#### FAMILY ECHINOTHAMBEMATIDAE

Echinothambemidae Menzies, 1956b, p. 9; MENZIES 1962a, p. 29; 1962b, p. 183.<sup>1</sup>

This family was first based on one species, *Echino-thambema ophiuroides* which differs from Thambematidae in having two claws on the dactyls. According to MENZIES' diagnosis, it further differs from Thambematidae and all other related families in having joint 1 of the antennula expanded and the "last two peraeonal somites and all pleonal somites fused with pleon". However, the only specimen available is, as stated by MENZIES, "clearly immature, because the seventh pair of peraepods are underdeveloped, lacking setae and claws". Moreover, pereonite 7 is, as usual, much less developed than the preceding segments. The possibility cannot be excluded therefore, that pereonite 7 is, in the adult stages, free and movable.

In 1962 b MENZIES added a new genus and species, *Vemathambema elongata*, to the family. The head is fused with pereonite 1 and prn. 7 fused with pleon but not with prn. 6; joint 1 of the antennula is not expanded.<sup>1</sup> The addition of *Vemathambema* means that Echinothambematidae differs only from the related families Thambematidae and Janiridae in having prn. 7 fused with pleon and additionally, from Thambematidae in having two claws instead of one. Future studies may show that in reality *Echinothambema* and *Vemathambema* are not closely related.

#### FAMILY THAMBEMATIDAE

Thambematidae Stebbing, 1913, p. 237; BOCQUET & LÉVI 1955, p. 133; MENZIES & PETTIT 1956, p. 441; BIRSTEIN 1961, p. 137.

## Diagnosis:

Body slender, elongated and without spines. Head and pereonites free. Pleon oval, consisting of two segments. No eyes. Antennulae short, with six joints only. Antennae longer than antennulae. Mandibles typical, with palp and subcylindrical molar process. Palp of maxilliped with joints 1-3 expanded, broader than endite; epipod long and narrow. Pereopods I prehensile, the remainder walking legs of moderate and almost equal length; dactylus of prps. II-VII with one claw only. Uropods inserted subterminally, biramous (unknown in *Thambema*).

 In the altered family diagnosis (1962 b) it is noted that either one or two perconites are fused with pleon, but it is still stated that joint 1 of the antennula is expanded, although this is not so in Vemathambema.

## Key to the genera of Thambematidae

## FAMILY HAPLONISCIDAE

Haploniscini Hansen, 1916, p. 28.

Haploniscidae Gurjanova, 1933b, p. 402; MENZIES 1956b, p. 6; 1962b, p. 94.

Diagnosis: See MENZIES 1962b, p. 94.

#### Remarks:

MENZIES (1962b, p. 107) established a new genus, Antennuloniscus, which differs from Haploniscus in two characters: "The third article of the peduncle of the second antenna much longer than wide. First five peraeonal somites always distinct."

<sup>1.</sup> When STEBBING (1912) established a family for the genus *Thambema* he named it Thambematidae. This is correct according to Greek grammar (cf. e.g. plasma – plasmatic). Thus, MENZIES' family must be called Echinothambematidae. The same applies to the names Desmosomidae and Schistosomidae (MENZIES 1962a, pp. 28 and 29; 1962b pp. 94 and 162). The type genera are *Desmosoma* and *Schistosoma*, the family names, accordingly, Desmosomatidae and Schistosomatidae.

<sup>\*</sup> STEBBING (1913, p. 237) referred to a preliminary description in "Abstract P. Z. S. 1912, p. 42 (Nov. 5th)". However, the abstracts of the "Proceedings of the Zoological Society of London" are often left out in older library copies (e. g. in all copies available in this country). Moreover, the said abstract (No. 112) only mentions the new family, genus and species in very short terms which can hardly be cited as a description (Dr. I. GORDON, London, *in litt.*). Thus, I propose that the detailed description in the "Transactions of the Zoological Society of London" (1913) should be cited as the first one.

Since the first five pereonites are also distinct in the majority of the numerous species of Haploniscus, only the length of joint 3 of the antenna is distinctive. According to MENZIES' figs. 14A, C, and G this joint is 2.5 times longer than wide in Antennuloniscus dimeroceras (Barnard, 1920) and his two new species, A. armatus and rostratus, while in the third new species, ornatus (fig. 14K) it is only about 1.5 times longer than wide. Thus, in none of the four species is it "much longer than wide". Moreover, in at least Haploniscus bicuspis, H. spinifer and MENZIES' new species, H. polaris (fig. 12A), joint 3 is about 1.5 times longer than broad<sup>1</sup> and in two of the species described below it is about twice as long as broad (Figs. 15b and 23b). As later shown (p. 208), the shape of the joint also varies during the ontogenetic development. Actually, the shape of the antennal peduncle is remarkably equal in all species of Antennuloniscus, in all hitherto described species of Haploniscus and in those of MENZIES' new species of the latter genus in which it is figured. It always consists of two short proximal joints; the length of joint 3 varies from being as long as broad, to at most, three times longer than broad. Generally, it has a dorsal spine or projection, joint 4 is

1. All measurements are exclusive of the dorsal spine or projection. short, and joints 5 and 6 are at least twice as long as broad. In *Hydroniscus*, however, the first joints are indistinct and joint 3 is short and always without the spine.

It would *a priori* appear inadvisible to separate two genera exclusively on the length of an antennal joint, and in this case, where the transition is so gradual, I find it impossible to accept *Antennuloniscus*.

MENZIES (1956b) included a key to the genera which is unfortunately, misleading. He based the separation between Haploniscus and Hydroniscus on one character only: Sixth or seventh segment (somite) free in the former, fused with pleon in the latter. Several species of Haploniscus have not only pereonite 7 fused with pleon, but also prn. 6 (and in some even 5) is fused with the posterior part of the body. This applies not only to the new species described below, but at least also to biscuspis, spinifer, and armadilloides. In HANSEN's figs. 2a and 4a on pl. II (1916), this is distinctly indicated and in his description of Haploniscini he states: "The three, or at least two, posterior thoracic segments coalesced at least on the dorsal side and immovably coalesced with abdomen." The only generic difference in this respect is that the original separation between the segments is less conspicuous in *Hydroniscus*.

#### Key to the genera of Haploniscidae

\* This may be difficult to see in Hapl. spatulifrons Menzies, 1962 and kermadecensis n. sp.

According to WOLFF (1960, p. 112) a new species of *Hydroniscus* was taken by the Soviet vessel *Vitjaz* in the Japan Trench at 6475-6570 m and recently, BELJAEV and VINOGRADOVA (1961, p. 128) have recorded a *Haploniscus* n. sp. from the Sunda (Java) Trench at 6935-7060 m depth (both species still undescribed). These are hitherto the greatest depths recorded for the two genera.

#### Genus Haploniscus Richardson, 1908

Haploniscus Richardson, 1908, p. 75; HANSEN 1916, p. 28; MENZIES 1956b, p. 8; 1962b, p. 94. Antennuloniscus Menzies 1962b, p. 107.

## Diagnosis:

Body flattened or considerably vaulted. The three posterior perconites well marked off from each other

and from pleon laterally, but often more or less fused dorsally. Coxal plates not visible from above. Pleon with the postero-lateral processes visible in dorsal view (except in *telus* Menzies). Third joint of antennal peduncle nearly always with a spine-shaped process. Uropods minute, uniramous, 1- or 2jointed.

#### Remarks:

Menzies (1956b, 1960,<sup>1</sup> 1962b) described a total of 25 new species (including 3 *Antennuloniscus*) and below are added another three, and one new subspecies. The only characters in which one or more of these new species disagree with HANSEN's fine description of *Haploniscus* are: (1) Body not depressed in e.g. *H. helgei* and very slightly so in *kermadecen*-1. With M. TINKER. sis; (2) pleon longer than broad in some of MENZIES' new species, e.g. *polaris* and *rostrata*; (3) joint 3 of antenna not with the acute, strong or long process in *helgei*, but with a conspicuous, rounded convexity (Fig. 15b);<sup>1</sup> (4) the copulatory organ of pleopod 2 not "produced into an extremely long thread" – neither in *spatulifrons, tridens, helgei*, and *kerma-decensis*, nor in *antarcticus* (VANHÖFFEN 1914, fig. 85h).

MENZIES (1962b) prepared an excellent key to the 28 species which he referred to the genus. My only comments are: bicuspis has the frontal margin entirely or nearly transverse (at least in the specimens described and illustrated by SARS (1885), HANSEN (1916) and those examined by me); thus, not excised as stated in couplet 8 a of the key. If couplet 8b (frontal margin straight or convex) is followed it leads to antarcticus, from which bicuspis can be distinguished in having the margins of pereon and pleon continuous (pleon not set in from pereon). Furthermore, acutus and spinifer cannot be distinguished by the length of the uropods in relation to that of the postero-lateral projections (couplet 21) since the latter are very short in the female of spinifer. However, in acutus the lateral margin of pereonite 7 is less than half as long as that of prn. 6, in spinifer almost as long (provided, of course, that the holotype of acutus is adult).

In addition to the twenty-eight species in the key, the four species referred by MENZIES to Antennuloniscus can be distinguished from most of the others by the somewhat longer joint 3 of the antenna; a key is given by MENZIES on p. 107. H. polaris, which also has a rather long third joint, can be distinguished from the four species by its straight frontal margin with a minute median process.

Of the new species described below, *helgei* and *ingolfi* also have a rather elongated third joint. The distinctly set off, spoon-shaped frontal projection of the former separates it from all other species, except *spatulifrons* Menzies, from which it can be distinguished in the shape of the male pleopod 1 and the, barely 1-jointed, uropods. *H. ingolfi* has a

terminal acute process on joint 6 of the antenna. A similar, although shorter process, is also found in *spinipes* Hansen, *dimeroceras* Barnard, and *armatus* and *ornatus* Menzies; in the three former the postero-lateral processes are, however, longer than the uropods, and in *ornatus* there is a ridge on the pleon near each lateral margin and six joints in the flagellum of the antennula (against four in *ingolfi*). The bud-shaped frontal projection of *kermadecensis* separates it from all other species. Finally, the new subspecies of *bicuspis* can be distinguished in the following way:

Second joint of antennular peduncle more than twice as broad as the joints of flagellum. Distinct corners laterally on the uncalcified part of male pleopods 1... bicuspis bicuspis (G.O.Sars, 1885)
Second joint of antennular peduncle less than twice as broad as the joints of flagellum. Uncalcified

part of male pleopods 1 rounded

laterally ..... bicuspis tepidus n. subsp.

## Haploniscus helgei n. sp. (Pl. I D-G; Text-figs. 13-19)

Material:

*Galathea* St. 554, Great Australian Bight (37°28'S, 138°55'E), 1360 m, 5 December 1951. Bottom: Globigerina ooze. Bottom temp.: *c*. 3.5°C. – 9 females and 5 males.

#### Description of male holotype:

*Body* (Pl. I E) smooth and white, oval in shape, 2.5 times longer than broad, when fully stretched. Pereon broader than pleon. The body is considerably vaulted, the maximum height being about twothirds the width of the broadest pereonite. As e.g. *Hapl. armadilloides* and *Hydr. abyssi* the animal can roll itself into a ball (Pl. I G).

*Head* somewhat broader than long. The incision in front is broad and the frontal projection or horn very distinctly set off from the head. It is rather drop-shaped (Fig. 13a), with the dorsal surface distinctly concave (14a) and the tip a little raised; in lateral view triangular (Pl. I F-G). On the ventral side of the head the inner part of antennulae and antennae, as well as the mouthparts, are well protected by the two oblique, lateral plates. Between the protruding labrum and the base of antennula and antenna is a furrow occupied by the mandibular palp (Fig. 13a).

Pereonites 1-4 with rather distinct lateral parts,

MENZIES (1962b, p. 95) states that the spine or projection on joint 3 "may be present or absent". However, in the diagnosis of *Hydroniscus* (p. 109) he finds that this genus is "lacking the angulate projection characterizing *Haploni*scus". It is not mentioned in how many, or which species of *Haploniscus* it may be absent. According to the figures, it is present in 14 of the 23 new species (including Antennuloniscus) while in six of the remaining, the antenna is not shown, and in two species joint 3 is obscured by the antennula; it seems to be absent in ornatus (fig. 14 K).



Fig. 13. *Haploniscus helgei* n.sp.; a, head of  $\mathcal{J}$  holotype from the ventral side; b-c, perconites 5-7 and pleon of  $\mathcal{J}$  holotype (b) and  $\mathcal{G}$  allotype.

even in dorsal view (Pl. I E). Prn. 1 the shortest, 2 and 3 equally long, and prn. 4 about twice as long as 1.

Pereonites 5-7 (13 b) have only a faint seam visible dorsally between prns. 5 and 6 and prns. 6 and 7. The anterior, free margins of prn. 5 crenulated. The three pereonites + pleon one-sixth longer than broad.

*Pleon* with slightly convex lateral margins and a gently rounded apex. The postero-lateral processes are distinct and somewhat compressed – forming ventrally a broad, rounded furrow in which the rather large anal opening is placed. In front of the processes there is a dorso-lateral concavity (Pl. I F). The uropods are placed in the inner corner, at the base of each process (14b). The length of the process (from base of uropod) is between one-fourth and one-fifth of the distance between the tips of the two processes.

Antennula (15a) with seven joints. Joint 2 in peduncle much narrower than joint 1. The two ultimate joints have respectively, two and one broad, transparent sensory filaments which are distinctly different from the usual setae.

