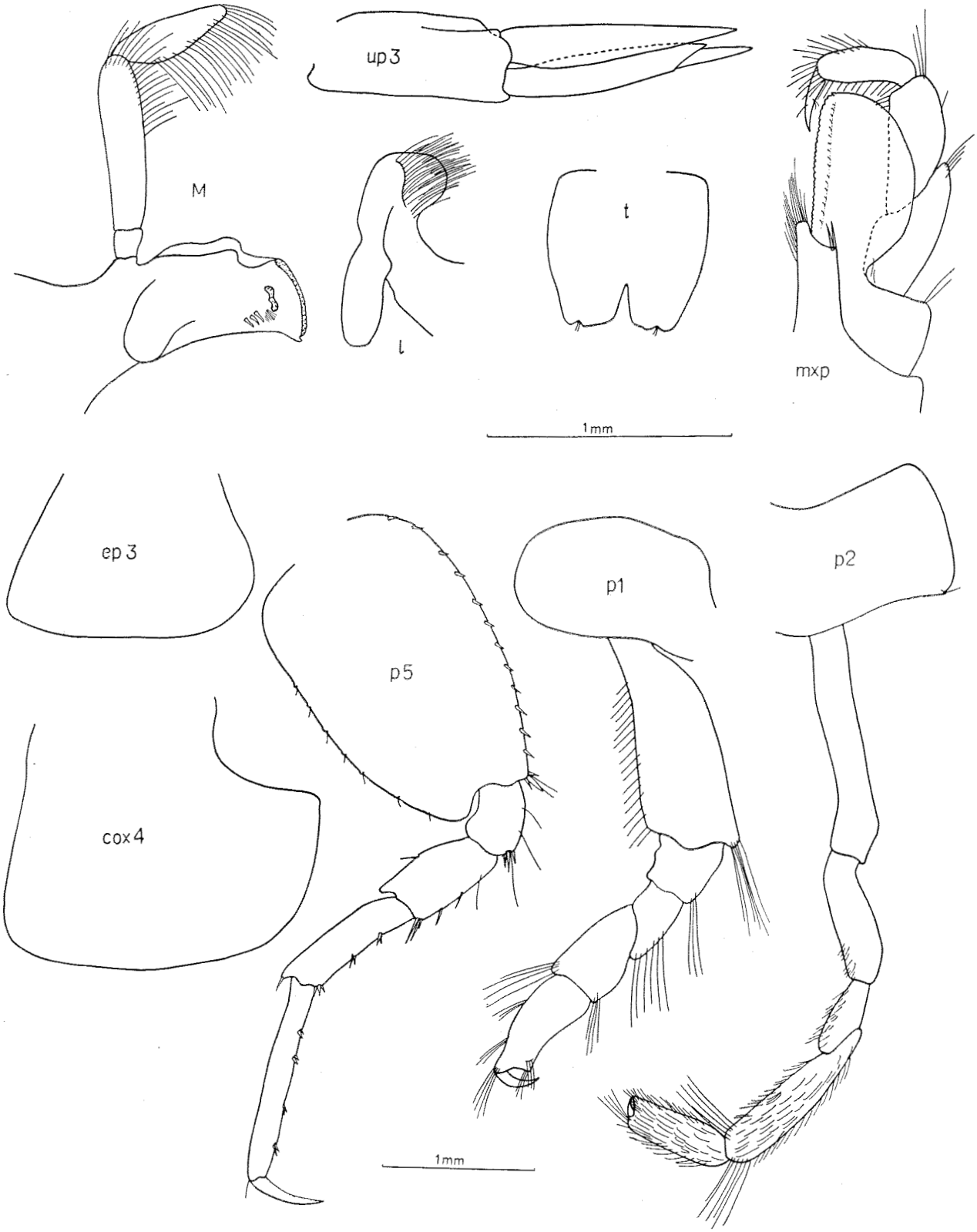

Fig. 1. *Hirondellea dubia* n. sp.

Uropods with slender rami, inner ramus of second uropod without constriction, third uropod with rami nearly equal.

Hirondellea gigas (Birstein and Vinogradov 1955)
syn. **Tetronychia gigas** Birstein and Vinogradov 1955

St. 418. Philippine Trench. 10°13′N 126°43′E, clay with gravel and stones, 10.190-10.150 m. 21. VII. 1951. 1 specimen, about 22 mm.
St. 429. Philippine Trench. 9°49′N 126°44′E. 10.020-10.120 m. 2. VIII. 1951. 3 specimens 20-25 mm.

The two records of this species establish the depth record as far as amphipods are concerned. Obviously, however, the species is at least facultatively bathypelagic, for BIRSTEIN and VINOGRADOV (1955 p. 228) record specimens captured by means of plankton nets. The excellent drawings published by the two Russian writers leave no doubt about the specific identity of the specimens from the Philippine and the Kurile-Kamtchatka trenches. As their description is entirely in Russian it appears convenient to give here a re-description of the species based upon the "Galathea" specimens. Drawings of some relevant appendages are also included.

Body smooth, not carinate apart from a rounded ridge behind a transversal depression on the first urosome segment. Cephalon with lateral corners produced and very broadly rounded. Epistome projecting past the labrum as a very broadly rounded ridge. Large and somewhat irregular markings on the sides of the head may indicate the presence of eyes, but their outline could not be traced in the preserved specimens.

First epimeral plate with posterior margin evenly rounded, second plate with posterior corner rectangular, third plate with hind margin straight but somewhat oblique so that the corner is somewhat produced with the point rounded.

Telson distinctly longer than broad with a few hairs on dorsal surface, cleft to about one third of its length. Apical lobes entire and without any marginal spines.

Antennula not much shorter than antenna, first segment of peduncle longer than second and third segments combined. Flagellum consisting of about 22 somewhat indistinct segments, first segment as long as the three to four subsequent ones combined. Accessory flagellum with 7 segments, the first of which is as long as the three subsequent ones together.

Antenna with basal segment of peduncle dilated, externally visible, about as long as broad, and about three times as broad as the second and third segments. Two distal segments of peduncle subequal.

Outer plate of maxillula with 11 serrate and pectinate spines, some of the former very broad, palp with 10 blunt teeth and some slender spines. Maxilla with both plates of about equal width. Maxilliped with outer plate very broad, inner plate with distal margin sinuate with two slender spines on lateral corner.

First coxal plate with anterior distal corner visible in front of second coxal plate and obtusely rectangular. Fourth coxal plate deeply excavated behind to receive fifth coxal plate.

First gnathopod with anterior margin of basis setose. Metacarpus as long as carpus and with posterior margin slightly concave. Palm transverse, straight and setose and provided with four chelate spines at posterior corner. Dactylus longer than palm with five teeth and a few setae on posterior margin.

Second gnathopod with carpus and metacarpus densely setose. Metacarpus with posterior corner produced but blunt, provided with a few large spines and numerous smaller ones which are at least partly brush-like. Dactylus with one tooth on posterior margin and longitudinal rows of small spines both on medial and lateral side.

Third and fourth pereiopods comparatively stout. Fifth to seventh pereiopods with basal segment expanded but otherwise slender. Accessory branchiae are present at least on the branchiae of P5 and P6, possibly also on P7.

First uropod long and slender. Second uropod without any constriction in the neighbourhood of the apex of inner ramus. There is a row of spines along the dorsal margin of the basal segment and both rami. Third uropod with a dorsolateral flange and a transverse row of numerous spines near distal end of dorsal margin of basal segment. A double row of spines along dorsal margin of inner ramus and a shorter row of spines along distal part of ventral margin. Second segment of outer ramus much narrower than first segment.

Genus **Onesimoides** Stebbing.

Onesimoides cavimanus Pirlot 1933.

St. 497. Banda Trench 5°18′S 131°18′E, soft clay, 6490-6650 m. 23. IX. 1951. 1 ♂ about 12 mm.

This is the second specimen of the species. The type was collected by the "Siboga" Expedition also in

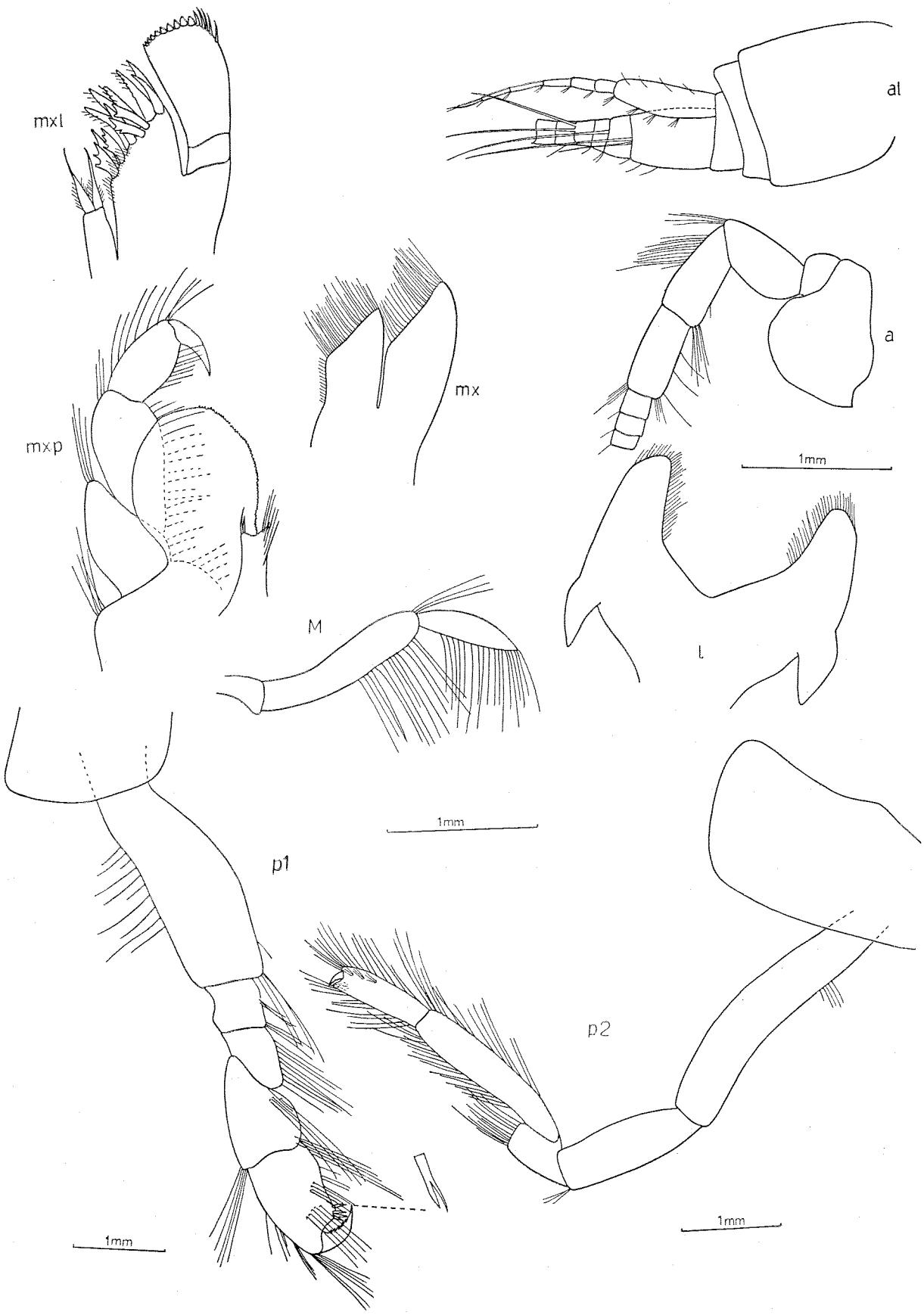

Fig. 2. *Hirondellea gigas* (Birstein & Vinogradov).

the Banda Sea in a depth of 1158 m (PIRLOT 1933 p. 129).

In general appearance and most structural details the present specimen agrees perfectly with the descriptions given by PIRLOT, and especially the most characteristic shape of the first gnathopod leaves no doubt about their specific identity. The present specimen is broken at the border between the second and third mesosome segments, but there can be no doubt about the two parts belonging to the same specimen, for they fit each other perfectly.

Some minor discrepancies between the present specimen and the drawings and descriptions given by PIRLOT may deserve mentioning. Both the "Galathea" and the "Siboga" specimens are males, the "Galathea" specimen is a good deal larger than the other.

In the present specimen the posterior margin of the first epimeral plate is not excavate, instead it bulges a little backwards, but on the other hand the anterior margin is distinctly excavate. In the second plate the anterior margin is almost straight but the posterior margin bulges a little, like that of the first plate. The posterior margin of the third plate is straight and the posterior corner is subacute without being produced.

In the type specimen the first and second epimeral plates are represented as bulging forwards and excavate behind, while in the third plate the anterior margin is represented as being straight and the posterior as being rounded below a slightly sinuate posterior margin.

The difference in this respect between the two specimens might appear important enough if it were not for the fact that if for each separate plate in PIRLOT's drawing the orientation is changed so that the present anterior margin becomes posterior and vice versa the two sets become identical.

I think we are forced to accept the view that PIRLOT became confused over the orientation of the dissected parts on his slides and that the actual shape of the epimeral plates of the two specimens is similar.

The flagellum of the antennula of the present specimen has got 12 segments as compared with 14 in the type, and the corresponding figures for the antennar flagellum are 11 and 13 respectively.

The hand of the first gnathopod seems to be longer and narrower in the present specimen than in the type and the dense growth of hairs seems to be more marginal.

As already pointed out, however, the minor

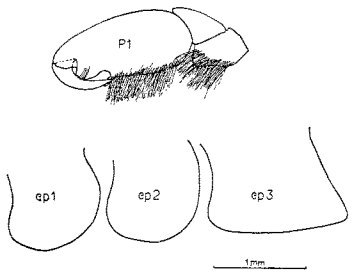

Fig. 3. *Onesimoides cavimanus* Pirlot.

descrepancies mentioned here could hardly be said to make the specific identity of the two specimens in any way doubtful.

Genus **Schisturella** and the **Ambasia** group

Among the amphipods from the Kermadec Trench was one ovigerous female about 10 mm in length, which, thanks to the redescription of *Schisturella pulchra* given by SHOEMAKER (1930), could be identified as a new species of the genus *Schisturella.*

The genus *Schisturella* shows a considerable degree of similarity with several of the genera which together could be said to constitute the *Ambasia* group. Of these *Parambasia* Walker and Scott and *Pseudambasia* Stephensen are closely related but stand a little apart from the others on account of their large first coxal plate which is much wider distally than proximally and not covered by the second coxal plate (cf. STEPHENSEN 1927 fig. 5 p. 305).