Antenna (15b) about twice as long as antennula, reaching backwards ventrally to the hind margin of pereonite 3. Third joint with a strong convexity cor-



Fig. 14. *Haploniscus helgei* n.sp.; a, head and frontal process seen at an oblique angle from in front (antennulae, antennae and legs omitted); b, terminal part of pleon seen obliquely from below.

responding to the spine in the other species. Flagellum with 16 joints.

Mandibles slender. Apex of molar process peculiarly shaped (16a), with two lateral processes and a row of teeth in another plane. Incisive part of the *left* mandible has four teeth (16b) as has the movable lacinia (16b); they are placed very close together and protrude only slightly (less than the spines) so are difficult to focus separately. There are two serrated and three simple spines in the spinerow (16b). In the *right* mandible the teeth in the incisive part are very irregular (16c). Three serrated and three simple spines in the spine-row (16d). The palp has three strong spines distally on the second joint and a row of eight, finely crenulated, and two simple, much longer spines, on the short and somewhat curved third joint.

*Maxillula and maxilla* according to Fig. 16e and f. All setae and hairs are very fine. Only one (the inner) of the twelve spines on maxillula is serrated.



Fig. 15. Haploniscus helgei n.sp.; a, antennula; b, antenna.



Fig. 16. *Haploniscus helgei* n. sp.; a, margin of molar process of mandibles; b, left mandible; c-d, right mandible; d, spine-row; e, maxillula; f, maxilla; g, labium; h-k, maxilliped; j, endite from the edge; k, epipod.

- Labium (16g) strong and with several rows of extremely fine hairs, visible only when greatly magnified.

*Maxilliped* (16h) narrow. Inner half of distal margin of endite with fine hairs, and on the inner corner, a dense bunch of longer spines. There are three spherical coupling hooks, and off these the inwardly bent margin has a low convexity (16j). Palp and epipod (16k) very slender.

*Pereopods* almost equal in length and shape. Dactylus of prp. I (17a) rather short, with a triangular process on the inner distal corner at the base of the claw, proximal to which, four fine setae issue. Dactylus of prp. IV (17b) a little longer, with the same process and with three setae; dactylus + claw of prp. VII almost twice as long and half as slender as those of I. On carpus of prp. IV are four peculiarly shaped setae (17b).

Male pleopods 1 (18a) calcified throughout. The thin, uncalcified area, found for instance in *H. bi*cuspis (Fig. 25c-d), is substituted here by an excavation on each side behind a vaulted terminal area with setae. The proximal limitation of the groove or excavation is formed by a crest (with short hairs) which continues in a low rounded keel, running along the lateral margin. Halfway between base and apex a pair of low, hook-like protuberances are visible, corresponding to the longitudinal keels in e.g. bicuspis. On the ventral (outer) side, each pleopod is slightly vaulted, both longitudinally and transversely. It is 3.4 times longer than broad. *Pleopod 2* (Fig. 18 b) with a very short and strong copulatory organ which hardly reaches the end of the sympod; thus differing very markedly from those in *bicuspis* and *spinifer*, where it is a very long, slightly tapering organ.

*Pleopods 3-5* (18c-e) with a 1-jointed exopod in plps. 3 and 4; it is very short and broad in the former.

Uropod (14b) short, 1-jointed, with about five long, terminal setae.

Size: 8.9 mm long and 3.5 mm broad.



Fig. 17. *Haploniscus helgei* n.sp.; a, pereopod I; b, pereopod IV.



Fig. 18. *Haploniscus helgei* n.sp.; a, pleopods 1; b-e, pleopods 2-5.

Description of female allotype (with embryos in marsupium):

Only differences between the two sexes will be pointed out.

Body (Pl. I D) broader, being only 2.2 times longer than broad. The distal part of the lateral plates are somewhat more horizontally bent. A white, very low crest, marking a stronger calcification of the side plates (Fig. 13c and Pl. I D) is more conspicuous.

*Pereonites 5-7 and pleon* (13c) a little broader than long, i.e. broader than in the male, due to the lateral plates being directed further outwards. There is also a narrow, almost horizontal plate on each side of the pleon which is totally absent in the male. Postero-lateral processes on the pleon about as long as in the male, but appear shorter because they are broader at base on the inner side. The furrow between them is also a little broader and much less deep than in the male since the processes are much less compressed. Finally, the uropods in the male are almost entirely hidden by the processes when seen directly from below, whereas in the female they are placed at some distance from them (19 b).

Antennulae and antennae perfectly equal (even to the three broad sensory filaments on the two distal joints of the former); the only difference being the female has only 13 joints in the flagellum of the antenna, each having only 3-4 setae.

Mouthparts. The only differences are: (1) in left mandible (right not studied) one serrated, one broad, unserrated and four simple spines in the spine-row; (2) considerably fewer and more robust setae on inner lobe of maxillula and on labium (19a).

Operculum (19 c) almost circular, one-tenth broader than long. It is highest medianly at the base; the surface being slightly convex towards the sides and distal part. Near the base are two shallow depressions. Pleopods 3-5 and uropod as in the male.

Size: 8.1 mm long and 3.6 mm broad.

## Variation:

In a later chapter (on hermaphroditism) the variation in sexual characters is treated (p. 212). Apart from this, no appreciable variation could be found.

## Remarks:

The extreme height of the body (owing to the downward-bent, amphipod-like pleura), the peculiarly shaped frontal projection, and the presence of a convexity (and not a spine) on joint 3 of antenna, distinguish helgei from the other species (cf. p. 51). In some respects it agrees with Hydroniscus abyssi (shape of body and - to some extent - of frontal projection). However, the extreme coalescence of pereonites 5-7 and pleon, the unique shape of pleon ventrally, the lack of a convexity or spine on the third antennal joint, the shortness of the antenna, and the broadness of the maxilliped clearly distinguish abyssi as belonging to a separate genus, Hydroniscus; none of these essential features show any agreement with helgei. In several respects (shape of body and frontal projection, antennula and male pleopod 2) helgei agrees with the South Atlantic



Fig. 19. *Haploniscus helgei* n.sp.;  $\Im$  allotype; a, labium; b, left uropod and postero-lateral spine; c, operculum.

*spatulifrons* Menzies. It also agrees with *kermadecensis* in some respects (general shape of head and in particular, pleopods 1 and 2). Finally, it resembles *armadilloides* in its ability to roll itself into a ball.

The species was named after Dr. HELGE VOLSØE, Director of the Copenhagen Museum and Zoologist on the *Galathea*.

#### Occurrence:

Great Australian Bight, 1360 m, c. 3.5°C.

## Haploniscus kermadecensis n. sp. (Pl. I H; Text-figs. 20-22)

Material:

Galathea St. 664, Kermadec Trench  $(36^{\circ}34'S, 178^{\circ}57'W)$ , 4540 m, 24 February 1952. Bottom: brown sandy clay with pumice. Bottom temp.:  $1.1^{\circ}C. - 1$  adult male.

#### Description:

*Body* (Pl. I H) smooth, milky white, oval in shape, 2.5 times longer than broad. It is only moderately vaulted transversely.

*Head* (Fig. 20b) about twice as broad as long. Anteriorly, there is a low concavity and a broad, rounded, downward-directed projection medianly (20a). On the dorsal, posterior part of the head a pattern of small, round patches is faintly visible (Pl. I H).

*Pereonites* increasing in width. Laterally, the fifth is the longest, but medianly the fourth is a little longer. The separation between pereonites 5-7 and between 7 and pleon can be traced only for a short distance on the dorsal side.

*Pleon* one-third to one-fourth broader than long. The postero-lateral processes are very short, reaching only a little further backwards than the median part of the pleon which is moderately convex (22e). The anal opening circular, with two small median, rounded processes proximally.

Antennula (20b) with the two joints of the peduncle larger in comparison with the flagellum than in the other species. Flagellum with six joints, furnished with many long hairs.

Antenna (20b) with a prominent spine, bent a little backwards, on the third joint. Flagellum with 12 joints and rather short hairs.

Left mandible (21 a) has a long movable lacinia with one prominent and two smaller teeth; four teeth on the incisive part. Spine-row with two bent, finely serrated spines and three (possibly four) longer, simple spines. On the right mandible (21 b) the spines are somewhat more elaborate, one being very broad and crenulated along the outer margin, two having one-sided, tiny teeth in the middle and another being long and simple. Second joint of the palp considerably curved and furnished with three differently shaped spines, the distal one not being very visible (21 c); third joint with two long and curved and four shorter, serrated spines (21 d).

Maxillula, maxilla and labium according to Fig. 21e-g. Inner lobes, of both maxillula and maxilla, broken.

*Maxilliped* (21 h) with three almost quadrangular coupling hooks. Epipod less triangular than is usual in the genus and with fine concentric stripes parallel to the inner margin.

*Pereopods* (22a) with considerably shorter and stronger dactylus and claw than in any other species of *Haploniscus* (in which it is described). The claw, even of prp. VII, is shorter than dactylus.

*Pleopods 1* (22 b) are broadest some distance from the proximal end, being almost three times as broad here as in the narrowest part. The terminal plates have almost the same shape as in *helgei*, but situated to them proximally there is a distinct groove. The



Fig. 20. *Haploniscus kermadecensis* n.sp.; ♂ holotype; a, head from the side (antennulae, antennae and legs omitted); b, head from above.



Fig. 21. Haploniscus kermadecensis n.sp.; a, left mandible; b, right mandible; c, setae on second joint of palp; d, third joint of palp; e, maxillula; f, maxilla; g, labium; h, maxilliped.

two longitudinal keels on the inner (upper) side are only moderately long.

*Pleopod 2* (22 c) rather squarish, with a convexity on the inner, proximal corner as in *helgei*. Copulatory organ very short and strong. – *Pleopod 4* (22d) also more squarish than in *helgei*.

Uropod (22e) shorter than the postero-lateral process; its setae are of a considerable length.

Size: 5.9 mm long and 2.4 mm broad.

## Remarks:

*H. kermadecensis* differs from all other species in the shape of the frontal projection, the short and broad claws on the legs, and the elaborate mandibular spines. It does not seem to be closely related to any other species (except perhaps *helgei*), although the body shape is rather similar to that of antarcticus Vanhöffen, bicuspis G. O. Sars, and percavix Menzies.

#### Occurrence:

Known only from the Kermadec Trench, NNE of New Zealand, at a depth of 4540 m and at a temperature of  $1.1^{\circ}$ C.

## Haploniscus ingolfi n. sp.

(Pl. II A-B; Text-figs. 23-24)

Haploniscus bicuspis G.O.Sars, HANSEN 1916, p. 30 (pars).

#### Material:

*Ingolf* St. 113, South of Jan Mayen  $(69^{\circ}31'N, 7^{\circ}06'W)$ , 2465 m, 21 July 1896. Bottom temp.:  $-1.0^{\circ}C. - 2$  females.



Fig. 22. Haploniscus kermadecensis n.sp.; a, percopod VII; b, pleopods 1 from inside; c-d, pleopods 2 and 4; e, uropod and postero-lateral process.



Fig. 23. Haploniscus ingolfi n.sp; a-b and d-e, φ holotype;
c, other φ; a, antennula; b, first two joints of antenna; c, antenna; d, pereopod III; e, pleon from below.

Going through the extensive material of H. bicuspis I found that HANSEN had overlooked two specimens which certainly do not belong to this species but undoubtedly represent a new one.<sup>1</sup>

## Description:

Body (Pl. II A-B) almost three times longer than broad and with the margins more parallel than in any other female of this genus. It is rather vaulted from side to side. The integument is finely granulated.

*Head* almost semi-circular, evenly rounded in front and with only slight trace of a median knob. The hind margin is slightly convex. The head is almost twice as broad as long and considerably vaulted.

*Pereonites* dorsally, almost equally long while, laterally, the fourth is the longest and the seventh the shortest. The articulation between all pereonites (and head, and pleon) is equally inconspicuous. No oostegites present.

*Pleon* (Fig. 23e) one-fifth broader than long, with slightly convex lateral margins. The postero-lateral processes are shorter than in *H. excisus* Richardson, although less short than in *armadilloides* Hansen,

and have a rounded apex. The dorsal surface of pleon is considerably less vaulted than that of the pereonites.

Antennula (23 a) with four joints in the flagellum. Antenna has on the third joint a moderately large, acute process (23 b) and on the sixth a similar terminal process as in e.g. *spinifer*, but even larger. Flagellum (23 c) with eight joints only (in the second female, not preserved in the holotype).

Right mandible (24a) rather slender. Incisive part with two prominent and three inconspicuous teeth (24b). There are two serrated, and at least four simple, spines (24c). Palp (24d) with rather few spines. - Maxilliped (24e) with a broader endite and palp than in most other species. Epipod narrow, triangular, and with almost straight margins.

*Pereopods* (23d) slender, with the claw slender and a little shorter than the dactylus. – *Operculum* (23e) almost circular and flattened, without a median keel. – *Uropods* longer than the postero-lateral processes (23e).

*Size:* The type is 1.8 mm long and 0.6 mm broad. The second female is 1.5 mm long.

#### Variation:

The second female differs in two respects from the type: (1) The body shape is more oval and is only 2.6 times longer than broad. (2) The posterolateral processes are as long as the uropods, and acute.

#### Remarks:

Only a few other species have similarly short, postero-lateral processes. From these *ingolfi* differs i.a. in the rounded frontal margin. It resembles *parallelus* closely in the shape of head, pleon and antennula, but anteriorly pleon is at least as broad as



Fig. 24. *Haploniscus ingolfi* n.sp.; a, right mandible; b, incisive part; c, spine-row; d, palp; e, maxilliped.