There remain the following genera, viz. *Ambasia* Boeck 1870, *Schisturella* Norman 1900, *Metambasia* Stephensen 1923, *Ambasiopsis* Barnard 1931, and *Ambasiella* Schellenberg 1935. Most of these genera are monotypic, and only one, *Ambasiopsis,* consists of as many as three species. It seems, however, as if *Ambasiopsis,* too, will have to be divided into two genera, and as this division has a certain bearing upon *Schisturella* it is necessary here to deal with it in some detail.

BARNARD's final definition of *Ambasiopsis* (1932, p. 44) runs as follows: "Agreeing with *Metambasia,* Steph. 1923, but differing as follows: 1st gnathopod feebly subchelate, outer plate of maxilliped non-spinose, inner ramus of uropod 2 not constricted, peraeopods 3-5, especially 5, much shorter and 4th joint more expanded, 3rd joint of antenna 2 not expanded. The last character is privisional as the only ♂ (see *uncinata, infra)* may not have attained its adult characters."

Although no drawings were given of the mouth

parts the description of *A. georgiensis* comprises all relevant details and is very lucid. *A. uncinata* is said to resemble *A. georgiensis* closely.

NICHOLLS (1938 p. 20) points out that the inclusion of his new species *A. tumicornis* "requires a slight modification of BARNARD's diagnosis, inasmuch as in it the outer plate of the maxilliped is spinose, as in *Metambasia,* and the first gnathopod is definitely subchelate," The description of the new species, however, contains various important points in which *A. tumicornis* differs from *A. georgiensis.* Thus in the palp of the mandible the two distal segments are subequal, and the maxillular palp also is rather different. The inner lobe of the maxillula has only one seta (in *A. georgiensis* there are two long and one short setae) and the telson is "scarecely longer than wide, cleft for two-thirds of its length."

To me it seems impossible to retain *A. tumicornis* within the genus *Ambasiopsis* without violating the current concept of generic delimitation within the group. The question then arises whether the species could be referred to any of the other genera. Apparently the shape of the maxilliped closely recalls that of *Metambasia* and *Schisturella,* and this is the case also with the epistome and labrum. On the other hand the first gnathopod is definitely subchelate while that of *Metambasia* is simple. In *Schisturella* the first gnathopod is subchelate but the shape of the mandibular palp, the armature of the inner plate of the maxillula, the shape of the fifth to seventh pereiopods (which are said to resemble those of *A. georgiensis)* preclude the inclusion of *A. tumicornis* into either *Schisturella* or *Metambasia. A. tumicornis* also lacks the terminal spine of the first segment of the antennular flagellum which is found in both species of *Schisturella.* It seems inevitable to create a new genus to receive *Ambasiopsis tumicornis* Nicholls, and for this genus I propose the name *Neoambasia,* to be defined below.

The result is that the *Ambasia* group in the stricter sense will consist of six genera, four of which are monotypic while the other two have two species each. Although such a state is not very agreeable and throws certain doubts upon the taxonomic principles now adopted it is hardly possible to make a revision of these principles for this generic group alone. A revision, which appears justified and even desirable, will have to comprise the whole family Lysianassidae, but such an enterprise would demand a very large effort and lies outside the scope of the present paper.

It seems necessary to review once more the generic definitions within the *Ambasia* group and to make the adjustments which are indicated by the facts accumulated during the latest decades.

Genus **Ambasia** Boeck

Definition as given by STEBBING (1906 p. 51).

Species: *A. atlantica* (Milne-Edwards).

STEBBING's definition only applies to *A. atlantica,* for he was not aware of the different shape and armature of the epistome and maxilliped of *A. pulchra* Hansen (now *Schisturella pulchra),* nor did he mention that the first gnathopod of the latter species is feebly subchelate. *A. murmanica* Brüggen was only added in the appendix to STEBBING's monograph, and the important characters in which it differs from *A. atlantica* were not commented upon. For this reason no alterations of STEBBING's diagnosis are necessary.

Genus **Schisturella** Norman

SHOEMAKER (1930 p. 13 ff.) gave a redescription of *S. pulchra* (Hansen) and produced a complete set of excellent drawings. He also corrected some mistakes made by NORMAN (1900 p. 208) which enables us to define the genus in the following manner.

Definition: Resembling *Ambasia.* First coxal plate very small, roughly triangular and almost completely hidden below second coxal plate, epistome straight or not very prominent, labrum somewhat produced forwards-upwards. First segment of antennular flagellum with long terminal spine. Mandible with palp attached over molar, second segment distinctly longer than third, molar strong. Maxillula, inner plate with two terminal setae, outer plate with numerous (11) serrate or pectinate spines, palp well developed. Maxilla, inner plate somewhat shorter than outer. Maxilliped with dactylus of palp well developed, outer plate not reaching end of second segment of palp, with spines on distal margin. First pereiopod with palm oblique. Fifth to seventh pereiopods with distal parts rather slender. Telson distinctly longer than broad, deeply cleft.

Species: *S. pulchra* (Hansen)

S. galatheae n. sp. (to be described below).

Genus **Metambasia** Stephensen

Definition: Very near *Schisturella.* Agreeing with definition given above except in the following respects, viz. no terminal spine on first segment of

Table 1.

	Ambasia	*Schisturella*	*Metambasia*	*Ambasiopsis*	*Ambasiella*	*Neoambasia*
Cox 1	Rather short not triangular	Rather or very short, triangular	Very short, triangular	Not very short triangular	Not very short triangular	Not very short oval
Epistome	Projecting, flanged	Straight or slightly projecting	Straight	Straight	Straight	Straight
Labrum, dorsoanterior lobe	Present	Present	Present	Present	Absent	Present
Mandible, palp attached	Behind molar	Over molar	Over molar	Over molar	Behind molar	?
Mandible, palp segm. 3 / segm. 2	Abt. $^2/_3$	Abt. $^2/_3$	Abt. $^2/_3$	Abt. $^2/_3$	Abt. $^1/_3$	Abt. $^1/_1$
Mandible, molar	Weak	Strong	Strong	Strong	Weak	?
Maxillula, setae on inner plate	2	2	2	3	2	1
Maxilliped, palp	Rather narrow	Rather narrow	Rather narrow	Broad	Very broad	?
Maxilliped, spines on outer plate	Absent	Present	Present	Absent	(Setae)	Present
First gnathopod	Simple	Subchelate	Simple	Weakly subchelate	Simple	Subchelate
Telson	Length >width, cleft $^2/_3$	Length >width, cleft $^3/_4$ or more	Length >width, cleft $<^2/_3$	Length >width, cleft $^3/_4$	Length >width, cleft $^3/_4$	Length = width, cleft $^2/_3$

antennular flagellum, first pereiopod simple, telson less deeply cleft.

Species: *M. faeroensis* Stephensen.

The relationship between *Schisturella* and *Metambasia* appears in fact to be so close that it is only with some hesitation I maintain *Metambasia* as a separate genus. The most important difference is to be found in the first gnathopod which is simple in *Metambasia* but subchelate in *Schisturella* and on the whole of a rather different shape.

Genus **Ambasiopsis** Barnard

BARNARD's definition (1931 p. 425, 1932 p. 44, already quoted above p. 216) is rather brief. His description of *A. georgiensis* however, is rather extensive, especially where the mouth parts are concerned. As *A. uncinata* is said closely to resemble *A. georgiensis* it seemed justified to compile the following diagnosis.

Definition: Resembling *Schisturella*. First coxal plate subtriangular, not very short, anterior corner covered by second coxal plate but larger part of anterior margin visible. Epistome not protruding, labrum produced. Mandible as in *Schisturella*. Maxillula with two long and one short terminal setae on inner plate, palp narrow with only few spinules. Outer plate of maxilliped minutely serrate but lacking spines. First gnathopod feebly subchelate, three posterior pairs of pereiopods rather short and stout, telson rather deeply cleft.

Species: *A. georgiensis* Barnard
A. uncinata Barnard.

Genus **Ambasiella** Schellenberg

Definition: First coxal plate subtriangular, almost completely hidden, not very short. Epistome and labrum straight, mandible very slender, palp attached behind molar, third segment very short, only about $^1/_3$ of second. Maxillula, inner plate with two terminal setae, outer plate with numerous spines, palp narrow with few terminal spinules. Maxilliped with inner and outer plates very narrow, outer plate reaching nearly to end of second segment of palp and provided with numerous setae on medial margin, palp very broad, terminal segment very small. First pereiopod simple. Telson deeply cleft.

Species: *A. murmanica* (Brüggen).

Genus **Neoambasia** n. gen.

Definition: Resembling *Schisturella*. First coxal plate oval, almost concealed but not very short. Epistome straight, labrum projecting as in *Metam-*

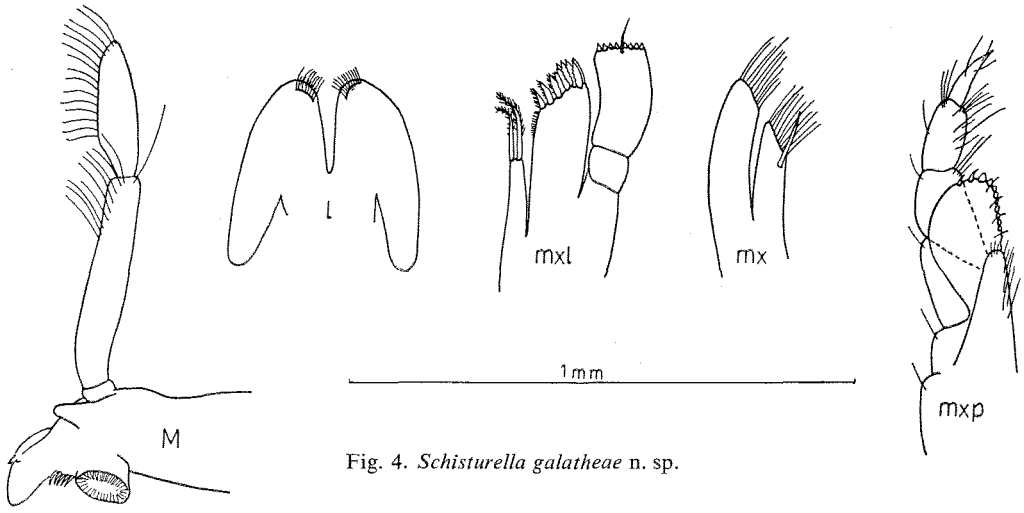

Fig. 4. *Schisturella galatheae* n. sp.

basia. Mandible resembling that of *Ambasiopsis* but with two distal segments of palp subequal. Inner plate of maxillula with one seta, palp with numerous (9) spines. Maxilliped, outer plate with numerous spines on medial margin. First pereiopod subchelate. Three last pairs of pereiopods resembling those of *Ambasiopsis*. Telson longer than broad, deeply cleft.

Species: *N. tumicornis* (Nicholls).

The above definition was compiled from the description of *Ambasiopsis tumicornis* given by NICHOLLS (1938 p. 21). That description is rather brief and consequently the generic definition may have to be supplemented in various respects.

To facilitate a comparison between the genera dealt with above, some of the most important features are compared in tabular form on p. 218.

Schisturella galatheae n. sp.

St. 651. Kermadec Trench, 32°10'S, 177°14'W, brown clay with pumice, 6960-7000 m. 16. II. 1952. 1 ♀ about 10 mm with 2 eggs.

No eyes. Lateral lobes of cephalon narrow with the points somewhat rounded. Epistome rounded, bulging a little so that it protrudes past the likewise rounded anterodorsal lobe of the labrum from which it is separated by a fold.

First urosome segment rather deeply excavated dorsally, third epimeral plate with posterior corner subacute, somewhat produced and with a rather indistinct tooth. Telson narrow, very deeply cleft, with three pairs of dorsal spines on the distal part of the lobes, the last pair subterminal.

Antennula with first segment dorsally carinate, second and third segments short. First and second segments of flagellum with a ventral, terminal, slender spine, in both cases as long as the two subsequent segments. Total number of segments seven. Accessory flagellum with five segments. Antenna slightly longer than antennula with fourth segment of peduncle longer than fifth segment. Flagellum with 12 segments.

Mandible with cutting edge rather long, with a small denticle near dorsal margin. Spine-row short, molar strong, palp attached over molar, first segment short, third segment about $^2/_3$ of second. Labium with inner margin of lobes straight. Maxillula, inner plate with two terminal setae, outer plate with 11 spines, the proximal ones of which are pectinate while the distal ones are serrate. Palp rather broad, reaching just past the spines of the inner plate and provided with 8 terminal spinules. Maxilla with plates rather narrow, outer plate distinctly longer.

Maxilliped with palp not very broad, dactylus well developed. Outer plates almost semicircular, reaching well past middle of second segment of palp. Armature very characteristic; on distal margin two curved spines and near anteromedial corner large denticles which continue along inner margin and decrease in size proximally. Inner plates with numerous setae on distal and inner margins.

First coxal plate triangular, rather short (but distinctly longer than in *S. pulchra)*. First gnathopod slender, distinctly subchelate with carpus slightly longer than metacarpus, posterior margin of metacarpus straight, palm oblique, well defined, with two spines at posterior corner. Second gnathopod slender, metacarpus a good deal shorter than carpus and hardly broader, distinctly subchelate with dactylus pectinate. All posterior pereiopods slender but basis of fifth to seventh pereiopod broad.