<sup>1.</sup> MENZIES (1962 b, p. 97) noted the differing lengths of the postero-lateral processes of specimens of *bicuspis*, figured by HANSEN (1916, pl. II) and suggested that at least two species were present in HANSEN's material of *bicuspis*. It is more likely that the variation in the length of the processes corresponds to that recorded in *spinifer* (p. 59).

pereonite 7; moreover, the antero-lateral corners of prn. 4 are not produced forwards, the uropods do not reach as far back and there is a terminal process on joint 6 of the antennula. The differences between *ingolfi* and the species with a similar process on joint 6 are pointed out above (p. 51).

Occurrence:

South of Jan Mayen, 2465 m, -1.0°C.

## Haploniscus bicuspis tepidus n. subsp. (Pl. II C; Text-fig. 25b and d)

Haploniscus spinifer Hansen, 1916, p. 31 (pars).

Material:

Ingolf St. 78, SW of Iceland ( $60^{\circ}37$  'N,  $27^{\circ}52$  'W), 1505 m, 13 June 1896. Bottom temp.:  $4.5^{\circ}C. - 1$  adult male, 3 juvenile females.

When studying the material of *spinifer* from the *Ingolf* Expedition I found that some of the specimens from St. 78 had a minute, although conspicuous, rounded projection medianly on the front part. This is present in *bicuspis* but lacking in *spinifer*.<sup>1</sup> Moreover, there was no spine on the last joint of the antennal peduncle in those specimens which had the antennae preserved. I referred these specimens initially to *bicuspis*, but the fact that St. 78 is from the warm area (+ 4.5°C.), and all the other *Ingolf* records of *bicuspis* are below –0.4°C. led me to study the only adult specimen, a male, more closely.

A thorough investigation (also of the mouthparts) of this male showed only very few differences; in

1. This significant difference between the two species was not pointed out by HANSEN.

fact, so few that it is with some hesitation that I refer the specimens to another subspecies. So far, the seemingly distinct differences in ecology thus appear to have had only a slight evolutionary effect. Apart from the differences listed below, I could find no features in which the variation was greater between this male and males of the nominate subspecies, than between males of the latter from different localities.

The differences between the male from St. 78 and nominate males are: The total length (1.7 mm) is only about two-thirds of any other adult male (cf. Table 11, p. 213); the body (Pl. II C) has almost parallel sides instead of being somewhat oval (HAN-SEN's fig. 2a, pl. II); the flagellum of the antennula is a little stronger and lacks most of the sensory hairs (Fig. 25a-b);<sup>1</sup> the uncalcified part of the male pleopods (see description on p. 209) has rounded outer corners laterally and, thus, only one process on each side (Fig. 25d) – cf. the outer end of pleopods 1 of a nominate male from St. 139 (25c); they resemble those of the male from St. 117, mentioned and figured on p. 209, in all respects.

SARS (1885, p. 122) records *bicuspis* from three stations in the North Atlantic at negative temperatures ( $-0.7 - -1.1^{\circ}$ C.) and from one station at + 3.5°C. HANSEN (1. c., p. 30) expresses doubts as to the accuracy of this latter record; his reasons being the same as my own suspicions regarding identification of the present specimens from the "warm" St. 78. Probably SARs' warm water specimens also belong to *tepidus*, but unfortunately the material was not available.

<sup>1.</sup> In his description of *bicuspis*, HANSEN overlooked the fact that the third joint actually consists of two joints, giving the antennula eight joints in all.





## Haploniscus spinifer Hansen, 1916 (Pl. II D-G; Text-fig. 26)

This species which is closely related to *bicuspis* was described by HANSEN (1. c., p. 31) who pointed out the marked differences in shape of body and length of postero-lateral processes in two adult males from the same locality *(Ingolf St. 22)*. In order to ascertain the systematic position of the, in all, four adult males, they have been closely studied.

Table 2. Total length of body and length of posterolateral processes in *Haploniscus spinifer* 

| Ingolf<br>Station | Specimen                        | Total length<br>in mm | Length of postlat.<br>processes in mm |
|-------------------|---------------------------------|-----------------------|---------------------------------------|
| 22                | juv.                            | 1.6                   | 0.05                                  |
|                   | 3 ad. 1                         | 2.7                   | 0.14                                  |
|                   | 3 ad. 2                         | 2.8                   | 0.19                                  |
|                   | ð ad. 3                         | 2.9                   | 0.33                                  |
| 36                | juv.                            | 1.1                   |                                       |
|                   | juv.                            | 1.2                   |                                       |
|                   | $\stackrel{\circ}{_{\sim}}$ ad. | 2.3                   | 0.06                                  |
|                   | ∂ ad. 4                         | 2.6                   | 0.13                                  |

Table 2 gives details of the variation in lengths of the postero-lateral spines. Photographs of three of the males are shown on Pl. II E-G. Although the specimens are rather damaged, the difference in body shape, already pointed out by HANSEN, is evident.

Comparison of the maxillipeds of  $3^{\circ}$  2 and  $3^{\circ}$  3 (Fig. 26d) showed no difference at all.

Only  $3^{\circ}$  4 had the entire pleopods 1 well preserved. They are even broader (Fig. 26a) than those in HANSEN's fig. 3f (pl. II).<sup>1</sup> The two terminal, rather pear-shaped plates are raised a little above the rest of the pleopods (26b) and are attached to them by a transparent, uncalcified structure which enables the terminal plates to move in a lateral direction. Analogous to the two longitudinal keels in *bicuspis* are two curved projections (considerably raised 1. These must have belonged to  $3^{\circ}$  1; they are not preserved. laterally) on the inner (dorsal) side (y in Fig. 26a-b). The distal end of pleopods 1 in 3 was also well preserved and only differs by the addition of a few more fine setae (26c).

In pleopods 2 a difference in the length of the stylet only was found. In 33 1, 2 and 4 its length is as illustrated by HANSEN on fig. 3 g, but in the most "pronounced" male (No. 3) it is almost twice as long.

Thus, it can be stated that apart from more or less slender antennulae and antennae, a somewhat oblong body shape, the length of postero-lateral processes, and the length of the stylet, there seems to be no difference between the four adult males, which undoubtedly belong to one and the same species. The significance of the differences will be discussed later on (p. 228).

Since the material of this species contains only one adult female, and as HANSEN expressly refers fig. 3h to a female from St. 36, the adult female from that station has been chosen as lectotype. Pl. II D of this female shows the oval body shape, short postero-lateral processes, slender antennae and a low, median keel on the operculum; the latter was not mentioned by HANSEN and is not present in *bicuspis*.

#### FAMILY MUNNIDAE nov. comb.

Munnidae G. O. Sars, 1899, p. 105 (pars); RICHARD-SON 1905, p. 479 (pars); GURJANOVA 1933, p. 402 (pars).

Munnidae Vanhöffen, 1914, p. 561.

Paramunnidae Vanhöffen, 1914, p. 571.

Munnini Hansen, 1916, p. 33 (pars); NORDENSTAM 1933, p. 197 (pars); p. 198.

Pleurogoniini Nordenstam, 1933, p. 199.

Munnidae Menzies, 1962a, p. 31; 1962b, p. 172.

Pleurogonidae Menzies, 1962a, p. 55; 1962b, p. 94 (pars).<sup>1</sup>

1. The correct name should be Pleurogoniidae, the type genus being *Pleurogonium.* 



Fig. 26. Haploniscus spinifer Hansen; a-b, pleopods 1 of  $3^{\circ}$  4 seen from inside and slightly obliquely from the side (y, projections); c, outer end of pleopods 1 of  $3^{\circ}$  3; d, maxilliped of  $3^{\circ}$  3.

|                                                                                                      | Munnini                 | Pleurogoniini    | Antiasini | Dendrotionini    |
|------------------------------------------------------------------------------------------------------|-------------------------|------------------|-----------|------------------|
| No. of joints in flag. of antennula                                                                  | 2-5                     | 2-5              | 1-3       | many             |
| No. of joints in peduncle of antenna                                                                 | <b>5-6</b> <sup>1</sup> | 5-6 <sup>2</sup> | 4         | 4-5 <sup>3</sup> |
| Squama on antenna absent (O) or present ()                                                           | 0 •                     | · O              | 0 🛛       | 00               |
| Molar process of mandible subcylindrical ( $\blacksquare$ ) or long and narrow ( $\blacktriangle$ )  | 驖                       | ٨                | <b>M</b>  |                  |
| Joints 1-3 of palp of maxilliped narrow ( <b>E</b> ) or broad ([])                                   |                         |                  |           |                  |
| Epipod of mxp. distally rounded ( $\frown$ ) or acute ( $\frown$ )                                   |                         |                  | ^         | ^                |
| Peduncle of uropod absent $(\bigcirc)$ or present $(\bigcirc)$                                       | 0                       | 0                | 0         | ۲                |
| Rami very short $(-)$ , $\frac{1}{5}-\frac{1}{2}$ of pleon $()$ , or as long as pleon or longer $()$ |                         | _                |           |                  |
| Developing oostegites absent $(\bigcirc)$ or present $()$                                            | 0                       | 0                | ?         | •                |

Table 3. Differing characters in NORDENSTAM's four subgroups (1933).

1. Six joints in Austrosignum only.

2. Six joints in Antennulosignum only.

3. Four joints in Pseudomunna only.

Diagnosis – see p. 62.

Although the *Galathea* did not collect any species belonging to this family (*s. str.*) it has been decided to discuss it here in some detail.

NORDENSTAM (1. c.) recorded the history of the group (family). Based on a study of several genera referable to HANSEN'S Munnini he divided this group into four subgroups, Antiasini, Munnini, Dendrotiini,<sup>1</sup> and Pleurogoniini; this division being founded on the shape of mandibles, antennulae, maxillipeds, and uropods. MENZIES (1962a) elevated the subgroups to families without adding any additional distinguishing characters in his diagnoses.

It is obvious that the genera of HANSEN'S Munnini have several essential characters in common (cf. his diagnosis p. 33). The most important are: a broadened body; pleon much narrower than body; head and all pereonites free; eyes (when present) on lateral processes; pereopods I prehensile; remaining legs simple; uropods situated on or above the lateral margins of pleotelson.

Table 3 gives the differences between the four subgroups, pointed out by NORDENSTAM plus a few additional ones. The following comments are necessary: in the peduncle as three, NORDENSTAM as four. Generally, it seems impossible to decide where the peduncle ends and the flagellum begins. In my opinion, HANSEN's view is the correct one.

Squama. NORDENSTAM claimed that it is absent in Munnini and Antiasini. It is generally present in the former, rarely in the latter (Antias mawsoni Menzies has a distinct one).

Peduncle of uropod. SARS (1899, pls. 47-48) showed a minute but distinct peduncle in *Paramunna bilobata, Pleurogonium rubicundum* and *P. spinosissimum*. HANSEN recorded it as "scarcely or not distinguishable" in the latter genus. NORDEN-STAM stated that it was "minute or missing" in Munnini and Pleurogoniini. MENZIES stated that the uropods "lack the peduncle". An examination of six species of *Pleurogonium* in this Museum (including the two species just mentioned) showed that there is no trace of a peduncle. Unfortunately, *Paramunna bilobata* was not available but probably a peduncle is missing in this species also.

Table 3 clearly shows that apart from the shape of the mandibles no additional features separate Munnini from Pleurogoniini. As mentioned in the chapter on the classification of the Asellota (p. 19), the mandibles may vary considerably in genera which are, without doubt, closely related. In addition, the structure of the male pleopods 1 is quite equal in *Paramunna, Coulmannia,* and *Austrosignum* on one side and in *Pleurogonium, Pleurosignum* and

Antennula. HANSEN fixed the number of joints

<sup>1.</sup> This incorrect name is due to the fact that NORDENSTAM constantly wrote *Dendrotium* instead of *Dendrotion*. Accordingly, MENZIES' family name should not be Dendrotidae (1962 a, p. 28) nor Dendrotioniidae (1962 b, p. 167) but Dendrotionidae, as was given by VANHÖFFEN (1914).

Antennulosignum on the other (cf. e.g. SARS 1899, pl. 46 of *Paramunna* and *Pleurogonium*). Thus, it is impossible to accept not only a division on the family level but, in my opinion, also on the subfamily (subgroup) level, as long as the respective genera are known to differ only in the shape of the mandibular molar process.

Antiasini and Dendrotionini differ from NORDENSTAM'S Munnini and Pleurogoniini in a very important character, viz. the shape and development of the uropods. As a matter of fact the missing peduncle in the latter two subgroups is unique within the asellotes, whereas the uropods in the two former are shaped as in most of the Janiridae and some of the Eurycopidae.

Dendrotionini also differs, at least from Munnini, in the presence of developing oostegites in the female. As shown in Table 12 (p. 216) none of a total of 110 females of three species of *Munna* and 23 females of four species of *Pleurogonium* had developing oostegites. This probably means that these are as absent in both subgroups as they seem to be in Haploniscidae and perhaps also Macrostylidae. On the other hand, conspicuous developing oostegites were found in *Dendromunna mirabilis* n. sp. which is a typical representative of Dendrotionini (cf. Table 4). It is unknown whether developing oostegites are present or not in Antiasini.

Finally, the maxilliped in Antiasini and Dendrotionini differs from that in the two other subgroups (Table 3).

I personally regard the marked difference in the uropods and the presence of developing oostegites in at least Dendrotionini, a sufficient reason for dividing on the family level.

A possible separation between Antiasini and Dendrotionini is discussed below (p. 63).