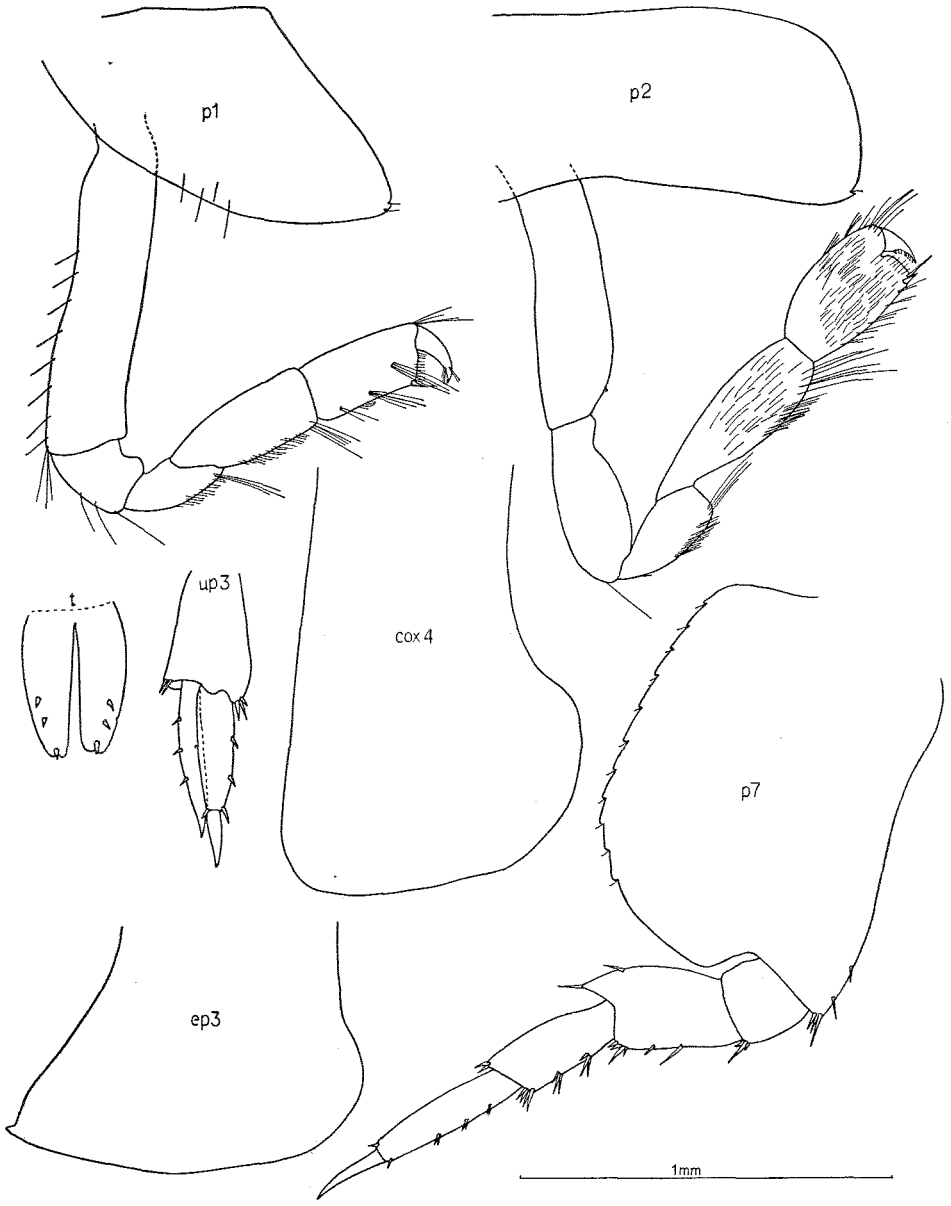

Fig. 5. *Schisturella galatheae* n. sp.

First uropod not reaching past second uropod, outer ramus of second uropod without constriction. Inner ramus of third uropod only a little shorter than outer ramus and distinctly longer than first segment of outer ramus.

S. galathea is easily distinguished from *S. pulchra* by means of various features, i. a. the longer first coxal plate, the palm of the first gnathopod which is much less oblique, the much larger denticles along the margin of the outer plate of the maxilliped, the absence of eyes and the presence of a long terminal spine also on the second segment of the antennular flagellum.

Bathycallisoma n. gen., the **Scopleocheirus** and **Alicella** groups

The genera *Scopelocherius* Bate, *Paracallisoma* Chevreux, *Aroui* Chevreux, and *Scopelocheiropsis* Schellenberg form a natural group of somewhat obscure mutual relationships. In all of them the first gnathopod is of a peculiar shape and strikingly similar. There is also a general agreement with respect to numerous other features, e. g. the mouth parts, the second gnathopod (which is more or less distinctly subchelate) etc. The fact that all genera except *Scopelocheirus* are monotypic makes the taxonomic evaluation of the various characters

Table 2.

	Scopelocheirus[1]	*Paracallisoma*[1]	*Aroui*	*Scopelocheiropsis*	*Bathycallisoma*
Epistome	Protruding	Not protruding	Not protruding	Protruding	Not protruding
Maxilliped, outer plate reaching	Middle of 2nd segm. of palp	Distal end of 2nd segm. of palp	Distal end of 2nd segm. of palp	3rd segm. of palp	Middle of 2nd segm. of palp
Maxilliped, 4th segm. of palp	Normal	Normal	Normal	Vestigial	Normal
P 1 and P 2, length	Equal	P 1<P 2	P 1<P 2	P 1<P 2	P 1<P 2
Coxal plates	Long	Rather short	Long	Short	Rather short
Basis of P 5-P 7	Broad	Rather narrow	Broad	Narrow	Broad
Merus of P 5	Normal	Normal	Broad	Normal	Normal

1. SCHELLENBERG (1926 a p. 258) regarded *Scopelocheirus coecus* Holmes as a synonym of *Paracallisoma alberti* Chevreux, and the same veiw was adopted by BIRSTEIN and VINOGRADOV (1955 p. 223). The fine set of drawings of *S. coecus* produced by BARNARD (1954 pl. 4 and 5) clearly shows that the species should be referred to *Paracallisoma*, but there are some discrepancies especially in the shape of the first coxal plate which may indicate that it is specifically different from *P. alberti*.

used to distinguish between them somewhat difficult. This difficulty is increased by a specimen captured by the "Galathea" which, although differing from all previously known forms, at the same time cuts across some of the border lines drawn between the different genera.

The specimen obtained by the "Galathea" very closely resembles the species of which fragments were obtained by the Swedish Deep Sea Expedition in the Puerto Rico Trench. Those specimens were in such a condition that SCHELLENBERG (1955 p. 185) preferred not to give a definite description. He refers to the Puerto Rico specimens as "aff. Paracallisoma spec." There can be no doubt about the generic identity of the fragments identified by him and the species obtained by the "Galathea". There is indeed such a close resemblance with respect to the characters available for comparison that I am inclined to believe that they may even belong to the same species. The final decision on this point must wait, however, till more complete specimens of the Atlantic form become available.[1]

In table 2 a comparison is made between the four genera mentioned above and the "Galathea" specimen. As will be seen from table 2 the specimen obtained by the "Galathea" rather closely resembles the genus *Paracallisoma* from which it is distinguished mainly by the outer plate of the maxilliped which is comparatively shorter, and, above all, by the three posterior pereiopoda which are notably different.

CHEVREUX himself never gave any diagnosis of the genus *Paracallisoma,* but a brief diagnosis was given by SCHELLENBERG (1926 p. 257). It seems to me that the difference in the proportions of the maxilliped is of comparatively minor importance and does not in itself justify the creation of a new genus to receive the "Galathea" specimen. On the other hand the difference in the shape of the three posterior pereiopoda is very striking and appears of to be doubly important because it underlines the re-

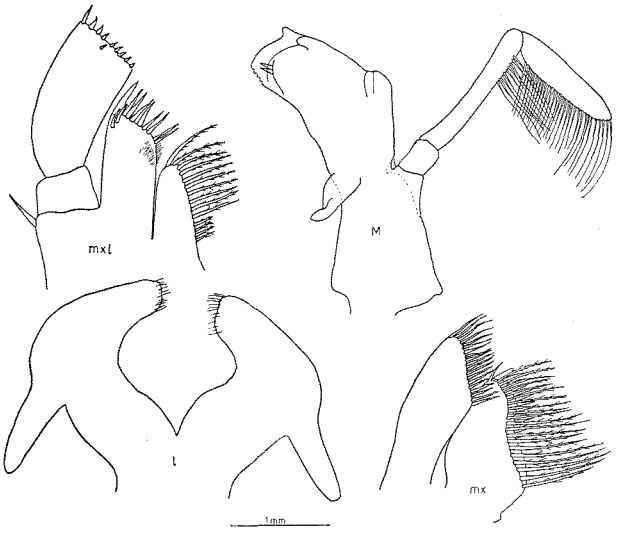

Fig. 6. *Bathycallisoma pacifica* n. gen. et sp.

1. After the present paper had already gone to press, BIRSTEIN and VINOGRADOV (1958) described a new species, *Scopelocheirus schellenbergi,* from the Pacific. Simultaneously I have had the opportunity to examine SCHELLENBERG's specimen from the Atlantic. As far as I can see the latter are to be referred to *S. schellenbergi.* On the other hand the "Galathea" specimen differs, especially in the shape of the first gnathopod and some other minor characteristics, and must probably be kept apart as a separate species. According to the nomenclature used here *S. schellenbergi* should be called *Bathycallisoma schellenbergi.* If the present two species should be referred to *Scopelocheirus* several of the other genera referred to in table 2 should also be abolished. Therefore I think *Bathycallisoma* should be retained, at least provisionally.

Fig. 7. *Bathycallisoma pacifica* n. gen. et sp.

lationship between the *Scopelocheirus* group (as defined above) and the *Alicella* group (consisting of the genera *Alicella* Chevreux and *Paralicella* Chevreux), a relationship which was pointed out by CHEVREUX (1935 p. 46).

The three posterior pairs of pereiopoda in the present specimen very closely resemble those of *Alicella* and *Paralicella* in having a broad basis and long and slender distal parts. In this way the present species becomes a very interesting connecting link between the two groups, and the creation of a new genus to receive it appears inevitable.

Bathycallisoma n. gen.

Resembling *Scopelocheirus* and *Paracallisoma* but coxal plates rather short, epistome straight and not protruding in front of labrum. Lower lip with medial margins of lobes sinuate. Maxilliped with outer plate reaching to middle of second segment of palp, fourth segment of palp well developed. Second gnathopod much longer than first gnathopod, three posterior periopoda with basis broad, distal parts long and slender. Telson cleft to base.

Bathycallisoma pacifica n. sp.

Syn. ? "aff. Paracallisoma spec". SCHELLENBERG 1955.

St. 651. Kermadec Trench. 32°10'S 177°14'W, brown clay with pumice, 6960-7000 m. 16. II. 1952. 1 female about 33 mm, somewhat mutilated.

Body smooth, without dorsal carina. Cephalon shorter than first free mesosome segment. No rostrum. Lateral corners produced (though not as

much as in *Paracallisoma alberti)* and obtusely pointed. No eyes visible in preserved specimen.

Posterior margin of third epimeral plate straight, posterior corner slightly produced. Telson cleft to base, unarmed.

Antennulae and antennae closely resembling those of *P. alberti.* Antennula short, reaching a little past middle of fifth segment of antennar peduncle. Peduncle heavy, basal segment with a high and narrow keel along dorsomedial margin. Flagellum with 10 segments, the first of which is long and provided with a dense ventromedial growth of setae. Accessory flagellum with three segments, first segment flattened, forming a thin and vaulted plate which is longer than the two distal segments together.

Antenna rather long, reaching approximately to posterior border of fourth mesosome segment. Flagellum with numerous segments.

Mandible with cutting edge long and narrow, spine-row probably represented by two short spines near the base of the cutting edge, molar a thin, jutting plate. Palp with second segment slightly longer than third segment.

Lower lip with inner margins of lobes deeply excavated.

Inner plate of maxillula with a row of plumose setae on inner margin, outer plate with a dense brush of short hairs near distal end of inner margin and 11 distal spines. Two of these spines are bent at the tip and provided with a few lateral denticles. Palp with two segments. last segment somewhat expanded distally.

Maxilla with plates of equal length, inner plate triangular.

Maxillipeds with palp long, outer plate reaching past the end of second segment of palp, inner plate with distal margin somewhat sinuate and with numerous hairs and denticles.

Coxal plates rather short. Second plate covering only posterior margin of first plate. Fourth plate excavated behind to receive fifth plate.

First gnathopod only half as long as second but much stouter. Basis of first gnathopod somewhat expanded distally, ischia about as broad as long and much wider than distal segments. Dactylus small with basal half concleaed between the projecting flanges of metacarpus. Second gnathopod slender, dactylus attached near centre of distal margin of metacarpus.

Third and fourth pereiopoda short and comparatively stout. Fifth and sixth pereiopods with basis about as long as broad and rounded posteriorly,

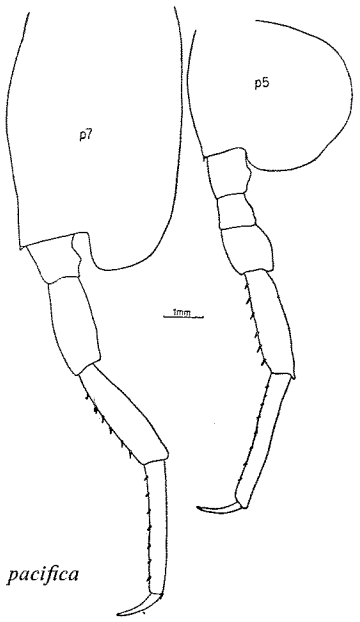

Fig. 8. *Bathycallisoma pacifica* n. gen. et sp.

distal segments long and slender. Seventh pereiopod with basis distinctly longer than broad, otherwise resembling two preceding pereiopods.

All uropods with rami more or less lanceolate, third uropod with both rami somewhat damaged distally.

Genus **Tryphosa** Boeck

Tryphosa bruuni n. sp.

St. 658. Kermadec Trench. 35°51'S 178°31'W, brown sand with clay and stones, 6660-6770 m. 20. II. 1952. 1 female about 7 mm. 1 juv.

Cephalon with lateral lobe moderately produced, blunt. No eyes. Epistome nearly straight, upper lip projecting a little in front of it. Third epimeral plate with posterior margin straight, posterior corner produced but not forming any tooth. First urosome segment dorsally with a saddle-shaped notch and a very low carina posterior to it. Telson cleft to about two thirds of its length, with three pairs of dorsal spines, apices narrowly rounded without terminal spines.

Antennula and antenna subequal. Antennula with second segment of peduncle not very short, flagellum with nine segments. Accessory flagellum with three segments the first of which is long and dorsoventrally flattened. Antenna with fourth segment of peduncle distinctly longer than fifth segment.

Mandible with cutting edge smooth, spine-row with three spines only, molar large and protruding.

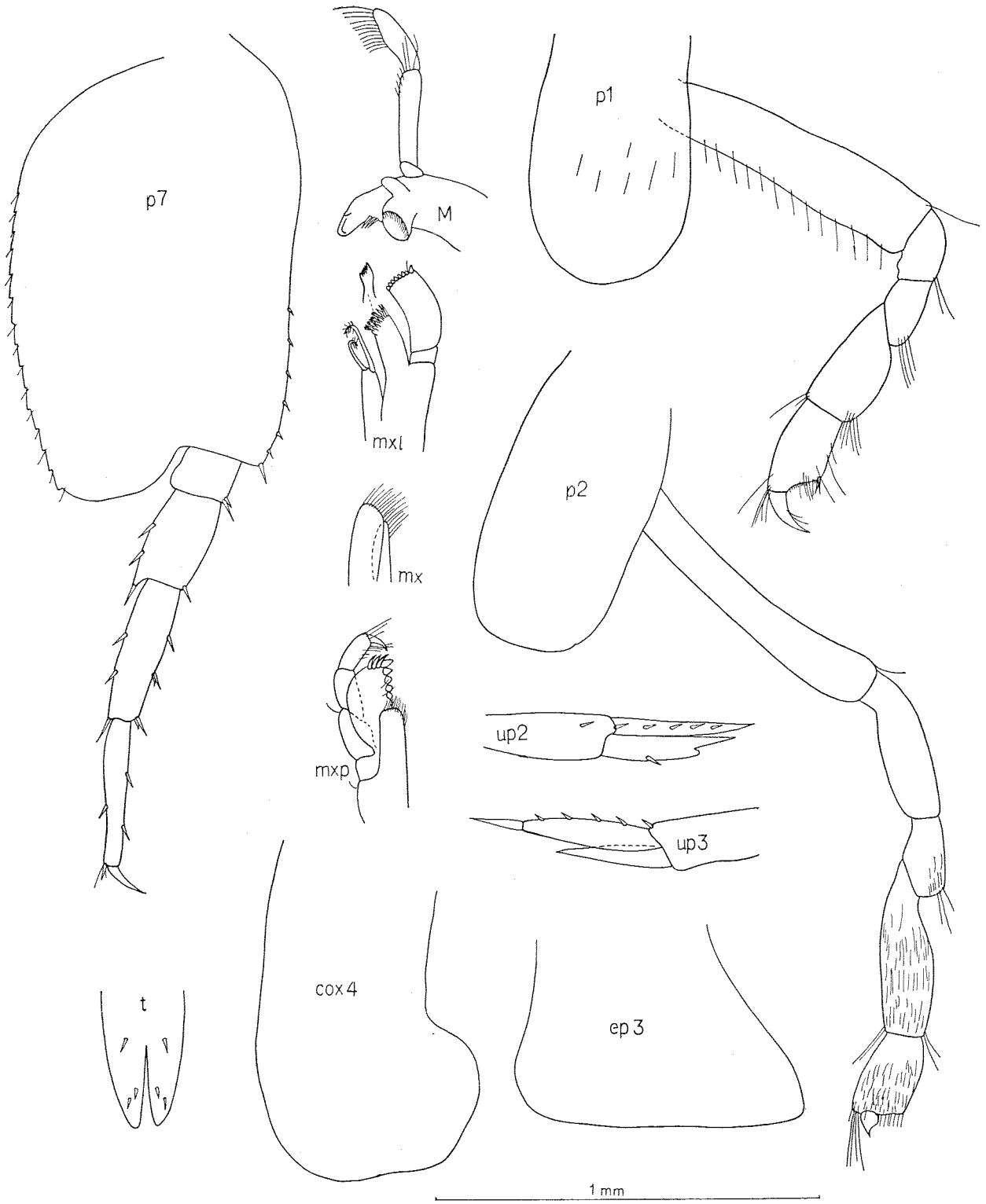

Fig. 9. *Tryphosa bruuni* n. sp.

Palp with first segment very short, third segment about two thirds of second.

Lobes of labium broad and short.

Maxillula with two terminal setae on inner plate, outer plate with 11 spines, proximal ones comb-like, distal ones with one single denticle. Palp with numerous short spines and one long spine near outer margin of distal end.

Inner plate of maxilla slightly shorter and distinctly narrower than outer plate.

Maxillipeds with outer plates almost semicircular, reaching just past second segment of palp, armed with three long, curved spines on distal margin, and with broad, laminar, obtuse teeth on inner margin. Inner plate with numerous terminal plumose spines, Last segment of palp well developed, unguiform.

First coxal plate hardly tapering distally. Posterior excavation of fourth coxal plate rather shallow, posterior angle obtuse. First gnathopod with basis long and carpus somewhat longer than metacarpus, palm oblique with two spines at posterior corner and a very fine but sharp crenulation, visible only with high magnification. Second gnathopod with basis long, carpus about twice the length of metacarpus, dactylus short and very rapidly tapering distally. Third and fourth pereiopods slender. Fifth to seventh pereiopods with basis broad and distal parts slender. First and third uropods reaching well past second uropod. End of first uropod level with tip of inner ramus of third uropod. First uropod with rami subequal, lanceolate, second uropod with outer ramus sligthly longer than inner and lanceolate, inner ramus abruptly constricted at about three fourths of its length and distal part narrow. Rami of third uropod narrow with inner ramus distinctly shorter than first segment of outer ramus.

It would perhaps have been better to refer the present species to a new genus. Its comparatively close relationship to *Tryphosa* is obvious, but its retention within the genus is not possible without violating the definition to a certain extent. Thus the epistome does not protrude past the labrum, the first segment of the accessory flagellum of the antennula is flattened and very long (as is often the case in deep-sea amphipods), the first coxal plate does not taper distally, the lobes of the telson lacks terminal spines, the inner ramus of the second uropod is abruptly constricted, and the inner ramus of the third uropod is distinctly shorter than the outer ramus.

These numerous discrepancies would, in themselves, well justify the creation of a now genus. When I refrain from following that course this is mainly because several other species of *Tryphosa* differ from the generic definition in one or more of the respects mentioned above, although as far as known at present not in all of them. Many species, however, are still badly known. I prefer to leave the question of a splitting up of the genus into new genera or subgenera to future investigators.

The species is dedicated to Dr. ANTON BRUUN, scientific leader of the "Galathea" Expedition.

Genus **Orchomenella** G. O. Sars

Orchomenella abyssorum (Stebbing)

St. 649. Kermadec Trench. 35°16′S 178°40′ W, grey clay with pumice. 8210-8300 m. 14. II. 1952. 1 ♀, 12 mm.

The identity of this fine and well-preserved specimen with STEBBING's species from the "Challenger" collection is substantiated by a perfect agreement with respect to all features examined by me, e.g. the mouth parts, the pereiopoda, the uropoda. After examining it, however, I feel doubtful concerning the identity of this true *O. abyssorum* with the species recorded under that name from Antarctic waters by SCHELLENBERG (1926, p. 281) BARNARD (1932 p. 69), NICHOLLS (1938 p. 35), and myself (DAHL 1954 p. 282).

BARNARD (1. c.) first called attention to the peculiar armature of the palp of the maxillula which, in his fig. 28b is represented as having seven blunt teeth set more than their own width apart. Similarly NICHOLLS (1c.). states that "there are apparently 8 widespaced spine-teeth on one side, 7 on the other, flanked externally by one single seta." In the "Galathea" specimen the palp of the right maxillula has nine terminal teeth and one slender spine. The teeth are rather sharp and stand close together just as in STEBBING's drawing of the "Challenger" specimen.

Furthermore there is the question of the eyes. In the "Challenger" specimen STEBBING (1888 p. 677) states that they were "not clearly perceived, but probably large." This again agrees with the present specimen where no eyes can be definitely discerned but where the corresponding area is brownish and the cuticle looks different. In the Antarctic specimens the eyes are generally noted as distinct and brownish.

The matter is further complicated by some North Atlantic specimens also referred to the present species. In the specimen from the "Ingolf" collection mentioned by STEPHENSEN (1925 p. 125) the head was lacking. A number of further specimens, also from the North Atlantic, recorded by CHEVREUX (1935 p. 59) were neither described nor drawn. It appears not improbable that we have here at least two species, viz. one Antarctic species and one deep sea species, while the relationship of the North Atlantic form to either of these is at present unknown.

FAM. PHOXOCEPHALIDAE

Genus **Harpinia** Boeck

Harpinia spaercki n. sp.

St. 496. Banda Trench 5°36′S 131°06′ E, 7270 m, soft clay. Petersen Grab. 23. IX. 1951. 1 ♀.

St. 499. Banda Trench 5°21′S 131°17′E, 6580 m, greenish clay. Petersen Grab. 24. IX. 1951. 2 ♀♀ (types).

Description of female, 7 mm. Body smooth with only a few scattered and very fine hairs on dorsum of metasome. Hood reaching to end of antennular peduncle, its apex evenly rounded. No eyes. Postantennal corner of cephalon approximately rectangular, blunt. Epimeral plates without marginal setae, but one long plumose seta laterally on second epimeral plate. Posterior corner of third epimeral plate evenly rounded, posterior margin with one fine hair. Telson little longer than broad, cleft to base with lobes slightly diverging.

Basal segment of peduncle of antennula of about the same length as the two distal ones together and much broader. Ventral corner of distal margin with a group of four large plumose setae and various smaller ones. Second segment about twice the length of third segment, ventral corner of distal margin with a group of eight long non-plumose setae and six somewhat shorter ones, one of which is plumose. Distal margin of third segment with six setae of varying length. Flagellum with seven segments and accessory flagellum with six, accessory flagellum not much shorter than flagellum.

Peduncle of antenna with third segment slightly shorter than fourth and fifth segments and with a few setae near centre of ventral margin. Fourth segment widening distally with groups of numerous non-plumose setae on both upper and lower distal corner. Fifth segment with a row of non-plumose setae along larger part of ventral margin. Flagellum with six segments.

Maxilliped with inner plate reaching well past base of outer plate with tip truncate and armed with three setae and one spine. Of the setae the two more medial ones are distinctly plumose, the lateral one indistinctly so. The outer plate is long and narrow and reaches to the middle of the second segment of the palp. Palp slender with third segment but little shorter than second segment and about as long as dactylus.

Other mouth-parts not dissected.

First to fourth coxal plates with marginal setae, first plate somewhat broader distally, fourth plate with posterior incision not very large.

First and second gnathopods with merus and carpus subequal, metacarpus with palm oblique and posterior margin about as long as palm. Posterior corner of palm defined by a broad tooth and also by characteristically double-pointed spines of which there are two on first and one on second gnathopod.

Dactylus of third pereiopod much shorter than metacarpus, that of fourth pereiopod not much shorter than metacarpus. Fifth pereiopod with merus, carpus and dactylus about equally long, dactylus shorter. Sixth pereiopod with dactylus very long, subequal with metacarpus. Seventh periopod with posterior lobe of basis serrate but with small

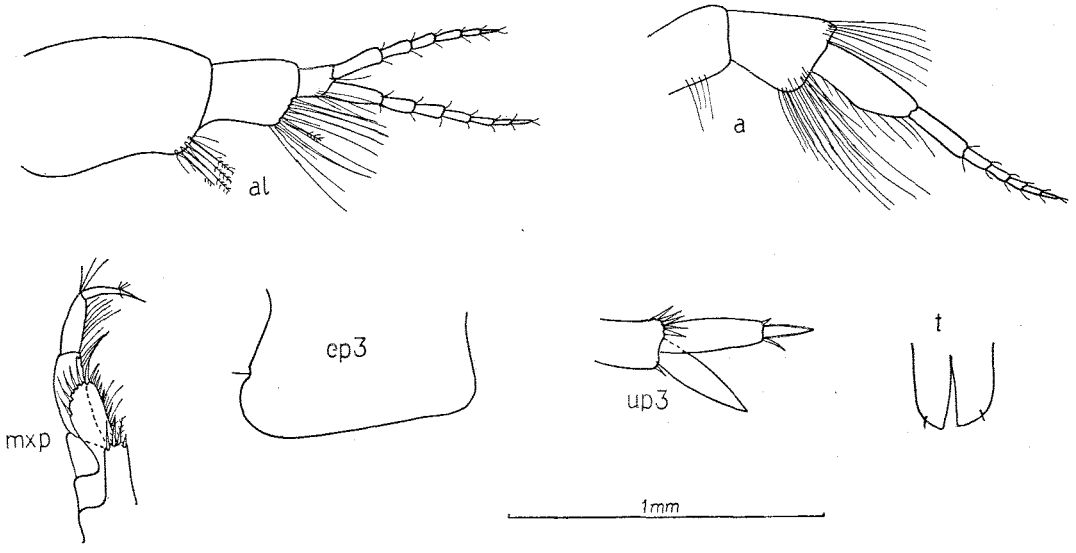

Fig. 10. *Harpinia spaercki* n. sp.

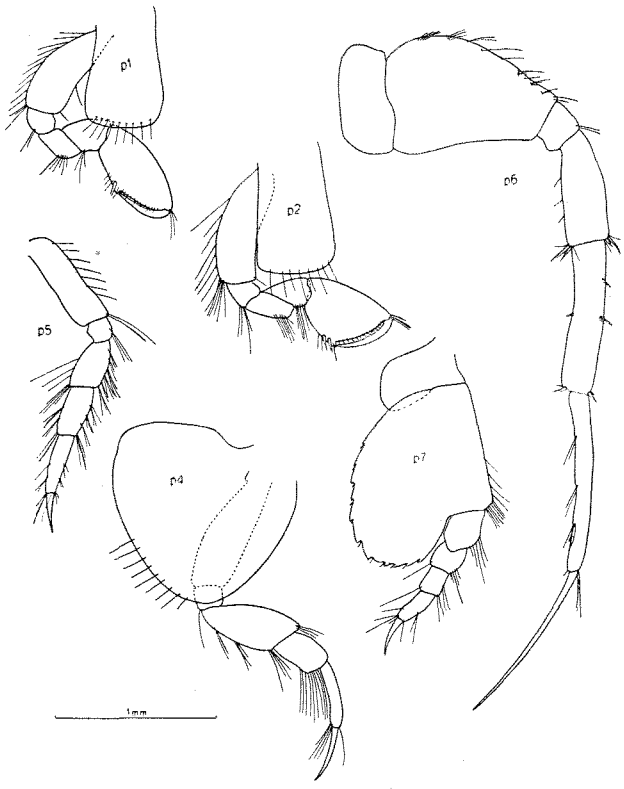

Fig. 11. *Harpinia spaercki* n. sp.

teeth and not particularly broad but very long, reaching almost to distal end of carpus.

Uropods with outer ramus longer than inner, peduncle of first uropod subequal with outer ramus, that of third uropod less than half as long as outer ramus. Inner ramus of third uropod reaching to end of first segment of outer ramus.