The Munnidae thus contains the genera of NOR-DENSTAM'S Munnini and Pleurogoniini, viz. Munna, Paramunna, Coulmannia, Notoxenus, Austrosignum and Echinomunna, and Pleurogonium, Pleurosignum and Antennulosignum, respectively. Both NORDEN-STAM (1933) and MENZIES (1962a) have provided keys for these nine genera.

Astrurus. In addition, NORDENSTAM discussed the relationship of the genus Astrurus (which has two species, crucicauda Beddard, 1886 and ornatus Vanhöffen, 1914). He referred it, albeit with some doubt, to his Munnini but pointed out that the palp of the maxilliped is narrow. This is, however, only so in the latter species and it is not much narrower than in several species of Munnidae. Since the uropods are very small and without peduncle, it indisputably belongs to Munnidae.

The genera *Caecimunna*, *Haplomunna*, *Kuphomunna* and *Acanthomunna* were referred to Munnidae in the original descriptions. They were not considered by NORDENSTAM but were mentioned or discussed by MENZIES (1962a).

Caecimunna was proposed by RICHARDSON (1908b, p. 79) as the generic name for the simultaneously described, new and blind species Munna truncata. HANSEN (1916, p. 34) included both truncata and a new, also blind species, acanthifera, in Munna; at the same time he altered this part of SARS' original diagnosis of the genus ("Eyes distinct") accordingly. STEBBING (1919, p. 336) pointed out that HANSEN had not been aware of RICHARDSON's proposal (in a footnote) to refer the blind species truncata to its own genus, Caecimunna which should therefore also include acanthifera. As further discussed in a previous chapter (p. 19) blindness cannot, however, be regarded as a character of generic significance; thus the genus Caecimunna must, as also proposed by MENZIES (1962a, p. 44), be regarded as invalid.

Haplomunna. MENZIES (1962a, p. 44) stated that this genus "probably does not belong within the family Munnidae". I agree with this, especially the pleotelson and antennulae being different. Its relationship is further discussed below (p. 64).

*Kuphomunna* was by MENZIES (1962a, p. 59) referred to his family Antiasidae and is also discussed below (p. 63).

Acanthomunna. The composition of this genus is dealt with on p. 65. Although the uropods are lacking in the known specimens of three of the four species referred to Acanthomunna (proteus, beddardi, spinipes, and hystrix), their stout dorsal insertion clearly shows that they must be very large in all four species.

Thus, it is difficult to understand why MENZIES in his latest paper (1962b) has included *Acanthomunna* in the Munnidae. In his 1962a paper he followed NORDENSTAM and several previous authors who regarded the minute uropod, which lacks peduncle, as a very essential character for this family. MENZIES' alternative diagnosis for Munnidae runs as follows (1962b, p. 172): "Paraselloidea with cephalon free from peraeon. All peraeopods ambulatory. Mandibles with expanded, truncated molar process. Maxillipedal palp with first three articles as broad as endite. Pleon with two somites."

None of these characters are distinctive: The head is free, the molar process expanded, the maxillipedal palp broad, and the pleon with two segments in almost all other families or in the great majority of their genera, and all seven legs are ambulatory in more than half the families of the asellotes. Moreover, the proximal joints of the maxillipedal palp are narrower than the endite in *Acanthomunna beddardi*, much narrower in *hystrix*, and unknown in *proteus* and *spinipes*.

Quite apart from the latter inconsistency the inclusion of *Acanthomunna* in Munnidae results in a watering down of the diagnosis of the family, which seems unnecessary in view of the fact that *Acanthomunna* can much more naturally be referred to Dendrotionidae (cf. Tables 3 and 4). This was already done by NORDENSTAM (1933) in the case of *hystrix* and *spinipes*.

Notoxenoides, was established by MENZIES (1962 b, p. 176) as a new genus and referred to Munnidae. It belongs, without doubt, to that family, despite the epipod in N. *abyssi* (1. c., fig. 58 C) not being as rounded as in the majority of the Munnidae.

In their revisions of the Munnidae (s. lat.) neither NORDENSTAM (1933), nor MENZIES (1962a, 1962b) considered the following genera, which were all referred to Munnidae by their original describers: *Pleurocope, Munella,* and *Urias.* Since there is a well developed peduncle in the uropods of all three species and the antennulae of the two former are different (they are unknown in *Urias*), none of them can belong to Munnidae. They are discussed below (p. 63).

#### Diagnosis of Munnidae nov. comb.

Body usually broad and ovate; head and all pereonites free and the four anterior pereonites conspicuously marked off from the three posterior ones (except in some species of Paramunna). Pleon narrow in relation to body, longer than broad. Eyes, if present, situated on lateral processes. Antennulae short, placed widely apart, flagellum with five joints at most. Squama sometimes present. Mandibles with the molar process broad and truncate or narrow. Maxillipeds with joints 1-3 of palp conspicuously broader than joints 4-5 (except in Astrurus ornatus) and the epipod generally short and rounded distally. Pereopods I almost always prehensile, all the remaining legs ambulatory. Uropods minute, without peduncle and situated on or above the lateral margins of pleotelson.

#### Key to the genera of Munnidae

(based in part on the keys of NORDENSTAM (1933) and MENZIES (1962a))

| 1.  | Molar process of mandible strong and subcylindrical, with the distal end cut transversely off   | 2  |
|-----|-------------------------------------------------------------------------------------------------|----|
| 1.  | Molar process of mandible narrow, with the distal end obliquely truncate, rounded or pointed    | 9  |
| 2.  | Coxal plates, at least on some segments, visible in dorsal view <sup>1</sup>                    | 3  |
| 2.  | No coxal plates visible in dorsal view                                                          | 5  |
| 3.  | Coxal plates visible on pereonites 2-7                                                          | 4  |
| 3.  | Coxal plates visible only on pereonites 5-7 Austrosignum Hodgson, 1910                          |    |
| 4.  | Body smooth or with small lateral spines                                                        |    |
| 4.  | Body strongly spinous Echinomunna Vanhöffen, 1914                                               |    |
| 5.  | Mandibles without palp                                                                          |    |
| 5.  | Mandibles with palp                                                                             | 6  |
| 6.  | Pereonites smooth, without dorsal or lateral spines or projections. Paramunna G.O.Sars, 1866    |    |
| 6.  | Perconites with spines or projections                                                           | 7  |
| 7.  | Pereonites 1-7 with a low median projection but no lateral spines Notoxenus Hodgson, 1910       |    |
| 7.  | Pereonites 1-7 either with groups of spines, lateral spines or median and lateral spines        | 8  |
| 8.  | Perconites 1-7 each with a pair of long lateral spines and a long median                        |    |
|     | spineNotoxenoides Menzies, 1962b                                                                |    |
| 8.  | Pereonites 1-7 either with groups of dorsal and lateral spines or with evenly scattered, small  |    |
|     | spines dorsally and a pair of strong lateral spines on each segment Astrurus Beddard, 1886a     |    |
| 9.  | Head without eyes and ocular projections Pleurogonium G.O.Sars, 1864                            |    |
| 9.  | Head with long ocular projections                                                               | 10 |
| 10. | Joint 2 of peduncle of antennula distally prolonged into a spine-like projection, exceeding the |    |
|     | flagellum in length Antennulosignum Nordenstam, 1933                                            |    |
| 10. | Joint 2 of peduncle of antennula normal, not prolonged distally. Pleurosignum Vanhöffen, 1914   |    |
|     |                                                                                                 |    |

<sup>1.</sup> RICHARDSON (1908b, fig. 12) shows Munna truncata without visible coxal plates. If this is correct the species can be distinguished by the following: lack of eyes, a pair of strong, lateral spines on the head, and distal end of pleon truncate.

#### The Dendrotion-Antias-Abyssianira complex

There are a number of genera which have previously been referred to Munnidae. However, as stated above, they cannot belong to that family owing to, primarily, the presence of a well developed peduncle in the uropods (or for various other reasons). In conjunction with these genera, the status of Abyssianiridae Menzies and *Mesosignum* Menzies should also be discussed. The genera in question are:

Dendrotion: For references, see below (p. 65). Referred by NORDENSTAM (1933, p. 198) to the group Dendrotionini ("Dendrotiini") which was ranked by MENZIES (1962a, p. 28 and 1962b, p. 167) as a family. Three species (cf. p. 65).

Acanthomunna (including Mormomunna Vanhöffen and Pseudomunna Hansen): For references and composition, see below (p. 65). The two latter genera referred by NORDENSTAM (1. c.) to Dendrotionini, Acanthomunna by MENZIES (1962b) to Munnidae (cf. above). Four species (cf. p. 65).

*Dendromunna:* Established by MENZIES (1962b, p. 167) and referred by the same to Dendrotionidae. Two species (cf. p. 66).

*Munella*: Established by BONNIER (1896, p. 593) and which he placed close to the genus *Munna*. One species: *dantesi* Bonnier.

*Pleurocope*: Established by WALKER (1901, p. 297) and referred by the same to Munnidae (cf. above). One species: *dasyura* Walker.

Antias: For references, see below (p. 70). Referred by NORDENSTAM (1. c.) to the group Antiasini which MENZIES (1962a, p. 59) ranked as a family. Ten species (cf. p. 70).

Kuphomunna: Established by BARNARD (1914, p. 438) and referred by MENZIES (1962a, p. 59) to Antiasidae. One species: *rostrata* Barnard.

Abyssianira: Established by MENZIES (1956 b, p.14) and referred by the same to the new family Abyssianiridae. Two species: *dentifrons* Menzies, 1956 and *argentinensis* Menzies, 1962.

Xostylus: Established by MENZIES (1962 b, p. 179) and referred by the same to Abyssianiridae. One species: *parallelus* Menzies.

Urias: Established by RICHARDSON (1911a, p. 12) and which she placed close to *Dendrotion*. One species: *spinosus* Richardson.

Haplomunna: Established by RICHARDSON (1908b, p. 79) on Munna caeca Richardson, 1905.

*Mesosignum:* Established by MENZIES (1962b, p. 184) who was reluctant to refer it to any family. Two species: *kohleri* Menzies and *usheri* Menzies.

All these genera agree in the shape of the body which is flattened and *Munna*-like, with the exception of *Xostylus*, in which it is elongated and with parallel margins. Pleon is considerably narrower than the pereonites (except in *Xostylus* and *Haplomunna*). When present, the eyes are placed on lateral processes. The mandibles are of normal shape with the exception of *Mesosignum*, in which they are very elongated and with a reduced molar process. Pereopods I are always prehensile (not described or figured in *Mesosignum* and *Dendromunna*).

The differences between the genera are not easily evaluated. The most significant ones are recorded in Table 4.

Xostylus has not been included in the table since I am convinced that it cannot be related to any of the other genera. It differs from them all in the shape of the body and the antennulae. It also differs from Abyssianira (which MENZIES stated to be its closest relative) in having the uropods inserted laterally, not dorsally. I consider it a typical janirid, closely related to *Ectias* Richardson and *Caecianiropsis* Menzies & Pettit. It agrees with these genera not only in the shape of head, pereonites, pleon, antennulae, and mouthparts but also in having a 2-segmented pleon and two claws on the pereopods; as in *Ectias*, the coxal plates are visible from above on prns. 5-7. It may be congeneric with *Ectias*.

Table 4 shows that there should be reason enough for separating *Dendrotion, Acanthomunna, Dendromunna, Munella*, and *Pleurocope* (Dendrotionidae) from *Antias, Kuphomunna*, and *Abyssianira* (Antiasidae). The former five agree in having many (at least six) joints in the flagellum of the antennula and one claw on the pereopods (long and slender in the first four, shorter and stouter in *Pleurocope*). The first four genera also differ from all others in having joint 4 of the antennula very short and joint 5 very long. In addition to the two claws on the pereopods and the short antennular flagellum, *Antias, Kuphomunna*, and *Abyssianira* also agree in having long sensory filaments on the latter.

The significance of the other differing characters listed in Table 4 is slight: (1) The presence or absence of eyes is without importance (cf. p. 19). (2) Joints 1-3 of palp of mxp. are as broad as the endite in *Abyssianira* but also nearly as broad as the endite in *Acanthomunna beddardi* (unknown in *A. proteus* and *spinipes*). (3) The insertion of the uropods is dorso-lateral in *Dendromunna* and in one species of *Antias (unirameus)*. (4) The uropods are not only

| Table 4. Distinguishing characters in Dendrotionidae, Anuasidae and genera of incertae s | cotionidae, Antiasidae and genera of incertae sedis. |
|------------------------------------------------------------------------------------------|------------------------------------------------------|
|------------------------------------------------------------------------------------------|------------------------------------------------------|

|                                                                                    | Dendrotionidae |              |             |         | Antiasidae |        |            | Incertae sedis |       |            |            |
|------------------------------------------------------------------------------------|----------------|--------------|-------------|---------|------------|--------|------------|----------------|-------|------------|------------|
|                                                                                    | Dendrotion     | Acanthomunna | Dendromunna | Munella | Pleurocope | Antias | Kuphomunna | Abyssianira    | Urias | Haplomunna | Mesosignum |
| Eyes absent (O) or present ()                                                      | 0              |              | 0           | 0       | 0          | •      |            | 0              | 0     | 0          | 0          |
| No. of joints in flag. of antennula                                                | many           | many         | many        | many    | many       | 1-3    | 1          | 2              | ?     | many       | many       |
| Joints 1-3 of palp of maxilliped nar-<br>row (1) or broad ([])                     | I              | ŀ            | I           | I       | I          | I      | I          |                | ?     | ?          | 1          |
| Epipod of mxp. distally rounded $( )$ or acute $( )$                               | $\sim$         |              | ?           | $\sim$  |            | $\sim$ | $\sim$     | ?              | ?     | ?          | ?          |
| Coxal plates not visible from above $(\bigcirc)$ or visible on perconites          | 1-7            | 2-7          | 2-5         | 0       | 2-7        | 2-7    | 5-7        | 2-7            | ?     | ?          | 5-7        |
| No. of claws on pereopods                                                          | 1              | 1            | ?           | 1       | 1          | 2      | 2          | 2              | ?     | ?          | 1          |
| Insertion of uropods lateral (○)<br>or dorsal (●)                                  | 6              | ۲            | 09          | 0       | ٩          | 0      | 0          |                | •     | 0          | 0          |
| Uropods uniramous (with one joint (-) or two joints ()) or biramous (- $\langle$ ) | -<             | -<           | <           |         | <          | -<     | ~~<        | <              |       |            |            |

uniramous in *Munella* but also in one species of *Antias (unirameus)*.

Urias belongs with certainty to either Dendrotionidae or Antiasidae, but is so imperfectly known that it is impossible to refer it at present.

Haplomunna is – in addition to the characters listed in Table 4 – distinguished by the lateral spines on the body and the large pleotelson, the size and shape of the latter being different from that of any Munna-like species. The mouthparts and pleopods are unknown and there is an inconsistency in RICHARDSON's description of the pereonites and her fig. 541 of the animal. It agrees with Mesosignum in the presence of a small uropod, consisting of one joint but the two genera are probably not related.

Although both *Haplomunna* and *Mesosignum* have a multi-jointed antennular flagellum and *Mesosignum* also has one claw on the pereopods, I find it impossible to refer any of them to Dendrotionidae owing to the shape of the uropods.

#### FAMILY DENDROTIONIDAE nov. comb.

Munnidae G.O. Sars, 1899, p. 105 (pars). Dendrotionidae Vanhöffen, 1914. Munnini Hansen 1916, p. 33 (pars). Dendrotidae Menzies, 1962a, p. 28. Dendrotioniidae Menzies, 1962b, p. 167.

#### Diagnosis:

Body always with spines and more varying in shape than in Munnidae. Otherwise, head, pereo-

nites, pleon, position of eyes (when present) and of antennulae, as in that family. Antennulae with very short joint 4, joint 5 very long (except in *Pleurocope*); flagellum with at least six joints. Squama sometimes present. Mandibles with molar process broad and truncate. Maxillipeds with joints 1-3 of palp narrower than endite; epipod subacute distally (except in *Pleurocope*). Pereopods I prehensile, all remaining legs ambulatory, with one claw. Uropods large or very large and biramous (except in *Munella*), situated as in the Munnidae.

#### Remarks:

The five genera which I have referred to this family were discussed in the preceding paragraph. *Munella* differs from all the others in the small, uniramous uropods and the absence of visible coxal plates (Table 4). *Pleurocope* differs in the shape of the first joints of the antennula and the epipod of the maxilliped. The large size of the uropods and the multi-jointed antennular flagellum refer it, however, to Dendrotionidae. STEBBING (1905) also mentioned its resemblance to *Dendrotion* rather than to *Pleurogonium*, as claimed by Walker; unfortunately, the mandibles are unknown.<sup>1</sup>

A special diagnosis for the two monotypic genera (*Munella* and *Pleurocope*) seems premature.

<sup>1.</sup> STEBBING (1. c., p. 57) had the intention of studying the mandibles but " at the very moment when I was arranging the specimen for dissection, it disappeared like a dream, and defied all the efforts made for its re-discovery". The animal was 1 mm long!

#### Key to the genera of Dendrotionidae

| 1. | Eyes present (vestigial, but visible in <i>hystrix</i> ). Head considerably broader than long Acanthomunna Beddard, 1886a                  |   |
|----|--------------------------------------------------------------------------------------------------------------------------------------------|---|
| 1. | Eyes absent. Head quadrangular or longer than broad (except in <i>Pleurocope</i> )                                                         | 2 |
| 2. | Head with long lateral projections. Epipod of maxilliped ovate. Uropods placed in front of the middle of pleotelson                        |   |
| 2. | Head without lateral projections. Epipod of mxp. acute or subacute.* Uropods placed behind                                                 |   |
|    | middle of pleotelson                                                                                                                       | 3 |
| 3. | Pleotelson about as long as broad. Uropods uniramous, much shorter than                                                                    |   |
|    | pleotelson                                                                                                                                 |   |
| 3. | Pleotelson at least one and a half times longer than broad. Uropods biramous, at least one-third                                           |   |
|    | as long as pleotelson                                                                                                                      | 4 |
| 4. | Lateral spines on, at least, pereonites 5-6 multi-branched. Pleon rounded posteriorly. Joint 1 of antennula at most twice as long as broad |   |
| 4. | Lateral spines on all pereonites simple or at most serrated. Pleon acute or subacute posteriorly.                                          |   |
|    | Joint 1 of antennula elongated Dendrotion G.O.Sars, 1872                                                                                   |   |
| No | ot described in <i>Dendromunna spinipes</i> and unknown in <i>D. mirabile</i> .                                                            |   |
|    |                                                                                                                                            |   |

#### Genus Dendrotion G.O.Sars, 1872

*Dendrotion* G.O.Sars, 1872, p. 30; G.O.SARS 1899, p. 116; HANSEN 1916, p. 50.

## Diagnosis:

Head almost quadrangular. Eyes absent. Pereonites 1-4 at least twice as broad as prns. 5-7. Long spine-like projections on prns. 1-4 and similar projections on the coxal plates of prns. 5-7.<sup>1</sup> Pleotelson narrow, lanceolate. Antennulae and antennae long and slender and situated on an ear-like projection. Mandibles with palp. Legs long and slender. Uropods inserted dorsally.

2

## Key to the species of Dendrotion

- 1. Pleotelson with a pair of dorsal spines and a row of six rather long spines laterally. Joint 1 of antennula very short, joint 2 very elongated, almost ten times longer... hanseni Menzies, 1956a
- 1. Pleotelson dorsally without spines and laterally, at most, with four short, curved spines. Joint 1 of antennula very elongated, about five times longer than second.....
- 2. Lateral spines with granules and those on pereonite 5 almost as long as the preceding pair. A pair of setiferous tubercles present on each of prns. 2-7 (two pairs on prn. 4). . *paradoxum* Hansen, 1916\*
- 2. Lateral spines smooth and those on prn. 5 much shorter than the preceding pair. No tubercles on prns. 2-7..... spinosum G.O.Sars, 1872

\* During the re-examination of this species I selected a male as lectotype. This animal is, without doubt, the specimen drawn by HANSEN (pl. IV, 3a), having almost all percopods intact and being the best preserved male present.

#### Genus Acanthomunna Beddard, 1886

Acanthomunna Beddard, 1886a, p. 102; BEDDARD 1886b, p. 47; MENZIES 1962b, p. 174. Mormomunna Vanhöffen, 1914, p. 569. Pseudomunna Hansen, 1916, p. 47.

## Composition:

MENZIES (1962b) transferred Mormomunna spinipes Vanhöffen and Pseudomunna hystrix Hansen to Acanthomunna Beddard (with one known species, proteus) and described a new species, A. beddardi. There is no doubt that proteus and beddardi are congeneric, agreeing both in shape of body and in particular, pleotelson, antennulae, male pleopods 1 and the extraordinary, elongated projection on the exopod of pleopods 2, etc. Joint 4 of the peduncle of the antenna is, according to BEDDARD, very long in proteus but it is short in beddardi. It is, however, quite likely that BEDDARD overlooked one of the

<sup>1.</sup> In the key to families, MENZIES (1962 a, p. 28) for this family stated: "Coxal plates spiniform and well developed." However, as pointed out by HANSEN (1. c.) this is not the case regarding perconites 1-4.

first short joints, the elongated joint in proteus thus actually being the fifth. In spinipes and hystrix the entire antenna is preserved and while joints 1-4 of the peduncle are very short, joints 5 and 6 are extremely elongated. Besides probable agreement in the peduncle of the antenna, *spinipes* also resembles proteus and beddardi in the structure of the antennulae and the exopod of pleopods 2, while the male pleopods 1 are very different. Nevertheless, I think MENZIES is right in referring spinipes to Acanthomunna, his only argument being, however, agreement in the "dorsal insertion of the massive uropods". For the same reason he transferred hystrix. This species also agrees in the shape of the antennulae and the peduncle of the antennae. It differs, however, considerably from proteus and beddardi in the shape of pleotelson and from all three other species in the structure of the male pleopods.<sup>1</sup> Strangely enough, HANSEN did not examine the male pleopods 2. A study of the male type in this Museum has shown that also hystrix has an elongated projection on the exopod (Fig. 27a), looking very much like that in *beddardi*. For this reason I agree with MENZIES in transferring hystrix also to Acanthomunna.

## Diagnosis:

Body densely covered with sturdy spines. Head with eyes, placed on lateral convexities or projec-

1. HANSEN even stated (1916, p. 48) that "it is certainly rather closely related to ... *Mormomunna spinipes* ... but at least the median lamella of the male operculum differs so much in the two genera that they cannot be united."

tions. Antennula with joint 3 elongated, longer than joints 1 and 2; flagellum multi-jointed. Antenna with joints 1-4 short, joints 5-6 elongated. Palp of mandible present. Exopod of male pleopod 2 with a long, backward pointing projection. Uropods stout, insertion dorsal, vaulted.

## Remarks:

Several of the features in MENZIES' diagnosis are left out here since they are known only in some of the species. On the other hand, a number of other features are included in the above diagnosis. A key to the four species was given by MENZIES.

#### Genus Dendromunna Menzies, 1962

#### Diagnosis:

Head subquadrangular, eyes absent. A strong spine-pair on pereonites 2-4. Lateral spines on prns. 5-6 not coxal, with secondary spines (dorsal and lateral spines on prns. 2-4 probably always of similar shape). Coxal plates on at least prns. 2-5 visible in dorsal view. Pleotelson longer than broad, rounded posteriorly. Joint 1 of antennula at most twice as long as broad. No squama on antenna. Uropods strong, inserted laterally (slightly dorsally).

#### Remarks:

The description of a new species has necessitated a radical change in MENZIES' diagnosis (1962b, p. 167). The coxal plates are visible only on prns. 2-6 (not 2-7).

#### Key to the species of Dendromunna

Lateral parts of perconite 5 about as long as the median part. Lateral spines on prn. 5 with a bunch of secondary spines apically. Peduncle of uropods much longer than the rami......spinipes Menzies, 1962 b

## Dendromunna mirabile n. sp. (Text-figs. 27-29)

#### Material:

*Galathea* St. 661, Kermadec Trench (36°07'S, 178°32'W), 5230-5340 m, 23 February 1952. Bottom temp.: 1.1°C. - 1 female.

## Description:

*Body* (Fig. 27b) elongated, three times longer than at greatest width (excl. of lateral spines). Most of

the dorsal surface (except the head) furnished with a large number of tubercles and spinules (short, spine-like setae). These could have been considerably more abundant originally than shown in the figures, since a certain number may have been lost during the thorough and very difficult cleaning of the specimen, which proved necessary before drawings could be made. Colour white.

Head subquadrangular, directed somewhat downwards and with the posterior part considerably



Fig. 27. a, Acanthomunna hystrix (Hansen); pleopod 2 of 3 holotype; b-k, Dendromunna mirabile n.sp.,  $\mathcal{Q}$  holotype; b, from above; c, lateral process on pereonite 5; d, pereonites 5-7 and pleon from the right side (s, scars at insertion point of the broken lateral processes); e, lateral spine on pereonite 6; f, pereonite 7 and pleon from above; g, right antennula; h, lateral part of pereonite 5 and basis of pereopod V seen from behind; j, right antenna; k, right uropod from above, slightly from outside.

vaulted. Antennulae inserted above and a little posterior to the low, broad projection on which the antennae are inserted.

Pereonites 1-4 (27 b) very inconspicuously marked off from each other. They increase in width from prn. 1 to 3 which is as wide as prn. 4. Prn. 1 is much shorter than 2; this is a little shorter than prn. 3, which is about five-sixths of prn. 4. A small portion of the coxae just visible beneath the lateral protuberances. These, on prns. 2-4 are furnished with an antero-lateral or lateral spine which is constantly broken off near the base. Dorsally, on prn. 1 are two bunches of rather long setae, apparently each with a common base and situated in pairs. Not far from the hind margin of prns. 2-4 is a pair of low convexities, each carrying the base of what was probably once a strong spine (cf. *spinipes*). There are many spinules laterally and similar spinules and tubercles are seemingly scattered over most of the dorsal surface, but are very difficult to make out.

*Pereonite 5* (excl. of the lateral protuberances) more than half as wide as the preceding segment. Lateral spine peculiarly shaped (Fig. 27 c). Approximately half way is a ball-shaped swelling armed with an oblique ring of radiating, short spines; distally are two much stouter spines, one being broken close to its base; the proximal part of the main process has very fine granules. Coxa is clearly visible under the distal part of the lateral protuberance. The segment seems to be almost entirely devoid of dorsal spinules.

*Pereonite 6* (27b and d) about two-thirds as long as prn. 5. Lateral protuberances almost as long and sturdy as those on prn. 5, but are directed almost



Fig. 28. *Dendromunna mirabile* n. sp.; a, labrum; b-d, right mandible; b, partly from the side; c, side view of apex; d, incisive part from inside; e-f, left mandible; e, partly from the side; f, side view of apex; g, palp; h, labium.

vertically downwards so are hardly visible from above. Postero-laterally on the protuberance is a somewhat outward-directed process which is as extraordinary in shape as that on the preceding segment: proximally, at the thick part, small spines point in all directions like branches of a tree (27e); distally are two considerably longer, slender spines which curve somewhat towards each other. Across the pereonite is a ring of spine-like setae.