PIRLOT (1932 p. 69ff.) described another species of *Harpinia* from fairly deep waters in the Sea of Timor and the Corontalo Golf, viz. *H. abyssalis* (a somewhat unfortunate name as it is likely to lead to confusion with the North Atlantic deep sea species *H. abyssi* G. O. Sars). It differs from *H. spaercki* in many respects and may be distinguished at the first glance by means of the third epimeral plate, the posterior corner of which is drawn out to form a long tooth. The posterior lobe of the basal segment of the seventh periopod is proportionally shorter and broader than in *H. spaercki,* and the dactylus of the sixth pereiopod is little more than half as long as the metacarpus. Besides those mentioned here there are also numerous other differences.

H. spaercki is also easily distinguished from the various North Atlantic and Antarctic deep sea species of *Harpinia.*

It should be noted that as long as the male of *H. spaercki* is not known it remains somewhat uncertain whether it is a true *Harpinia* or a *Harpiniopsis.*

The species is dedicated to Professor R. SPÄRCK, Vice-President of the Committee of the "Galathea" Expedition.

FAMILY PARDALISCIDAE

Genus **Princaxelia** n. gen.

The amphipod species which was obtained in the greatest numbers in depths below 6000 meters belongs to the family Pardaliscidae, but its generic relationships caused certain difficulties.

In an appendix to his "Challenger" report STEBBING (1888, p. 1725) described the deep sea genus *Pardaliscoides* from the South Pacific. Further particulars, including numerous figures, of which there were none in the first description, were published in 1897 (p. 38 and pl. 12). STEPHENSEN (1931 p. 217) in his "Ingolf" report referred three specimens captured SW of Iceland in a depth of 1505 m to STEBBING's *Pardaliscoides tenellus,* although with some hesitation. He stated, however, that his three specimens "upon the whole" conformed to STEBBING's description, which was founded upon one single female 8 mm in length. STEPHENSEN added some points to the description and produced a series of highly relevant drawings.

Thanks to these drawings by STEPHENSEN it is easy to see that the "Ingolf" and "Galathea" specimens belong to the same genus, and this was further confirmed by a re-examination of the "Ingolf" specimens which were kindly put at my disposal by Mr. WOLFF.

On the other hand I find it impossible to agree with STEPHENSEN concerning the identity of his species with *P. tenellus.* It is true that STEBBING's specimen was small and probably immature but on the other hand it differs from the "Ingolf" and "Galathea" specimens in various respects which should not be subject to relevant changes connected with sexual maturation. These points emerge from STEBBING's descriptions and drawings of 1888 and 1897, and his final diagnosis of the genus *Pardaliscoides* (1906 p. 224) seems to preclude the possibility of referring the present specimens to that genus. STEPHENSEN's attitude was probably influenced by the bad state of preservation of his specimens. Now that numerous large and well-preserved specimens

of both sexes are available the reasons for this cautious attitude have been removed.

The main points in which the present specimens differ from *Pardaliscoides* will be enumerated here.

The antennular peduncle of *Pardaliscoides* is not much shorter than the antennar peduncle. The second segment is longer than the first segment which, in its turn, is longer than the third segment. In the present specimens the antennular peduncle is short, much less than half the length of the antennar peduncle. Further its first segment is slightly longer than the second segment which is about twice the length of the third segment. In this respect the antennula very closely resembles that of *Pardalisca*.

The mandibles of *Pardaliscoides* have very few spines, 2 on the left and 3 on the right side, while in the present genus there are numerous slender spines, about 15 on each side, and moreover a group of 5-6 accessory spines. The palp of *Pardaliscoides* is slender with the middle segment half as long again as the distal segment. In the new genus the middle segment is expanded and subequal in length with the third segment.

In the maxillula the outer plate has more terminal spines and the palp is much broader in the new genus.

In the maxilliped of *Pardaliscoides* the outer plate does not reach the base of the second segment of the palp but in the new genus it does reach it.

The carpal segment of the gnathopods of the new genus is much more dilated and in the second uropod the rami are of equal length.

Some of the differences enumerated here may have little significance on the generic level, but those found in the structure of the antennulae and mandibles (spinulation and palp) are too great to permit the inclusion of the "Challenger", "Ingolf", and "Galathea" specimens under the same generic name.

The new genus, which will be defined below, is respectfully dedicated to H.R.H. Prince AXEL, President of the "Galathea" Committee.

Princaxelia n. gen.

Urosome with dorsal teeth. Antennulae and antennae rather long, the antennulae being the longest. Flagella of both antennula and antenna with many segments. Accessory flagellum of antennula well developed. Right mandible with three blunt teeth on upper corner of cutting edge and no accessory plate, left mandible with less marked teeth but large and crenulate accessory plate. Both mandibles with a row of slender spines and a group of accessory spines. Maxillula, inner plate small with one terminal seta, outer plate with numerous (10) spines, the distal one much larger than the others, palp much expanded distally and with numerous spines on distal and inner margins. Maxilla, inner plate with 3 terminal setae, outer plate with numerous distal and lateral setae. Maxilliped with inner plates very small, outer plates likewise small, palp long and slender, dactylus large, with spinules. Carpus of first and second gnathopod much expanded and longer than metacarpus, third to seventh pereiopods slender, uropods with rami equal, first and second uropod with rami slender, third uropod with rami foliaceous. Telson long and narrow and deeply cleft.

It will be seen that the present genus in many respects, particularly in the structure of the antennula, and also that of the mandible and maxillula, is very similar to *Pardalisca*. On the other hand e.g. the maxilliped is so different that the two genera must be kept apart.

To *Princaxelia* as defined above two species must be referred, one from the North Atlantic collected by the "Ingolf" and one from the Pacific, collected by the "Galathea".

Princaxelia stephenseni n. sp.

Syn.: "? *Pardaliscoides tenellus* Stebbing". STEPHENSEN (1931 p. 217).

non *P. tenellus* Stebbing (1888 p. 1725).

SW of Iceland: 60°37'N, 27°52'W, *1505 m.* 3 specimens (1 ♂ abt, 10 mm, paratype, 1 ♀ abt. 11 mm with large oostegites, type, anterior $^2/_3$ of another ♀ of approximately the same size). "Ingolf" St. 78.

For description and figures cf. STEPHENSEN l.c.

To the description given by STEPHENSEN the following additions should be made:

Cox 5-7 broad with more or less straight ventral margin. Posterior part deeper than anterior part. (Fig. 12 is drawn from the specimen dissected by STEPHENSEN which should be the type of the species and the genus).

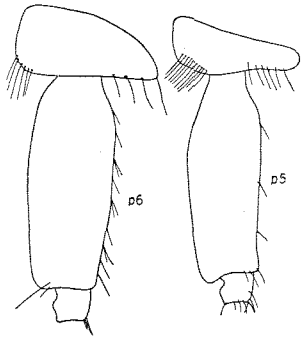

Fig. 12.
Princaxelia stephenseni n. gen. et sp.

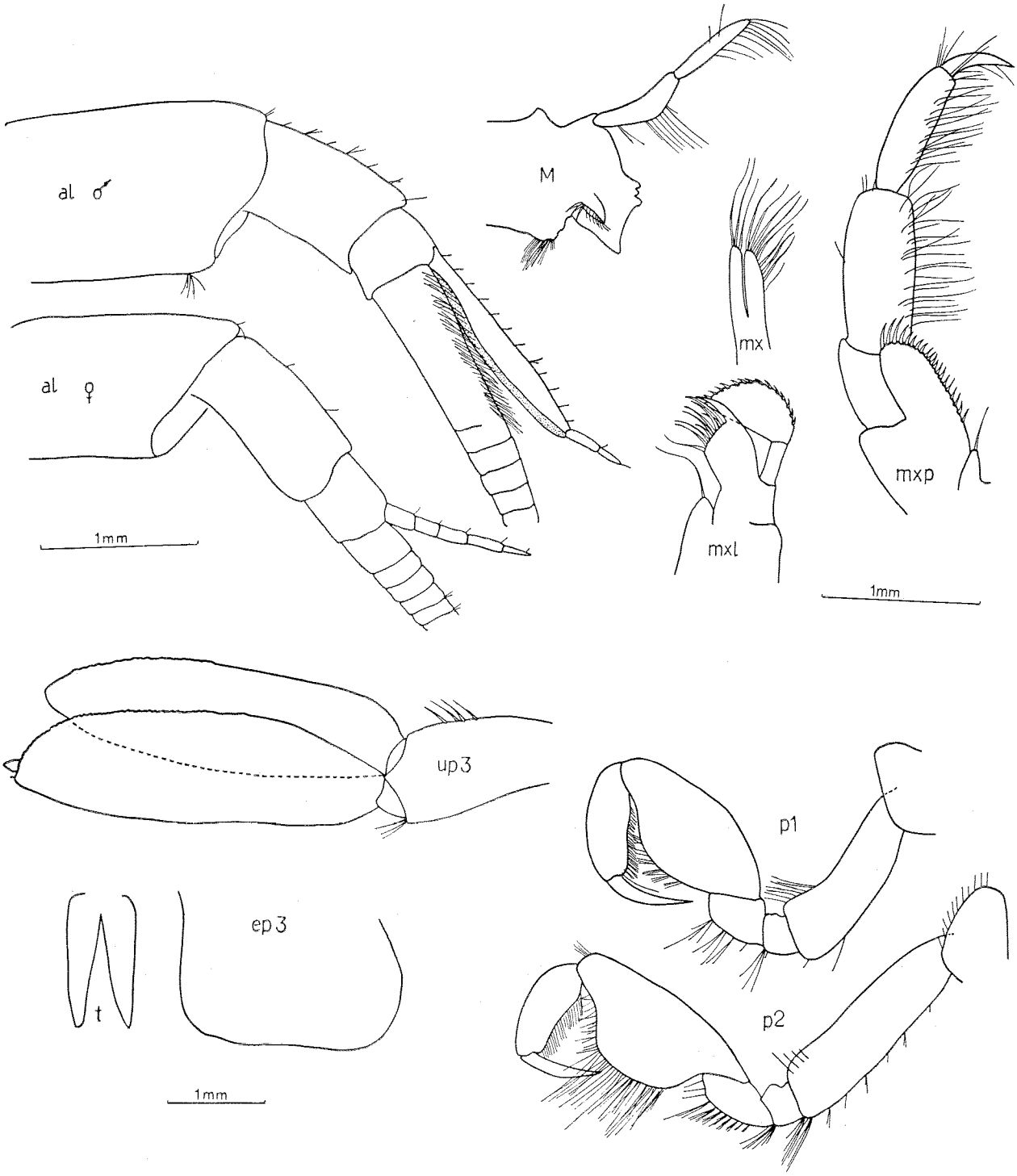

Fig. 13. *Princaxelia abyssalis* n. gen. et sp.

Princaxelia abyssalis n. sp.

St. 649. Kermadec Trench. 35°16′S 178°40′W, 8210-8300 m, grey clay with pumice. 14. II. 1952. 1 ♀, about 32 mm.

St. 650. Kermadec Trench. 32°20′S 176°54′W, 6620-6730 m, brown-grey clay with pumice. 15. II. 1952. 1 ♂, about 15 mm, urosome lacking.

St. 651. Kermadec Trench. 32°10′S 177°14′W, 6960-7000 m, 16. II. 1952. 1 ♀, 18 mm type, 1 ♂, about 21 mm paratype, 1 ♀ 11 mm, 1 sex?, badly mutilated.

Rostrum very short. Lateral lobes prominent, obtusely pointed. Two last urosome segments with

dorsal denticle which points backwards as in *P. stephenseni.*

Dorsal margin of first and second urosome segments produced posteriorly to form a pointed tooth. Posterior angle of third epimeral plate rounded. Telson with lobes diverging with one small dorsal spine near base and one lateral spine about $^1/_3$ from base, one or two fine dorsal setae about $^1/_4$ from tip. Lobes terminally with small notch.

Antennula, accessory flagellum of ♀ with 5 segments (in type), 6 and 7 segments in large specimen from St. 649, that of male with two small segments besides large scale-like first segment. Fifth segment of antennar peduncle slightly shorter than fourth.

Mouth-parts as described in generic diagnosis, spine-row of mandible with about 15 slender spines and one group of 5-6 accessory spines.

First and second gnathopod with carpus very broad, especially that of second gnathopd. Metacarpus and dactylus subequal in length. Third and fourth pereiopoda with merus and carpus rather broad, carpus distinctly longer than merus.

Coxal plates of fifth to seventh pereiopod short but broad, with ventral margin straight or nearly straight. Distal part of appendages slender with basis not much broader than distal segments.

Up 1 and Up 2 with rami narrowly lanceolate, subequal, Up 3 with rami foliaceous, outer ramus slightly longer and with a small terminal process which represents second segment (Up 3 present only in large female from St. 649).

Undoubtedly *P. stephenseni* and *P. abyssalis* are closely related. The most striking difference is to be found in the palp of the maxillula which is very much expanded in *P. abyssalis* but hardly expanded at all in *P. stephenseni.* The number of spines in the spine-row of the mandible is also different, and so are the posterior coxal plates.

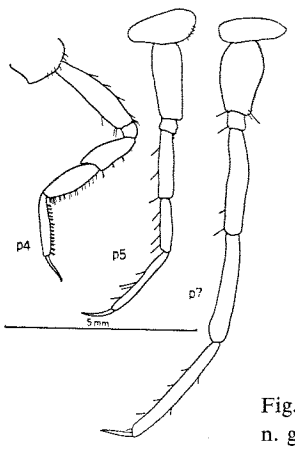

Fig. 14. *Princaxelia abyssalis* n. gen. et sp.

Genus **Pardaliscoides** Stebbing

Though *Hirondellea gigas* (cf. p. 214) was the only amphipod obtained in depths greater than 10.000 meters another species very nearly attained the same distinction. It is represented by a very small specimen captured in the Phillippine Trench at a depth of almost 10.000 m and was for a long time, also after the return of the expedition, considered to represent the depth record where amphipods were concerned. The specimens of *Hirondellea* were then considered to be bathypelagic, and although the possibility remains that they were actually caught above the bottom it seems very probable that they belong to a species which is at least facultatively benthic.

The present specimen which is only 4.5 mm long and apparently immature, was first taken to be a young specimen of the species described under the name of *Princaxelia abyssalis.* However, a re-examination disclosed the fact that it obviously belongs to the genus *Pardaliscoides,* described in an appendix to the "Challenger" report by STEBBING (1888 p. 1725) on a specimen captured at 39° S, 83° W. A more complete description with numerous figures was published later (STEBBING 1897 p. 38 and pl. 12).