*Pereonite* 7 (27d and f) considerably shorter and somewhat narrower than the preceding segment. Ventro-laterally there is no trace of either protuberances or pereopods; only a small and inconspicuous knob with two short setae is found here (27d). Also on this pereonite is a transverse, upper ring of short setae.

Pleon (27f) oval, a little less than twice as long as broad. It is considerably vaulted (27d), being about as high as broad. Hind margin of pleon evenly rounded and with a fringe of small, slender setae. Close to the proximal margin is a transverse depression, separated on each side from the main part of pleon by an inconspicuous ridge which probably indicates the hind margin of a vestigial pleonite. There are also two faint, longitudinal ridges close to the median line. Central part of pleotelson with a convexity which carried originally a strong spine now broken off near the base; thus, its direction cannot be stated. Uropods inserted dorsally on a pair of projections. The surface of pleon is covered with a large number of tubercles and spinules which are particularly significant along the lateral margins (27d).

Antennula (27g) a little more than one-fourth as

long as the body. Joint 1 about one-third longer than broad, with fine granules and two long spines on the outer margin. Joint 2 somewhat shorter, about twice as long as broad and with several tiny spinules resembling rose thorns. Joint 3 elongated and joint 4, which certainly also belongs to the peduncle, only as long as broad. Twelve joints in flagellum, the distal ones having long olfactory filaments.

Antenna (27j) with joint 1 broadest at base and smooth. Joint 2 broader than long, with an inner, forward-directed spine. Joint 3 widest distally where a collar of six outward-directed spines is found on the lateral and lower sides (only two of the spines are preserved). Joint 4 very elongated, almost three times as long as the preceding joints together, and with several spines; joints 2-4 covered with conspicuous granules. Joint 5 less than half as long and much narrower than joint 4. Flagellum lost.

Labrum (28 a) bilobed and with many tiny setae. Right mandible (28 b) moderately strong. Incisive part chisel-shaped, very narrow in side view (28 c), and with four small teeth distally (28 d). Only three spines in the spine-row. Molar process long and rather slender. Left mandible has a conical, rounded incisive part (28 e), and the movable lacinia is, if present, apparently rather short and spine-like, but is difficult to distinguish from the four serrated spines in the spine-row (28 f). Palp (28 g) with joint 2 almost three times as long as joint 1; third joint also very long, only about one-fifth shorter than joint 2 and furnished with a row of slender spines and a strong, curved spine terminally.

Labium according to Fig. 28 h. Maxillula and max-

Fig. 29. Dendromunna mirabile n.sp.; a, operculum; b-c, pleopods 3-4.



illa almost as in Dendrotion spinosum (SARS 1899, pl. 49). Maxillipeds lost.

*Pereopods* lost, except the basipodite on prps. I-V. This is shortest and broadest on prp. V, almost twice as long on prps. II-IV, although considerably narrower on II, and on prp. I it is one-fourth longer than on prp. V, although yet a little narrower than that on prp. II. All basipodites are armed with spinules (except on prp. I), and the same applies to the ringed coxae (27h). Prps. I-IV are all furnished with a rather thick, suboval, developing oostegite; this is two-thirds the length of basis on pereonites 2-4, onethird its length on prn. 1.

*Operculum* (29a) egg-shaped, with three longitudinal, low convexities proximally; the middle one very short, the two outer ones stretch backwards towards the distal end of operculum and are furnished with some rather strong spinules.

*Pleopod 3* (29 b) much the same as in *Dendrotion;* a terminal seta on the exopod may have been broken off. *Pleopod 4* (29 c) with a very broad, somewhat folded endopod.

Uropod (27k) very strong, about one-fifth longer than pleon, and abundantly covered with conspicuous granules and stout spines. Peduncle short, less than one-fourth of endopod, but under a transmitted light it can be seen to continue for some distance inside pleon (27f). Exopod inserted on the outer, lower corner of peduncle, but is not preserved. Endopod rather abruptly cut off distally. It is probably 1-jointed, but a faint seam a little beyond the middle may indicate a separation, although this could also be due to damage (only one endopod is preserved).

Size: The only specimen  $(\mathfrak{P})$  is 5.7 mm long and 1.9 mm across perconites 3 or 4.

#### Remarks:

The significance of the lack of percopods VII was discussed above (p. 20).

HANSEN mentions (1916, p. 52) that enormous quantities of sponges were procured from Ingolf St. 78 from whence Dendrotion paradoxum and spinosum were recorded; a third member of Dendrotionidae, Acanthomunna hystrix, with very spiny legs (as well as a couple of long-legged species of tanaids) was also found at this station. HANSEN presumes that these species "live on the sponges, and that there may be some correlation between their armature or very elongate appendages and their mode of living." It is interesting that part of the remains, which were removed from the body D. mirabile, proved to be tiny pieces of sponge. From the same station as mirabile (661) at least three species of sponges were collected, and it seems likely that the very spiny mirabile also lives on sponges. Unfortunately, a thorough investigation of the sponges rendered no further material of this remarkable isopod.

#### Occurrence:

Known only from the Kermadec Trench NE of New Zealand, 5230-5340 m.

#### FAMILY ANTIASIDAE nov. comb.

Antiasini Nordenstam, 1933, p. 198.

Antiasidae Menzies, 1962a, p. 59.

Abyssianiridae Menzies, 1956b, p. 12; MENZIES 1962b, p. 179 (pars).

#### Diagnosis:

Shape of head, pereonites, pleon, position of eyes (when present), and of antennulae, as in Munnidae. Flagellum of antennulae with at most three joints, with sensory filaments. Squama sometimes present. Mandibles with molar process broad and truncate. Maxillipeds with epipod subacute distally (unknown in *Abyssianira*). Coxal plates visible from above on at least perconites 5-7. Percopods I prehensile, all the remaining legs ambulatory, with two claws. Uropods biramous, inserted dorsally or laterally.

## Remarks:

As stated above (p. 63) *Xostylus* should be referred to Janiridae and *Abyssianira* to Antiasidae; thus Abyssianiridae must be cancelled.

MENZIES (1962a) gave a key for the separation of *Kuphomunna* and *Antias*, whereby a rostrum twice the length of cephalon is present in the former, lacking in the latter. However, BARNARD (1920, p. 409) pointed out that the projection appears to be the epistome, not a rostrum and that while this is very produced in the male it only projects slightly in the female.

#### Key to the genera of Antiasidae

| 1. | Head more than four times broader than long (excl. of projection). The male with an exceeding-       |   |
|----|------------------------------------------------------------------------------------------------------|---|
|    | ly projecting epistome and with pereonite 1 large and swollen, as long as prns. 2-4                  |   |
|    | combined Kuphomunna Barnard, 1914                                                                    |   |
| 1. | Head at most twice as broad as long. Frontal margin (but not epistome) often projecting              | 2 |
| 2. | Frontal margin finely serrated. Insertion of the short uropods distinctly                            |   |
|    | dorsal Abyssianira Menzies, 1956b                                                                    |   |
| 2. | Frontal margin even (not serrated) or with spines. Insertion of uropods lateral or (rarely) slightly |   |
|    | dorso-lateral Antias Richardson, 1906                                                                |   |
|    |                                                                                                      |   |

| Genus Antias Richardson 1906                     |    |
|--------------------------------------------------|----|
| Genus minus Rechardson, 1900                     | W  |
| Antias Richardson, 1906, p. 16; NORDENSTAM 1933, | le |
| p. 200; Menzies & Miller 1955, p. 383.           | n  |
|                                                  | •  |

Diagnosis:

Head considerably broader than long. Eyes pre-

sent. All pereonites rounded laterally (sometimes with several short lateral spines) and subequal in length (except the male of A. dimorphis). Pleotelson more or less oval in shape. Antennulae with 3 joints in the peduncle, 1-3 in the flagellum. Dactylus of all pereopods with two claws. Uropods never exceeding the length of pleotelson.

#### Key to the species of Antias

| 1. | Frontal margin forming an even, convex arch                                                     | 2 |
|----|-------------------------------------------------------------------------------------------------|---|
| 1. | Frontal margin straight or concave, becoming more or less emarginate distally                   | 5 |
| 2. | Width of frontal projection only about one-third of that of the head. Female operculum much     |   |
|    | broader than long. Uropods uniramous unirameus Menzies & Miller, 1955                           |   |
| 2. | Frontal projection more than half as wide as the head. Uropods biramous                         | 3 |
| 3. | Pleotelson shorter than perconites 5-7. Body with short, scattered setae but no                 |   |
|    | spines hofsteni Nordenstam, 1933                                                                |   |
| 3. | Pleotelson considerably longer than prns. 5-7. Body and/or uropods with spines                  | 4 |
| 4. | Both pereonites and pleon with many spines. No projection in front of the eyes. Rami of uropods |   |
|    | of about equal length hispidus Vanhöffen, 1914                                                  |   |
| 4. | Pereonites at most with long 2-pointed setae on the coxal plates. A small projection in front   |   |
|    | of the eyes. Endopod of uropods almost twice as long as exopod mawsoni Hale, 1937               |   |
| 5. | Frontal margin with a deep median incision. Endopod of uropods curved                           |   |
|    | outwards charcoti Richardson, 1906                                                              |   |
| 5. | Frontal margin at most concave, without incision. Endopod of uropods straight                   | 6 |
| 6. | Pereonites and pleon smooth, at most with a few setae                                           | 7 |
| 6. | Pereonites and pleon with many spines                                                           | 9 |
| 7. | Uropods less than half the length of pleotelson; rami shorter than peduncle. All pereonites of  |   |
|    | almost equal width Marmoratus Vanhöffen, 1914                                                   |   |
| 7. | Uropods more than half the length of pleotelson; at least the endopod longer than the peduncle  | 8 |
| 8. | Frontal margin truncated at apex. Prn. 1 as long as prn. 2 in both sexes. Rami of uropods sub-  |   |
|    | equal in length* laevifrons Menzies, 1962a                                                      |   |
|    |                                                                                                 |   |

\* This character is according to Menzies' diagnosis (1962 a, p. 60), not to his fig. 15 B.

- 8. Frontal margin concave. Prn. 1 about as long as prn. 2 in the female, twice as long in the male. Endopod of uropods about twice as long as exopod...... *dimorphis* Menzies, 1962 a
- 9. Frontal margin almost straight. Five hooked spines on each side of pleotelson. Uropods as long as pleotelson, endopod about three times the length of exopod..... uncinatus Vanhöffen, 1914
- 9. Frontal margin concave. Many simple lateral spines on pleotelson. Uropods half as long as pleotelson, rami subequal in length...... hirsutus Menzies, 1951

#### FAMILY ISCHNOMESIDAE

Ischnomesini Hansen, 1916, p. 54; WOLFF 1956a, p. 86.

Ischnomesidae Gurjanova, 1933 b, p. 409; MENZIES 1962 b, p. 111.

Ischnosomidae Menzies, 1962a, p. 28.

## Diagnosis:

Body either somewhat, or greatly elongated; pereonites 4 and 5, to a small or large extent, produced backwards and forwards respectively. Head deeply embedded in and completely fused with pereonite 1. Pleon with one, two or three segments. Eyes lacking. Antennula with joint 1 short and globular, joint 2 elongated. Antenna rather long, without squama. Mandibles normal. Pereopods I prehensile, others, simple walking legs; dactylus with one claw. Anus widely separated from branchial chamber. Uropods terminal, moderately long and uniramous.

## Remarks:

MENZIES' diagnosis (1962 b) has been substituted by the above as he does not mention the shape of pereonites 4-5 or the antennula, and claims that the antennae are shorter than the body (they are longer in e.g. *Ischnomesus bispinosus)*, that joints 1-3 of the maxillipedal palp are as wide as endite (they are much narrower in e.g. *Heteromesus* and *Stylomesus)*, and that all pereopods are simple walking legs (prps. I are prehensile).

## Comments to the genera:

Since HANSEN's revision of the family (1916) and my discussion on *Ischnomesus* and *Stylomesus* (1956a), a considerable number of new species of Ischnomesidae have been described by BIRSTEIN (1960) and MENZIES (1962b). Diagnoses of the two genera were given by HANSEN and myself, but some of these new species, including another new species described below, do not agree with the diagnoses. As the following characters were considered to be the principal dividing ones on the generic level, they should be mentioned separately:<sup>1</sup> (1) Number of joints in flagellum of antennula was fixed as four-eight in *Ischnomesus*, three in *Stylomesus*, two-three very small ones in *Heteromesus* and four in *Haplomesus*. However, in *Stylomesus menziesi* and *wolffi* Birstein, 1960 and *S. gorbunovi* (Gurjanova, 1946),<sup>1</sup> there are four joints in the flagellum, while the latter is absent in *S. gracilis* Birstein, 1960 and *S. elegans* Menzies, 1962. These five species will be discussed below.

(2) Length of joint 3 of antenna. In the study of the generic characters of *Ischnomesus* (WOLFF 1956a, p. 88), it was found that in all species of *Ischnomesus* (where the length of joint 3 of the antenna could be studied), it was less than twice as long as joint 4; this character strongly contrasting with the elongated third joint in the three other genera. However, in *I. birsteini* n. sp., which no doubt belongs to *Ischnomesus*, the third joint is a little more than twice as long as the fourth. Moreover, in *Haplomesus tropicalis* Menzies, 1962 it is less than twice as long as joint 4 (cf. p. 86). The limited length of joint 3 of the antenna cannot, therefore, be maintained as a distinguishing generic character.

(3) Length of palp of maxilliped. According to HANSEN (1. c.) the palp in *Haplomesus* is less than two-thirds as long as the sympod ("second joint itself"), the endite not included. However, in BIR-STEIN's five new species of *Haplomesus*, the palp varies between being two-thirds and as long as the sympod; this also applies to MENZIES' *Hapl. bifurcatus*.

(4) Width of joints 2 and 3 of palp of mxp. HANSEN also stated that these joints are expanded in *Ischnomesus* and *Haplomesus*, but narrow in *Heteromesus* (and *Stylomesus*). According to BIR-STEIN's fig. 10 they are, however, narrow also in *Hapl. insignis orientalis*. In HANSEN's description of *Hapl. insignis* (1916) he did not mention or illustrate the maxillipeds. An examination of the holotype in this Museum showed that the two joints are

<sup>1.</sup> It should be noted that variations from the generic characters, found in the new species and listed here, represent

a minimum only, since several of MENZIES' species and one of my own lack the anterior part.

<sup>1.</sup> BIRSTEIN transferred the latter species from *Haplomesus* to *Stylomesus*.

as narrow in *insignis* as in *i. orientalis*. At the same time it was confirmed that perconites 5-7 *are* completely fused;<sup>1</sup> thus, the species cannot belong to *Heteromesus*. In conclusion, the shape of the maxillipedal palp should also be disregarded as a distinguishing feature – at least, as far as *Haplomesus* is concerned.

(5) Shape of carpus of pereopod I. This is not very expanded and is of about equal width throughout in *Stylomesus* and *Haplomesus*; considerably expanded before the middle in *Ischnomesus* and more or less triangular in shape and expanded beyond the middle in *Heteromesus*. However, in *Ischnomesus bruuni* Wolff and *I. andriashevi* Birstein the carpus is almost equally broad throughout, this also being true of *Heteromesus* n. sp., CATTLEY.<sup>2</sup>

(6) Number of joints in the uropods. These are 2-jointed in *Ischnomesus* and *Stylomesus*, 1jointed in *Heteromesus* and *Haplomesus*. They are totally absent in a new species (described below), and this feature (combined with the shape of the antennulae), has called for the establishment of a new genus, *Mixomesus*.

(7) Pereonites 5-7 and pleonites free or fused. According to the diagnoses given by HAN-SEN and WOLFF (1. c.) the genera are characterized as follows:

| Ischnomesus: | all segments (pereonites as well as    |
|--------------|----------------------------------------|
|              | pleonites) free.                       |
| Stylomesus:  | prns. 5-7 free, prn. 7 fused with the  |
|              | pleonites, which are fused.            |
| Heteromesus: | prns. 5 and 6 free, prns. 6 and 7 and  |
|              | the pleonites all fused.               |
| Haplomesus:  | prns. 5-7 and the pleonites all fused. |

According to BIRSTEIN's and MENZIES' descriptions and illustrations, the following species of *Stylomesus* disagree with the diagnosis of the genus:

S. elegans Menzies and gracilis Birstein: prns. 5-7 free, prn. 7 not fused with the pleonites – which are fused.

- S. wolffi Birstein: prns. 5 and 6 free, prns. 6 and 7 and the pleonites all fused.
- S. menziesi Birstein and gorbunovi Gurjanova: prns. 5-7 and the pleonites all fused.

BIRSTEIN noted that *Stylomesus* was characterized by the antennae being stalked and by prns. 6 and 7 being free. Since the latter feature is not relevant in some of his new species of *Stylomesus*, he came to the conclusion that this character had to be disregarded. Thus, according to BIRSTEIN, only the stalked antennae remain. It is true that in all species referred to *Stylomesus* the antennae are inserted on a strong projection on the head, but this is also so in *Haplomesus insignis orientalis* (BIRSTEIN's fig. 10), *Heteromesus dentatus* (HANSEN's fig. 6b, pl. V), and *Heteromesus* n. sp., CATTLEY.

It appears from the above that added to the number of joints in the uropods, the presence or lack of coalescense of pereonites 5-7 and the pleonites, must be regarded as the main distinguishing character in this family.<sup>1</sup> Consequently, I find it necessary to erect three new genera to receive the five species of *Stylomesus* mentioned above. Some of them also differ from *Stylomesus* in having a different number of joints in the flagellum of the antennula. The diagnoses of the new genera are given on pp. 83 and 84.

(8) Number of pleonites. This feature was not dealt with in the original diagnoses; as mentioned above (p. 30) some of the species of *Stylomesus* have more than two pleonites<sup>2</sup> (species in brackets have been transferred to other genera in this paper):

| Two pleonites indicated | Three pleonites indicated |
|-------------------------|---------------------------|
| (elegans)               | (gracilis)                |
| (menziesi)              | (gorbunovi)               |
| (wolffi)                | spinulosus                |
| inermis                 | regularis                 |
| [inermis] pacificus     | s simplex                 |
| granulosus              | productus                 |
|                         | simulans                  |

It is probably not possible to use this character taxonomically – variation being found also in other genera. In *Haplomesus tenuispinis* and *modestus*,

<sup>1.</sup> BIRSTEIN shows *Hapl. insignis orientalis* with prns. 5-7 free. As indicated by HANSEN (pl. V, 3a) *insignis* has dorsal grooves between the segments which are almost as deep as those between the anterior segments, but in ventral view it can be seen there are no articulations between them.

<sup>2.</sup> The John Murray Expedition (1933-34) to the Indian Ocean obtained i. a. two new species of Ischnomesidae, one belonging to *Heteromesus* and one to *Ischnomesus*. A description of these will be published by J.G.CATTLEY in the near future. Mr.CATTLEY has kindly given me permission to refer to them here and has furnished me with copies of his manuscript and figures.

<sup>1.</sup> On occasions it may be difficult to decide whether two segments are fused or not, but in all doubtful cases, I have succeeded in deciding this point when investigating the ventral side of the segments. Moreover, the segments can always be slightly moved, if they are free.

<sup>2.</sup> Dr. MENZIES has informed me by letter that he is also aware of this fact.

and *Heteromesus* n. sp., CATTLEY there are definitely three pleonites (HANSEN's figs. 4d, 4f and 5b (pl. V) and Fig. 40a in this paper), as probably also in the female of *Haplomesus quadrispinosus* and in *Hetero*- mesus frigidus (HANSEN's fig. 10 (pl. V) and figs. 4d and 4r (pl. VI)). In all other species of *Haplomesus* and *Heteromesus* there seem to be two pleonites only.

## Key to the genera of Ischnomesidae

| 1.   | Uropods not developed. Peduncle of antennula with five joints Mixomesus n. gen.                  |
|------|--------------------------------------------------------------------------------------------------|
| 1.   | Uropods developed. Peduncle of antennula with two joints                                         |
| 2.   | Uropods with two joints                                                                          |
| 2.   | Uropods with one joint                                                                           |
| 3.   | All pereonites and both pleonites free and movable. Endite of maxilliped longer than broad and   |
|      | the palp with joints 2 and 3 expanded Ischnomesus Richardson, 1908 b                             |
| 3.   | At least the two or three pleonites fused. Endite of mxp. broader than long (except in Hapl.     |
|      | glabrus) 4                                                                                       |
| 4.   | Prns. 5-7 and pleon free. Antennula with two joints only Bactromesus n. gen.                     |
| 4.   | At least prn. 7 fused with pleon. Antennula with at least five joints*                           |
| 5.   | Prns. 5-7 free, prn. 7 fused with pleon Stylomesus Wolff, 1956a                                  |
| 5.   | At least prns. 6 and 7 and pleon fused 6                                                         |
| 6.   | Prns. 5 and 6 free, prns. 6 and 7 fused. Pleotelson longer than broad Gomphomesus n. gen.        |
| 6.   | Prns. 5-7 fused. Pleotelson broader than long Helomesus n. gen.                                  |
| 7.   | Prns. 5 and 6 free, prns. 6 and 7 and pleon fused. Antennula with two distinct, and two or three |
|      | reduced joints Heteromesus Richardson, 1908 b                                                    |
| 7.   | Prns. 5-7 and pleon fused. Antennula with six distinct joints Haplomesus Richardson, 1908 b      |
| * Tł | he head is not known in all species.                                                             |

#### Genus Ischnomesus Richardson, 1908

Diagnosis – see WOLFF 1956a, p. 88, with the exception that joint 3 of the antenna is not always less than twice as long as joint 4.

#### Remarks:

When including the new species, recently described by BIRSTEIN and MENZIES, the one being described by CATTLEY, and the four new species described below, *Ischnomesus* now consists of 23 species in all. I have tried to arrange all the new species in a table corresponding to that previously published (1. c., p. 89),<sup>1</sup> but it was evident that neither the original nor any additional material, calls for the establishment of one or more new genera.

According to size of the lateral projections of male pleopods 1 and the length of the stylet on plp. 2, MENZIES (1962b), has proposed a tentative division of the genus into two groups.

1. It was erroneously stated in the table that an exopod is present on the uropod in *I. bispinosus* (cf. SARS 1899, p. 124).

#### Key to the species of Ischnomesus

. .

. . . .

| 1. | Pleotelson broadly pear-shaped, one-third longer than wide, and with the lateral parts entirely    |    |
|----|----------------------------------------------------------------------------------------------------|----|
|    | flattened and spineless. Outer branch of pleopod 3 only one-third as long as inner. Joint 2 of the |    |
|    | uropod one-third longer than joint 1 planus n. sp. (p. 82)                                         |    |
| 1. | These characters not combined                                                                      | 2  |
| 2. | Pleotelson with two large, postero-lateral spines or processes, both more than half as long as the |    |
|    | width of pleotelson bidens Menzies, 1962 b                                                         |    |
| 2. | Pleotelson without spines, with two tiny spines or with two large and several small spines (pleo-  |    |
|    | telson unknown in Ischnomesus n. sp., CATTLEY and I. anacanthus n. sp.)                            | 3  |
| 3. | Pereonites 4 and/or 5 rounded, without antero-lateral spines                                       | 4  |
| 3. | Prns. 4 and/or 5 with antero-lateral spines                                                        | 12 |
| 4. | Palp on mandible present                                                                           | 5  |
| 4. | Palp on md. absent (md. not described in <i>caribbicus</i> ).                                      | 6  |

| 5.         | Integument white, with reddish or greenish tinge. Joint 3 of palp on md. more than half as long as joint 2 $(n + 2)$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |            |
|------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| 5.         | Integument without reddish or greenish tinge. Joint 3 of palp on md. less than one-fifth of joint<br>2 No spines on prn 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |
| 6.         | No spines on prn. 1. Joints 2 and 3 on palp of maxilliped narrower than                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |            |
| 6.         | Spines present on prn. 1. Joints 2 and 3 on palp of mxp. broader than endite (mxp. not described in <i>caribbicus</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 7          |
| 7.         | Head with two small spines dorsally. Prns. 2-4 with small, submarginal processes near the antero-<br>lateral corners and having medianly, a pair of small processes set on a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | /          |
| 7.         | No spines on the head and no submarginal and median processes on pros 2-5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 8          |
| 8.         | Pleotelson evenly rounded postero-laterally                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 9          |
| 8.         | Pleotelson with small projections postero-laterally                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 10         |
| 9.         | Spines on prn. 1 directed mainly outwards. Carpus of pereopod I not expanded, only slightly broader than merus andriashevi Birstein, 1960                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |
| 9.         | Spines on prn. 1 directed mainly forwards. Carpus of prp. I greatly expanded proximally bispinosus G.O. Sars, 1868                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |
| 10.        | Spines on prn. 1 directed forwards                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |
| 10.        | Spines on prn. 1 directed mainly outwards                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 11         |
| 11.        | Postero-lateral corners of pleotelson, each with a spine directed backwards. Outer branch of male pleopods 1 strongly projecting, being almost as long as the width of each pleopod distally                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |            |
| 11.        | Postero-lateral corners of pleotelson without spines. Outer branch of male plps. 1 small and in-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |            |
| 12         | conspicuous                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 10         |
| 12.        | Long spines present on prn. /                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 13         |
| 12.        | Length of new 5 short ten times exected the minimum itil. Direct in the state of th | 14         |
| 15.        | spines                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |            |
| 13.        | Length of prn. 5 about three times greater than the minimum width. Pleotelson with many spines                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |
| 14         | Long spines present on prn 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 15         |
| 14.        | No spines on prn. 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 19         |
| 15.        | Length of prn. 5 at least eight times more than the minimum width. <i>bacilloides</i> (Beddard, 1886a)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 17         |
| 15.        | Length of prn. 5 (excl. of the spines) less than five times more than the minimum width                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 16         |
| 16.        | Dorsal spines on most perconites. Margin of pleotelson with many spines. <i>spärcki</i> Wolff, 1956a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |            |
| 16.        | Dorsal part of peronites and margin of pleotelson smooth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |            |
| 17.        | Spines on prns. 3 and 4 directed forwards. No palp on md armatus Hansen, 1916                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |            |
| 17.        | Spines on prns. 3 and 4 directed outwards. Palp on md. present (not described in <i>wolffi</i> )                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 18         |
| 18.        | Spines on prn. 6 directed more backwards than outwards wolffi Menzies, 1962b (p. 75)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |            |
| 18.        | Spines on prn. 6 directed more outwards than backwards bruuni Wolff, 1956a                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |
| 19.        | Long dorsal spines on prns. 6-7 and pleotelson multispinis Menzies, 1962b                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |            |
| 19.        | No long spines on prns. 6-7 and pleotelson                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 20         |
| 20.        | Lateral spines on pleotelson. Dorsal surface of prns. 5-7 and pleon with tiny<br>nodules magnificus Menzies 1962 h                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |            |
| 20         | No lateral spines on pleatelson. Dorsal surface smooth                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 21         |
| 21.        | Long dorsal spines on prosteriour. 2013al surface smooth.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 41         |
| 21         | Dackwards                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <b>~</b> ~ |
| 21.        | No dorsal spines on prns. 2-4.* The spines on prn. 5 directed outwards                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 22         |
| 22.<br>22  | Joint 1 of the uroped here then half as long as width of pleetelson. bacillus (Beddard, 1886a)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |            |
| 44.<br>* F | Joint i of the uropod less than half as long as width of pleotelson elegans Menzies, 1962b                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |            |
| * Pr       | IIS. 2-3 UIIKNOWN IN DACHIUS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |            |