Another specimen apparently belonging to the same species of similar size but rather badly mutilated in the anterior end was captured in the Kermadec Trench (St. 653).

As stated above the specimens captured by the "Galathea" conform very well with the generic description given by STEBBING, but it seems impossible to refer them to the same species. The third uropod is very different from the one of *P. tenellus* Stebbing, and the antennulary accessory flagellum of the specimen from the Phillippine Trench is proportionally much longer.

This last difference and some other discrepancies may be due to the apparently immature condition of the present specimens, but the shape of the third uropod appears sufficiently different to preclude any specific identity.

Pardaliscoides longicaudatus n sp.

St. 435, Philippine Trench, 10°20′N 126°41′E, 9820-10.000 m, very stiff clay. 7. VIII. 1951. 1 specimen 4.5 mm, immature (type).

St. 653. KermadecTrench,32°09′S176°35′W,6180m, brown clay with pumice. 17. II. 1952. 1 spm., head mutilated, probably imm. about 4 mm.

Rostrum, distinct, curved downwards, not much shorter than first segment of antennular peduncle, Lateral lobes little produced, very obtusely pointed, Urosome segments 1 and 2 each with one pointed tooth on posterior dorsal margin. Posterior corner of third epimeral plate quadrangular but rounded at point.

Peduncle of antennula reaching just past end of fourth segment of antennar peduncle. In antennular peduncle the second segment is very distinctly the longest, while the first segment is not much longer than the third segment.

Only one antennula is left and its flagellum is broken, but it is nevertheless a good deal longer than the antenna. The accessory flagellum is notably long, it appears to be broken but the part left consists of 8 segments, the first of which is longer than the others. In the antenna the two ultimate peduncle segments are subequal, and together they are longer than the flagellum.

The mouth-parts were not dissected but in the mandibular palp the third segment is shorter than the second segment which is not dilated, and the maxilliped closely resembles that of *P. tenellus.*

First and second pereiopoda with carpus broad, third and fourth pereiopoda with merus and carpus not much broader than metacarpus. Coxa of fifth to seventh pereiopoda more or less rectangular and especially that of the fifth pereiopod rather large. Otherwise the three last pereiopoda are slender, but the basis of the seventh pereiopod is distinctly broader than those of the fifth and sixth pereiopoda. The dactyli of all pereiopoda are very long proportionally, but this may partly be due to the specimen being immature and not full-grown.

Uropods 1 and 2 reaching past uropod 3. Peduncle of Up 1 very long, subequal with inner ramus, outer ramus broken. Up 2 with rami unequal, peduncle shorter than rami. Up 3 with peduncle much shorter than rami, which are very long and slender, inner ramus very slightly longer than outer.

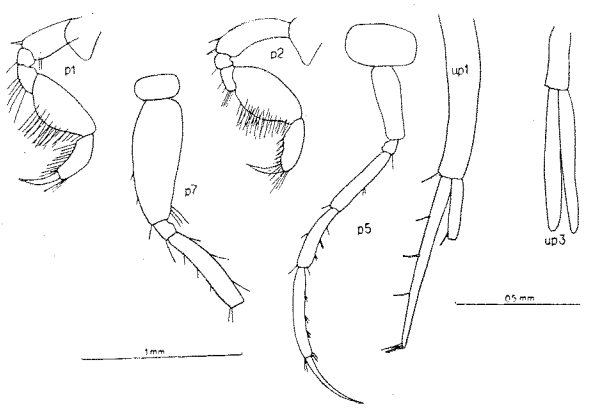

Fig. 15. *Pardaliscoides longicaudatus* n. sp.

It is somewhat doubtful whether the specimen from St. 653 really belongs to the same species. It is similar but in such a bad state that a definite identification is hardly possible.

Genus **Halice** Boeck

Syn. **Synopiodes** Stebbing

BIRSTEIN and VINOGRADOV (1955 p. 242) described two new species from the Kurile-Kamtchatka area which in their opinion obliterate the difference between the genera *Halice* and *Synopioides,* of which the former has the priority. They give a key to altogether nine species of *Halice,* including *H. aculeata* Chevreux and *H. secunda* (Stebbing). But according to SCHELLENBERG (1955 p. 190 and 194). *H. aculeata* Chevreux is identical with *Synopioides secundus* Stebbing, and as the latter specific name has priority this species should consequently be called *H. secunda* (Stebbing). Provisionally I accept SCHELLENBERG'S view.

Halice secunda (Stebbing)

Syn. **H. aculeata** Chevreux

Synopioides secundus Stebbing

St. 418. Philippine Trench, 10°13'N 126°43'E. 10.190-10.150 m, clay with gravel and stones. 21. VII. 1951. 1 ♂.

St. 651. Kermadec Trench, 32°10'S 177°14'W. 6960-7000 m, clay. 16. II. 1952. Anterior half of ♂.

It is practically certain that *H. secunda* is a purely pelagic species occurring in all three oceans. As it was obtained in two hauls where benthic species were also present, it is, however, mentioned her for the sake of completeness.

FAMILY EUSIRIIDAE

Genus **Rhachotropis** Smith

Rhachotropis flemmingi n. sp.

St. 466. Sunda Trench, 10°21'S 110°12'E. 7160 m. clay. 6. IX. 1951. 2 specimens 18-20 mm + fragments of at least 3 further specimens of about the same size or slightly larger.

Description of male, 18 mm.

No eyes. Rostrum long and slightly curved. Lateral

lobes of cephalon produced, rounded. Postantennal corner not produced. Epistome somewhat produced, nearly straight.

One large dorsal tooth on the three metasome segments and the first urosome segment. Two posterior metasome segments and first urosome segment with distinct medial carina, lateral keels indistinct, but can be recognized at least on some segments. On the posterior margin of the three metasome segments the end of this indistinct, lateral keel is marked by a small tooth. Telson narrow, distal part tapering to a point, cleft for about one fifth of its length. Third epimeral plate with posterior corner broadly rounded, serrate.

Antennulae and antennae subequal, peduncle of both pairs compressed dorsoventrally with distinct lateral keel. First segment of antennar peduncle longer than second, third segment short. Antennar peduncle distinctly longer than antennular peduncle and fifth segment somewhat longer than fourth.

Left mandible with large molar, the edge of which is armed with a dense row of strong spines, spine-row with three large and some smaller spines, lacinia mobilis with six teeth, cutting edge with two teeth. Right mandible essentially similar but with cutting edge more produced. Maxillula, inner plate with two terminal setae, outer plate with 7 forked or indistinctly serrate spines. Palp with margins parallel, first segment about half as long as second segment. Maxilla normal with plates of equal length and inner plate broader than outer. Maxilliped with inner plate broad and armed distally with 4 short but heavy spines. Outer plate short, reaching just past first segment of palp.

Coxal plates small, first much produced anteriorly, subacute. Fourth coxal plate with small posterior emargination and posterior corner subacute. Fifth and sixth plates bilobate, posterior lobe larger than anterior lobe. Seventh coxal plate with distal margin straight.

Both gnathopods with palm very spinose, posterior end of palm marked by a group of heavier spines. Carpal lobe not reaching past posterior end of palm in either gnathopod.

Third and fourth pereiopods very slender with dactylus very long, equal with metacarpus. Fifth to seventh pereiopods also very long and slender, with posterior distal corner of merus somewhat produced and dactylus long. Posterior corner of basal lobe of fifth and sixth pereiopods rounded, that of seventh somewhat produced downwards and acute. Seventh pereiopod extremely elongate, approximately as long as whole body, and much longer than fifth and sixth pereiopods, which are subequal.

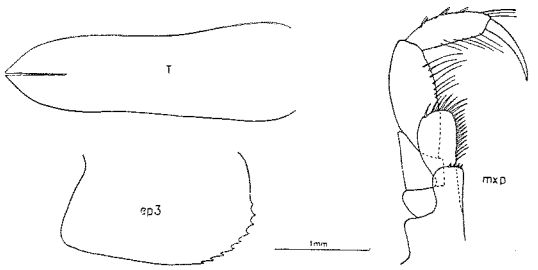

Fig. 16. *Rhachotropis flemmingi* n. sp.

First uropod reaching past second uropod and nearly to end of third uropod. Rami of first uropod subequal, outer ramus of second uropod slightly shorter than inner ramus. Third uropod with outer ramus very slightly shorter than inner ramus, both rami narrowly lanceolate, inner border of inner ramus with spine-row.

R. flemmingi may be defined as a blind species with metasome virtually unicarinate and with seventh pereiopod extremely long and with distal corner of basal lobe acute. Although these features, when taken separately, are known also from other species the combination is unique.

The species is dedicated to Count Flemming of Rosenborg, Naval Officer on board the "Galathea".

Eusiriidae, gen. et sp. ? (cf. **Rhachotropis).**

In the Kermadec Trench, St. 651, 7140-7180 m, a specimen was obtained which, although it undoubtedly belongs to the family Eusiriidae, is in such a fragmentary state that I prefer not to attempt to put any name to it.

The rostrum is small and bent downwards. The last metasome segment and the urosome are missing altogether. But on the badly mutilated first and second metasome segments a low carina ending in a rather small posterior tooth can be identified. Further the gnathopods are undoubtedly of the type found in *Rhachotropis* and closely resemble those described above in *R. flemmingi*. What remains of the other pereiopoda indicates that they were also long and slender. On the other hand the first coxal plate is not at all produced anteriorly, and there is no posterior lobe on the basal segment of the seventh pereiopod. In the maxilliped the outer plate reaches well past the first segment of the palp, and the second segment of the palp is rather broad in the middle and tapers both distally and proximally.

The specimen is a female with large óostegites

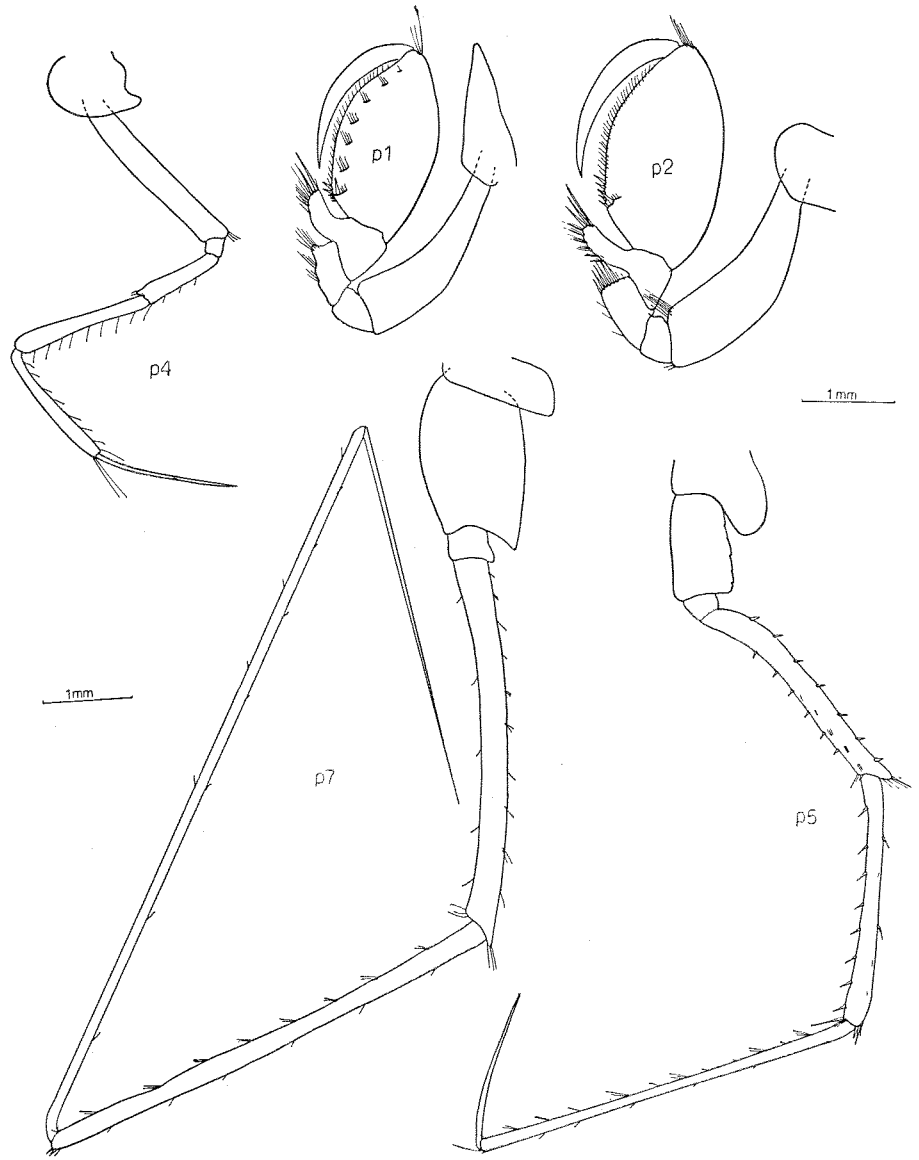

Fig. 17.
Rhachotropis flemmingi n. sp.

and must have measured between 15 and 20 mm in length.

It is above all the absence of the posterior part of the body with i. a. the third epimeral plate, the uropods, and the telson which make a definite identification impossible at the present stage. I have little doubt that the specimen represents a new species and it appears rather probable that a new genus must also be created for it when well-preserved specimens turn up.

FAMILY PONTOGENEIIDAE

Bathyschraderia n. gen. and allied genera

Among the rich crop of amphipods from the Kermadec Trench there are three very fine specimens and various fragments of a species which obviously belongs to the Pontogeneiidae. It is also clear that this new species belongs to a group of genera to which *Schraderia* Pfeffer and *Djerboa* Chevreux must also be counted.

The main characteristics of this group of genera could be summed up as follows: Both pairs of antennae long but antennula definitely longer than antenna, accessory flagellum present, both pairs of gnathopods very slender, especially the second pair, telson rather broad, with lobes truncate. Especially the gnathopoda distinguish these genera from all other members of the family at the first glance.

However close its relationships to the two other genera the new species cannot be referred to either of them.

To facilitate a comparison a number of important features have been plotted against each other in table 3.

Table 3

	Schraderia	*Djerboa*	*Bathyschraderia*
Eyes	present	present	absent
Dorsal spines on mesosome	absent	present	absent
Epistome, keel	absent	absent	present
Labrum, free margin	entire	entire	emarginate
Antennula, peduncle	segm. 1>2	segm. 1>2	segm. 1<2
Antenna, peduncle, length	normal	normal	very long
P 3-P 4 dactylus, convex side	unarmed	with strong spine	unarmed
P 5-P 7, dactylus, convex side	?	with strong spine	with numerous very slender spines
P 7 in relation to P 5 and P 6	slightly larger	very much larger	slightly larger
Mandible, distal segment of palp	truncate, setose terminally	normal, setose on inner margin	normal, setose on inner margin

Bathyschraderia n. gen.

Diagnosis: Rostrum small, slightly curved. No eyes. Cephalon longer than first body segment. Lateral lobes and postantennal corner broadly rounded, separated by a narrow slit. Body without dorsal teeth. Coxal plates rather deep, fourth excavate behind, fifth to seventh with posterior lobe little deeper than anterior lobe. Telson rather long and broad, rather deeply cleft. Antennula with peduncle rather long, second segment the longest, accessory flagellum small, antenna with peduncle very long, two ultimate segments subequal or ultimate segment slightly longer. Epistome with low keel, anterior margin of labrum emarginate. Mandibles powerful with lascinia mobilis on both sides, palp with two distal segments subequal, third segment distally narrowly rounded with setae on interior margin. Labium with accessory lobes obsolete. Maxillula with inner plate rather broad, numerous setae along inner margin. Maxilla with plates nearly equal, inner plate with transverse row of setae. Maxilliped with inner margin of outer plate lacking spines but bluntly serrate. Palp slender with second segment long.

Gnathopods subchelate and very slender, especially the second pair. Carpus and metacarpus with margins parallel. P 3 and P 4 slender. P 7 not notably larger than P 5 and P 6. Dactylus of P 5 to P 7 with spines on convex margin. Up 1 and 2 with rami slender, outer ramus shorter than inner, Up 3 with rami narrowly lanceolate, subequal.

Bathyschraderia magnifica n. sp.

St. 651. Kermadec Trench. 32°10'S 177°14'W. 6960-7000 m, brown clay with pumice. 16. II. 1952. 3 specimens + fragments.

Antennula with first segment of peduncle somewhat shorter than second segment, both with a small tooth-like projection on distal end of inner margin. Third segment of peduncle short, accessory flagellum with a number of terminal and subterminal setae. Antenna with peduncle distinctly longer than that of antennula, third segment of peduncle of antennula only reaching a little past fourth segment of antennar peduncle.

First to third coxal plates with distal margin rounded and bluntly serrate, fourth plate broad with distal margin straight.

P 1 and P 2 with palm very oblique and rather badly defined. Metacarpus of P 1 slightly shorter than carpus, those of P 2 subequal. P 3 and P 4 extremely slender, metacarpus of both appendages with a pair of rather large terminal spines. Hind lobe of basis on P 5 – P 7 with posterior margin nearly straight, distal margin projecting a little but not reaching distal end of ischia.

First epimeral plate with posterior corner nearly rectangular, posterior margin of second plate straight, corner slightly produced, posterior corner of third plate rounded with minute tooth.

First uropod with outer ramus slightly shorter than inner ramus, outer ramus of second uropod only two thirds the length of inner ramus, rami of

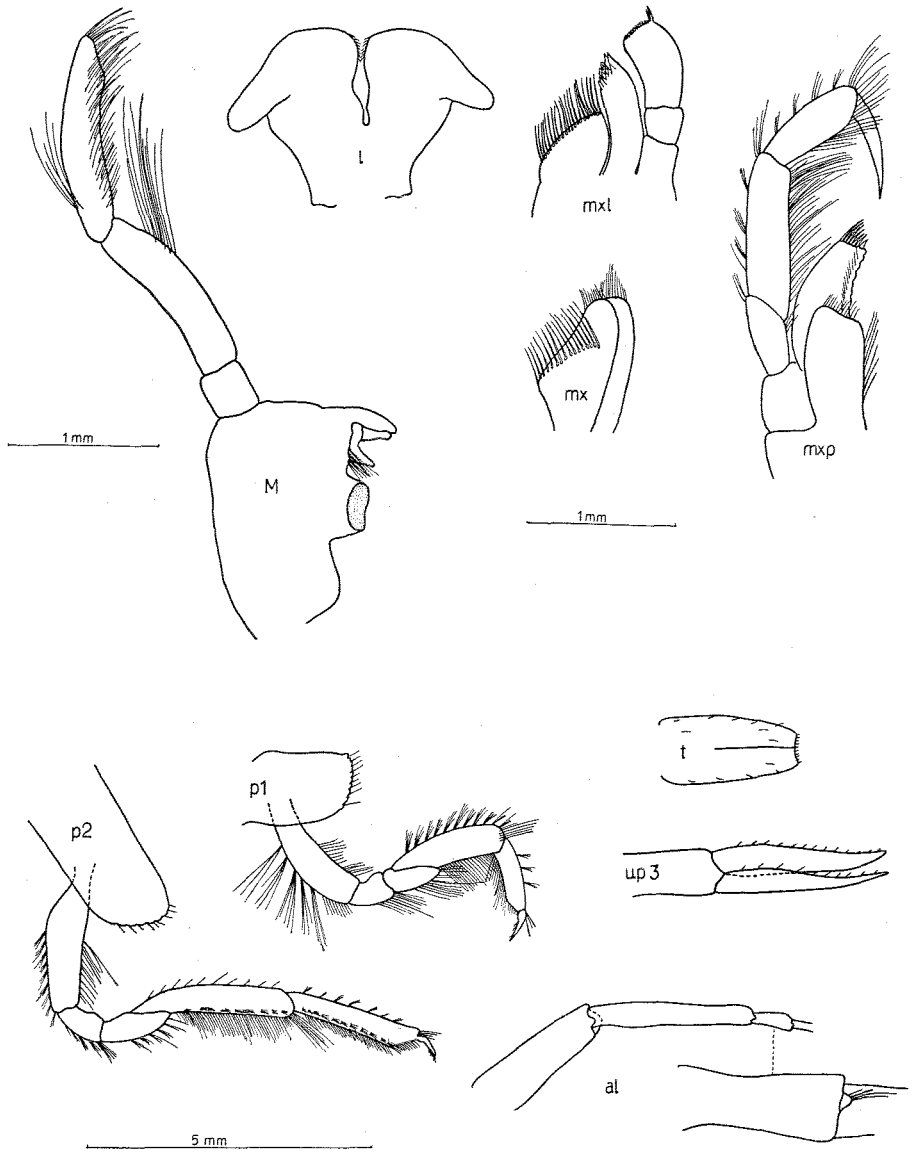

Fig. 18.
Bathyschraderia magnifica n. gen. et sp.

third uropod subequal. Both rami of all uropods with row of spines on dorsal margin.

Telson with some dorsal spines. The number and arrangement appears to vary from specimen to specimen.

The slender appendages and general appearance of *B. magnifica* makes it rather probable that the species is pelagic or at least facultatively pelagic.

FAMILY LEPECHINELLIDAE

Genus **Lepechinella** Stebbing

Syn. **Dorbanella** Chevreux

The "Galathea" collection contains one very fine specimen of *Lepechinella* from the Kermadec Trench. With a total body length of between 15 and 20 mm it is by far the largest specimen of the genus hitherto recorded and of the same size as the related *Paralepechinella longipalpa* Pirlot.

The taxonomic position of *Lepechinella* caused some difficulties. STEBBING (1908) in his original description referred it to the Paramphithoidae, and as pointed out independently by BARNARD (1925 p. 355) and SCHELLENBERG (1926 p. 344) this was undoubtedly the reason why CHEVREUX (1914) referred the next species to be discovered to a new genus, *Dorbanella,* which he placed in the neighbourhood of the family Tironidae.

SCHELLENBERG (1925 p. 205) maintained that the genus could have no very close affinity to the Tironidae, i. a. because of the different shape of the inner plates of both pairs of maxillae and the fusion of the two last urosome segments, and he created a

new family Dorbanellidae to receive the genus *Dorbanella* Chevreux. Next year when he discovered the identity of the genus in question with *Lepechinella* Stebbing the name was duly changed to Lepechinellidae. In the same connection (1926 p. 344) he pointed out that it is impossible to follow Stebbing in referring the genus to the Paramphithoidae. Because of the fusion of the last urosome segments, the presence of well developed inner lobes on the labium, and the narrow basal segments of the pereiopoda the family Lepechinellidae should be ranged in the neigbourhood of the family Atylidae, a point of view which was later on accepted by BARNARD (1932 p. 186). PIRLOT (1933 p. 167) found it difficult to accept all previous views and suggested that the Lepechinellidae may constitute a branch of the family Gammaridae which has become highly specialized for life in the deep sea. He maintained that the fusion of the urosome segments is hardly any reason for placing the family in the neighbourhood of the Atylidae, and pointed out that e. g. among the hyperiids a fusion of the last urosome segments occurs frequently in various lines which are quite independent of each other.

On the whole the fusion of the last two urosome segments has come to play a central part in the discussion of the affinities of the Lepechinellidae. As the "Galathea" specimen throws some light upon this question some further remarks will be added.

STEBBING (1908) in his original description of the type species *L. chrysotheras* made no reference to any fusion of the two posterior urosome segments, but in his drawing they are represented as being separate as in ordinary amphipods. BARNARD (1925 p. 356) reported the occurrence of a species of *Lepechinella,* which, although it did not fit completely into the description given by STEBBING, was considered to be *L. chrysotheras.* The posterior urosome segments were stated to be separate. Later on BARNARD described a new species from the Antarctic, *L. cetrata,* (BARNARD 1932 pp. 186-187) where the last two urosome segments were found to be "united, but with the suture visible, at least laterally." A re-examination of the South-African *L. chrysotheras* disclosed the fact that despite the visible suture between the posterior urosome segments, they were nevertheless immovably united.

It is remarkable that despite the fact that a suture between the urosome segments was found in *L. chrysotheras* and later also in *L. cetrata* most writers on the family have taken the complete fusion of the segments in question for granted and considered it to be of great taxonomic importance. Such a complete fusion is found in *L. echinata* (Chevreux), *L. drygalskii* Schellenberg, *L. curvispina* Pirlot and in *Paralepechinella longipalpa* Pirlot. Probably the same is the case with *L. arctica* (Schellenberg). This species was first described as *Dorbanella sp.* (Schellenberg 1925 p. 206), and it was stated that the two posterior urosome segments were fused. Later on SCHELLENBERG (1926 p. 394 foot-note) gave it the specific name *L. arctica.* STEPHENSEN (1944 p. 19) re-described the species but had evidently overlooked SCHELLENBERG's note and named it *L. schellenbergi.* In his drawing the two urosome segments are represented as fused without any trace of a suture. On the other hand the specimen drawn by GURJANOVA (1951 fig. 465 p. 677) as *L. arctica* Schellenberg has the two segments in question separated by a well-marked segmental border. In fact, however, other features, e. g. the epimeral plates and the coxal plates, differ so much from the drawing given by STEPHENSEN (1944 fig. 11 p. 19) that it seems doubtful whether the species are really identical. Finally the specimen taken by the "Galathea" not only shows a distinct segmental border between the two posterior urosome segments, a border which is clearly visible all around the body, but it was also found that they are slightly movable independently of one another.

Consequently among the Lepechinellidae a more or less distinct separation of the two last urosome segments was found in at least three species, viz.

L. chrysotheras Stebbing
L. cetrata Barnard
L. wolffi n. sp. (to be described below)

and possibly in two more, the South African *L. chrysotheras* (BARNARD 1925) and *L. arctica* sensu Gurjanova (1951) which may both be distinct species.

On the other hand a complete fusion seems to exist in five species, viz.

L. echinata (Chevreux)
L. drygalskii Schellenberg
L. arctica Schellenberg (s. str.)
L. curvispina Pirlot
Paralepechinella longipalpa Pirlot

Thus a tendency to fusion of the last two urosome segments may be said to exist within the family but it is by no means universal and does not play the

important part suggested by various previous writers.

All this is not without a bearing upon the taxonomical position of the family. In the first place it adds weight to the argument advanced by PIRLOT (1933 p. 167) against the atylid affinities of the Lepechinellidae. The fusion of the posterior urosome segments constituted the main argument in favour of such affinities, as already pointed out by PIRLOT (1 .c.) most other features rather contradict it. It is highly improbable that atylids with the secondary fusion of the urosome segments characteristic of their family should have evolved in the direction of the lepechinellid type, at the same time gradually loosing that fusion. On the other hand, if the tendency to fusion of the urosome segments is now in the process of becoming established within the family, its members could hardly have been derived from atylids, which have already a fusion between the two segments.

The alternative suggested by PIRLOT, viz. that the Lepechinellidae are most closely related to the Gammaridae merits serious consideration. As mentioned above PIRLOT suggested that the Lepechinellidae might have evolved as a specialized deep sea branch of the latter family. *L. echinata* and *L. wolffi* have both been obtained in very deep water and the remaining species are in most cases recorded from depths a little above or below 1000 m. The mouth-parts of the Lepechinellidae are rather similar to those of the Gammaridae, the most important difference being the narrow inner plate of the maxillulae of the former family. Otherwise the resemblance with the Gammaridae is not particularly great. In fact it seems more fruitful to compare the Lepechinellidae with the Melphidippidae which are generally considered to be rather closely related to the Gammaridae.

In the Melphidippidae there exists a general tendency (also to be found in the Gammaridae) to develop strong spines on the dorsal side of the metasome and urosome segments the posterior margins of which are often crenelated. The basal segment of the three posterior pairs of pereiopoda is narrow, almost linear, and all the pereiopoda are long and very slender. The gnathopods are feebly subchelate with ill-defined posterior corner of the palm. The mouth parts closely resemble those of the Gammaridae. The two distal segments of the antennar peduncle are often very long. The rami of the uropoda are narrow. In all these respects the Melphidippidae resemble the Lepechinellidae. On the other hand the peduncle of the third uropod is always very long in the Melphidippidae and very short in the Lepechinellidae, and in the former family the dactylus in the two posterior pairs of pereiopoda is turned backwards. In contrast to the Lepechinellidae the Melphidippidae never have long dorsal spines on the anterior segments. Nevertheless the general resemblance between the Lepechinellidae and the Melphidippidae seems great enough to be more than accidental.

It would seem as if evidence is accumulating to support the opinion expressed by PIRLOT that the Lepechinellidae are not too far removed from the Gammaridae. At least it seems probable that they are more closely related to that family than to the others which have been mentioned in that connection. Particularly, however, there seems to be a considerable degree of similarity with the family Melphidippidae, and it seems to me that the Lepechinellidae are likely to find their definite place in the system in the neigbourhood of those two rather closely related families.

Lepechinella wolffi n. sp.

St. 658. Kermadec Trench, 35°51'S 178°31'W. 6660-6770 m, brown sand with clay and stones. 20. II. 1952. 1 female with large oostegites, 21 mm.

Body slender, very spinose. Rostrum short, curving upwards. Anterior margin of cephalon with two teeth, the upper one so long and acute that it could almost be called a spine, emanating at the height of the antennular base and only slightly shorter than the first segment of the antennular peduncle. Below it another much smaller and blunter tooth. Dorsum of cephalon with a group of small spines arranged in three rows. Other small spines on the sides of the cephalon. First free mesosome segment with two long dorsal teeth, the anterior one curving forwards, the posterior one curving backwards. Subsequent segments, including first segment of urosome, with one big tooth which curves slightly backwards. Second urosome segment without any dorsal tooth, third with a vertical, acute process. Besides the dorsal teeth there are large spines or groups of spines in front of the teeth on the five posterior mesosome segments. On the metasome segments the posterior part of the dorsum is provided with a rather high carina with a double row of spines, the big teeth are the posterior continuation of this carina. Hairs on posterior margins of segments.

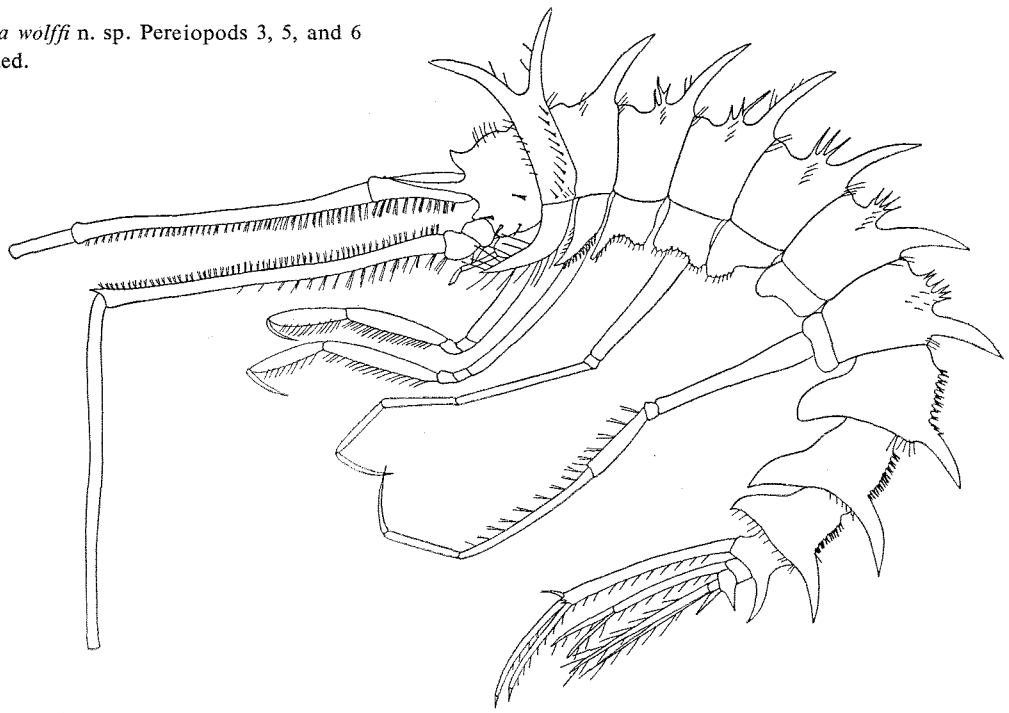

Fig. 19. *Lepechinella wolffi* n. sp. Pereiopods 3, 5, and 6 and pleopods omitted.

Epimeral plates long with posterior margin straight or nearly straight, posterior corner of second and third plate somewhat produced.

Telson deeply cleft with lobes somewhat diverging.

Antennula with second segment of peduncle very long, flagellum long and slender, accessory flagellum short and rod-like, consisting of one segment only. Peduncle of antenna much longer than that of antennula, two distal segments subequal. Fourth segment ending in a small dorsal tooth. Flagellum of both sides lost.

Mandibular palp normal (i. e. similar to that of *L. curvispina, L. echinata,* and *L. chrysotheras)*. Other mouth parts of unique specimen not dissected.

First coxal plate long, curved and drawn out to a sharp point, along most of its length fringed by long hairs which sit well apart. Second coxal plate also ending in an acute point but hardly curved, provided with marginal spines. Third coxal plate with anterior corner produced into a sharp, straight tooth, posterior corner blunt. Fourth coxal plate bilobed with anterior and posterior lobes equal and blunt. Three posterior coxal plates with blunt anterior lobe which is obsolete in seventh coxal plate and posterior part of distal margin more or less straight.

All pereiopoda long and very slender, first two pairs feebly sub-chelate with palm badly defined, five posterior pairs with basis linear and dactylus very long.

First uropod long, reaching well past two posterior pairs. Peduncle longer than rami, ending in a big ventral spine. Dorsal margin of peduncle and rami with numerous spines. Rami subequal. Second uropod reaching to end of third, peduncle longer than rami, dorsal margin of peduncle and rami with numerous spines, rami subequal. Third uropod with peduncle very short, rami very slender, provided with numerous hairs and of about equal length.

L. wolffi belongs to the group of species within the genus *Lepechinella* which shows no cleaving of the first coxal plate, and where there are large dorsal teeth on the mesosome segments. This group consists of the species *L. curvispina, L. drygalskii,* and *L. echinata.* Of these three species *L. wolffi* undoubtedly resembles *L. echinata* most closely. An attempt to examine the species according to the key produced by STEPHENSEN (1944 p. 19) leads to *L. echinata.* From this species, however, *L. wolffi* is easily distinguished by the separation of the last urosome segments, the dorsal projection on the last urosome segment, and the subequal rami of the uropods. In *L. echinata* the posterior urosome segments are fused, the dorsal projection of the last segment is lacking, and the uropod rami are inequal.

The species is named after Dr. TORBEN WOLFF, First Scientist on the "Galathea".

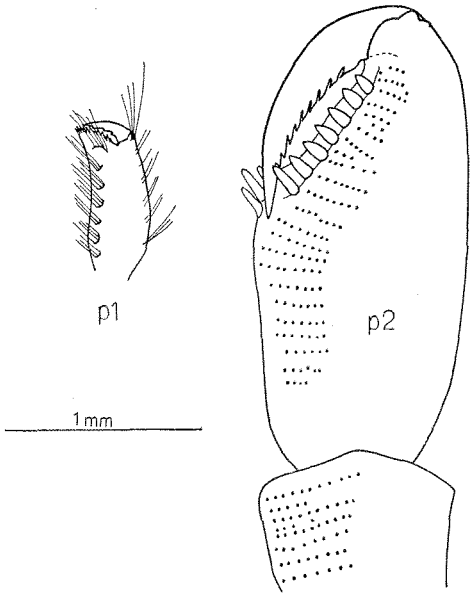

Fig. 20. *Bathyceradocus stephenseni* Pirlot. Setae on 2nd gnathopod omitted but their positions indicated by dots.

FAMILY GAMMARIDAE

Genus **Bathyceradocus** Pirlot

B. stephenseni Pirlot 1934

St. 495. Banda Trench. 5°26′S 130°58′E. 7290-7250 m, clay. 22. IX. 1951. 1 ♂, about 18 mm.

Unfortunately the very large specimen of this species, described by PIRLOT (1934 p. 224 ff.) from the Moluccas Strait, is broken. Nevertheless the anterior fragment, consisting of the cephalon and the two anterior segments of the mesosome, fits the posterior fragment with the remaining segments so perfectly that there can be no doubt about their belonging to the same specimen. PIRLOT had two females and one young specimen at his disposal, the present specimen is a male, and as the gnathopods differ substantially from those of the female, a drawing of them is reproduced here. The present specimen is about one and a half times as long as the largest one seen by PIRLOT. Otherwise it conforms very well with the description.

THE DISTRIBUTION OF HADAL AMPHIPODS

Amphipods were obtained by the "Galathea" in the following four deep sea areas from depths of more than 6000 m, viz. the Sunda Trench, the Banda Trench, the Philippine Trench, and the Kermadec Trench. The various species mentioned in the taxonomic part of this paper were found to be distributed over the various hadal areas in the following manner:

The Banda Trench:

Onesimoides cavimanus Pirlot
Harpinia spaercki n. sp.
Bathyceradocus stephenseni Pirlot

The Sunda Trench:

Rhachotropis flemmingi n. sp.

The Philippine Trench:

Hirondellea gigas (Birstein & Vinogradov)
Pardaliscoides longicaudatus n. sp.
Halice secunda (Stebbing)

The Kermadec Trench:

Hirondellea dubia n. sp.
Schisturella galatheae n. sp.
Bathycallisoma pacifica n. sp.
Tryphosa bruuni n. sp.
Orchomenella abyssorum (Stebbing)
Princaxelia abyssalis n. sp.
? *Pardaliscoides longicaudatus* n. sp.
Bathyschraderia magnifica n. sp.
Halice secunda (Stebbing)
Lepechinella wolffi n. sp.

Besides the "Galathea" Expedition the Swedish Deep-Sea Expedition and the Russian expedition to the Kurile-Kamtchatka Trench also reported the occurrence of amphipods in depths of more than 6000 m.

Puerto Rico Trench (SCHELLENBERG 1955)

aff. *Paracallisoma* sp. = Bathycallisoma schellenbergi Birstein & Vinogragov
Metandania islandica Stephensen
Eusirus bathybius Schellenberg
Halice secunda (Stebbing)

Kurile-Kamtchatka Trench (BIRSTEIN & VINOGRADOV 1955)

Hirondellea gigas Birstein & Vinogradov
Halice secunda (Stebbing) (recorded as *H. aculeata* Chevr.)
Vitjaziana gurjanovae Birstein & Vinogradov
Astyra bogorovi Birstein & Vinogradov
Cleonardo macrocephala Birstein & Vinogradov.

Thus no less than 21 species of Amphipoda Gammaridea have been recorded from depths exceeding 6000 m. It is interesting to note that although 10 different families have been recorded no less than

8 species belong to the family Lysianassidae, while the Pardaliscidae and the Eusiridae are both represented by 3 species. A complete list of the species in taxonomic order is composed as follows:

Fam. Lysianassidae
Hirondellea dubia Kermadec Trench
Hirondellea gigas Kurile-Kamtchatka Trench, Philippine Trench
Onesimoides cavimanus Banda Trench
Schisturella galatheae Kermadec Trench
Bathycallisoma pacifica Kermadec Trench
B. schellenbergi Puerto Rico Trench
Orchomenella abyssorum Kermadec Trench, S. Atlantic, possibly cosmopolitic
Tryphosa bruuni Kermadec Trench

Fam. Stegocephalidae
Metandania islandica Puerto Rico Trench, N. Atlantic

Fam. Phoxocephalidae
Harpinia spaercki Banda Trench

Fam. Pardaliscidae
Pardaliscoides longicaudatus Philippine Trench, ? Kermadec Trench
Halice secunda Philippine, Kermadec, Kurile-Kamtchatka and Puerto Rico Trenches + various other localities. Cosmopolitic.
Princaxelia abyssalis Kermadec Trench

Fam. Vitjazianidae
Vitjaziana gurjanovae Kurile-Kamtchatka Trench

Fam. Astyridae
Astyra bogonorovi Kurile-Kamtchatka Trench

Fam. Eusiridae
Eusirus bathybius Puerto Rico Trench
Rhachotropis flemmingi Java Trench
Cleonardo macrocephala Kurile-Kamtchatka Trench

Fam. Pontogeneiidae
Bathyschraderia magnifica Kermadec Trench

Fam. Lepechinellidae
Lepechinella wolffi Kermadec Trench

Fam. Gammaridae
Bathyceradocus stephenseni Banda Trench.

The small number of species common to more than one of the deep sea trenches indicates a considerable degree of endemism. Only two of the species are definitely known to occur in more than one of the deep trenches, and both of those, *Hirondellea gigas* and *Halice secunda,* are known to be pelagic. *H. secunda* is most probably purely pelagic, while *H. gigas* may be facultatively so. This further underlines the important relationship between motility and geographical range to which I already called attention in 1954 (p. 47). For a more detailed discussion of these problems cf. WOLFF (1956).

It should be pointed out that as far as the amphipods are concerned it is often extremely difficult to decide whether a species is to some extent pelagic. Closing trawls seem to provide the solution but so far the amphipods caught by this type of gear in the depths of the Atlantic by the Lamont Geological Station of the Columbia University have not been worked up.

With respect to the hadal areas investigated by the "Galathea" only one, the deep part of the Banda Trench, is situated in an area were the benthic amphipod fauna of somewhat shallower waters is comparatively well known. It is interesting to note that out of the three species of amphipods captured in more than 6000 m in the Banda Trench two had already been obtained by the "Siboga" Expedition. The working up of the amphipoda collected by the "Galathea" in depths between 2000 and 6000 m will probably throw some light upon the question of the bathymetric range of the benthic or mainly benthic hadal amphipods.

MORPHOLOGICAL ADAPTATIONS OF HADAL AMPHIPODS

Fairly extensive discussions of the morphological adaptations of deep sea amphipods were already published by SCHELLENBERG (1926) and PIRLOT (1936) and the "Galathea" collection from the deep trenches adds but little new information on this point.

All the species obtained by the "Galathea" in depths of more than 6000 m are apparently blind, which could be expected considering the great number of blind species among abyssal amphipods from less extreme depths.

Another interesting point should be mentioned. PIRLOT (1936 p. 252) calls attention to the fact that among the deep sea species of the "Siboga"-expedition there are a group of species which are supposed to occur on the surface of the deep sea mud. He points out that the most striking characteristics of this group of species is their long and slender bodies which are often provided with dorsal projec-

tions, and, above all, their very long and very slender appendages. As typical representatives of this type he mentions *Lepechinella curvispinosa, Paralepechinella longipalpa,* and *Rachotropis sibogae.* It is interesting to note that some of the new species described here, and notably *Lepechinella wolffi* and *Rachotropis flemmingi,* are even more extreme in this respect than the closely related species dealt with by PIRLOT.

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