Some of MENZIES' new species were described on fragmentary specimens, only the lengths of the fragments being given. By comparing the species in question with those MENZIES indicated as being most closely related, the approximate total lengths of the fragmentary species are as follows:

| <i>I. magnificus</i> $\mathfrak{Q}$ : | <i>c</i> . 23 mm |
|---------------------------------------|------------------|
| I. bidens 3:                          | c. 13 mm         |
| I. elegans ♂:                         | c. 11 mm         |
| I. paucispinis $\mathcal{J}$ :        | <i>c</i> . 5 mm  |

#### Ischnomesus wolffi Menzies, 1962

This species is, perhaps, a synonym of *bruuni*. MEN-ZIES states (p. 114) that it differs from *bruuni* only in the more backward-direction of the spines on pereonite 6 but this is hardly a sufficient reason for distinguishing on the species level. In addition, pereonite 5 appears to be somewhat more elongated in *wolffi*. Otherwise, the figured pereonites and pleon, apex of male pleopod 1 and the entire plp. 2 in *wolffi* are remarkably similar to those in *bruuni*. Since, however, MENZIES does not give a figure of the anterior half of the species (or illustrate or describe head, antennulae, antennae, mouthparts, legs or any complete uropod), *wolffi* is too little known to decide whether it is conspecific with *bruuni* or not.

The length of the fragmentary male holotype (MENZIES' fig. 18A) is given as 5.8 mm. Thus, by comparison with *bruuni*, the total length of the animal would be about 11 mm.

## Ischnomesus birsteini n. sp. (Text-figs. 30-31)

Ischnomesus sp. (Kermadec Trench), WOLFF 1956a, p. 97.

## Material:

*Galathea* St. 663, Kermadec Trench (36°31'S, 178°38'W), 4410 m, 24 February 1952. Bottom: brown sandy clay with pumice. Bottom temp.: 1.2°C. – 1 female.

## Description:

Body. Unfortunately, the head, dorsal part of pereonites 1-3 and most of prn. 4 are rather damaged, thus preventing an accurate comparison with the same joints in *Ischnomesus spärcki* (WOLFF 1956a, p. 94) which this species closely resembles. The body is not so elongate as in *spärcki*, the rate between width of pereonite 5 (anterior part) and length of prns. 5-7 + pleon being only 5.5, com-

pared to 6.7. The integument is extremely fragile and its colour completely white. The spines are numerous; a long thread-like hair often projects from the calcified end of the spine (Fig. 31a).

Pereonite 1 has the same vaulted lateral parts as *spärcki*, but has two spines of almost equal length, directed somewhat forwards (and one also outwards) and corresponding to the long anterior, and the minute posterior spines in *spärcki*. The two spines in *birsteini* are only two-thirds the length of the anterior spine in *spärcki*. Moreover, there is one shorter, plus a few minute spines, on the vaulted parts. The paired dorsal spines are much shorter and are not connected with a keel. The posterior pad has a row of about fifteen minute spines.

*Pereonites 2 and 3* as in *spärcki*, but without the median spines interspersed between the long, slender ones dorsally, and with a similar row of about ten minute spines posteriorly as on prn. 1.

*Pereonite 4* has less vaulted antero-lateral corners and the spine here is more slender; there is also a



Fig. 30. Ischnomesus birsteini n.sp.; pereonites 5-7 and pleon of  $\mathcal{Q}$  holotype.



Fig. 31. *Ischnomesus birsteini* n. sp.; a, spine with thread-like hair; b, epipod of left maxilliped; c, pereopod I; d, operculum; e, pleopod 3.

very slender coxal spine, totally absent in *spärcki*. The same applies to two slender, outward-directed, postero-lateral spines. Finally, the armament, with its rather robust spines on the dorsal and lateral surface, is much more conspicuous. The spines are more or less arranged in six longitudinal rows, two lateral and four dorso-lateral. Developing oostegites on prns. 1-4; they are more swollen than normally.

*Pereonite 5* (Fig. 30) has the same remarkable furnishment of smaller spines in six rows as prn. 4; the two median ones are, however, not very evident. Near the anterior end is a dorsal, transversal, cutoff pad, resembling the edge of a thick fingernail; it is absent in *spärcki*.

*Pereonites*  $\delta$  and 7 both have a pair of long lateral spines, in addition to many shorter spines arranged in pairs.

*Pleon* (Fig. 30) shaped as in *spärcki*, but more heavily armed with spines. In particular, the anterior, lateral spines are much longer; there are four conspicuous spine-pairs dorsally, the oval, vaulted areas have laterally, a longitudinal row of spines, and the median hind margin is furnished with a long spine-pair and several short, symmetrically arranged spines. Ventrally, the pleons are equal in the two species except for the terminal face in *birsteini* being directed somewhat more backwards.

Antennula only a little longer than in spärcki and the three first joints have the same relative length. The second and third are, however, much more slender, being only half as thick as those of spärcki; their thin setae are longer and more numerous. The fourth joint is a little thicker and almost twice as long as each of the three distal ones. The flagellum consists of five joints;<sup>1</sup> their combined length is a little less than that of joint 2 of the peduncle. Antenna also has a more slender peduncle than in spärcki; e.g. joint 3 being four times longer than broad (compared to only three times in spärcki). Moreover, joint 3 is a little more than twice as long as joint 4, and at least the distal joints of flagellum are twice as long as broad (compared to only about one and a half times as long as broad). Their numbers are equal. The total length of the antenna (especially the flagellum), is relatively longer in birsteini. As in the antennula, the peduncle in birsteini has a greater number and longer setae, while the flagella of both species have very short sensory hairs only.

*Mandibles, maxillula, maxilla* and *maxilliped* very similar in the two species, but the maxilliped in *birsteini* somewhat shorter and broader; e.g. joint 2 being only one-seventh longer than broad (compared to one-fourth in *spärcki*). The epipod is also a little broader and more pointed (Fig. 31 b).

Pereopod I (31 c) has a considerably broader and more flattened carpus than in *spärcki*; it is more than twice as long as broad in the latter, compared to only one-third longer than broad in *birsteini*. In addition, it is furnished with three long and four short, strong spines. Both in shape and size of spines it closely resembles the carpus of *bispinosus* (SARS 1899, pl. 52).

Pereopods II-VII have, apart from a complete prp. VII, only the basipodites preserved. There is a marked difference in the length of the basipodites in *spärcki* and the present species. In *spärcki*, basis of prps. II and V are the shortest, while all remaining basipodites (and probably the entire appendages) are of equal length. However, in *birsteini* basis of prp. II is the shortest, followed by VII which is slightly longer, while basis of prps. III-VI are all of equal length. Only in *bispinosus* (and perhaps *bacillopsis*), is a similarly short pereopod VII found. Moreover, the basis is more slender in all the pereo-

<sup>1.</sup> Also in *bruuni* and (perhaps) *spärcki* the peduncle probably consists of two joints only, the flagellum being composed of eight and four joints, respectively.

pods of *birsteini*. The complete prps. VII are fairly equal in *birsteini* and *spärcki*, although in the former it is more slender and has a comparatively longer propodus.

*Operculum* (31d) between one-fourth and one-fifth longer than broad and with the proximal and distal ends straightly cut off. There is a low median keel, two short longitudinal keels near each of the proximal corners, and two shallow depressions laterally. – *Pleopod 3* according to Fig. 31e.

Uropod (Fig. 30) differs from that of *spärcki* in two respects: joint 1 is proportionately longer, being three-fifths the length of joint 2 (as compared with one half), and it is considerably more slender, being about twice as broad as joint 2. In addition, the setae on both joints are longer and more numerous.

*Size:* The total length is 14-15 mm, but owing to the damaged anterior part it is not possible to state the exact measurement.

#### Remarks:

There is no doubt that the present female is closely related to I. spärcki, agreeing in general appearance, and especially, in shape of head, pleon, mandibles, percopods and uropods, etc. However, apart from the very conspicuous difference in the spine length (which has very little or no specific bearing), there are many minor and some essential differences which bring me to the conclusion that the female belongs to a separate species. It differs from spärcki in the following important features: the antennulae, antennae, percopods and uropods are more slender (while contrariwise, the body is stouter and the maxillipeds shorter and thicker); the armament has much stronger spines and setae and in several places spines are found, which have no counterpart in spärcki – e.g. postero-lateral corners of pereonite 4 and coxae of pereopods IV, lateral parts of prn. 7 and hind margin of pleon. On prn. 1, however, the antero-lateral spines are shorter, and the armament with dorsal spines on prns. 1-3 is weaker. Prn. 5 has a transversal pad anteriorly and the carpus of pereopod I is differently shaped. The basis of prp. V is as long as that of III-VI and the basis of prp. VII shorter. The first joint of the uropod is longer and more slender.

There is yet another reason for regarding *birsteini* a different species: in spite of one of the two specimens of *spärcki*, from two different localities in the Kermadec Trench, being incomplete, a comparison between them showed absolute identity in all the

above-mentioned features where *birsteini* differs from *spärcki*. The affinity of *birsteini* to other species of *Ischnomesus* is identical with that of *spärcki*.

The species is named after Professor J. A. BIRSTEIN, Moscow, who not only described the magnificent, hadal species of the Ischnomesidae, collected by the *Vitjaz* Expeditions but has contributed so much to the knowledge of deep-sea crustaceans.

## Occurrence:

Kermadec Trench NE of New Zealand, 4410 m, 1.2°C.

## Ischnomesus sp. (Pl. III A; Text-fig. 32)

Ischnomesus sp. (Tasman Sea), WOLFF 1956a, p. 97.

#### Material:

Galathea St. 575, Tasman Sea (40°11 'S, 163°35 'E), 3710 m, 19 December 1951. Bottom: pteropod ooze. Bottom temp.:  $c. 1.1^{\circ}C. - 1$  fragmentary female.

## Description:

Only a fragment consisting of four perconites is present (Pl. III A). The integument is very fragile and milky white in colour.

*Pereonite 1* is broken; it is, however, evident that the lateral parts are as swollen as in *I.spärcki* Wolff (1. c., p. 94), but the antero-lateral spine is much shorter and the suture between the coalesced lateral parts and the coxae is distinct (not present in *spärcki* and *birsteini* n. sp.). Dorsally, the two spines on a connecting keel or pad are also shorter.

*Pereonite 2* without an antero-lateral spine, with the outer, dorsal spine-pair shorter than in *spärcki* and with no inner dorsal spines.

*Pereonite 3* has also a shorter lateral and outer, dorsal spine-pair than in *spärcki* and lacks the inner,



Fig. 32. Ischnomesus sp.; right percopod I.

dorsal pair although two minute nodules indicate their position.

*Pereonite 4* a little more than 1.5 times as long as broad, i.e. roughly as strong as in *birsteini* and considerably stronger than in *spärcki* (where it is twice as long as broad). The antero-lateral spine is small and the median, anterior spine-pair minute. Many dorsal and lateral nodules on the segment correspond to the spines in *spärcki* and *birsteini*.

Pereopod I present on the right side (Fig. 32). Carpus not very expanded, being more than twice as long as broad. Propodus also rather slender; dactylus short and with many setae on the inner side.

*Pereopods II-IV* have only basis preserved; in prp. II it is somewhat shorter than in prps. III and IV, where they are of almost equal length. Fully developed, transparent oostegites are present.

Size: When compared with the length of the similar pereonites of the two closely related species, *spärcki* and *birsteini*, the present fragment is of a remarkable size, being almost 1.5 times as long as the corresponding segments of the former species; accordingly, it is between 23 and 24 mm long. The maximum width (pereonite 2, at base of lateral spines) is about 4 mm.

#### Remarks:

According to the shape of the pereonites, it seems most likely that this fragment represents a subspecies of the hadal *I. spärcki*; it differs in the size and (to a minor extent), position of spines and in the shape of pereopod I. On the other hand, owing to the lack of head, posterior half of pereon, and pleon, a definite statement on its status, until further material becomes available, would be premature. The spined armament is reminiscent of that found in *I. decemspinosus* Menzies and *multispinis* Menzies (especially the latter, which also lacks lateral spines on prn. 2).

#### Occurrence:

Tasman Sea off New Zealand, 3710 m, c. 1.1°C.

## Ischnomesus anacanthus n. sp. (Pl. II H-J; Text-fig. 33)

Material:

Galathea St. 575, Tasman Sea ( $40^{\circ}11$  'S,  $163^{\circ}35$  'E), 3710 m, 19 December 1951. Bottom: pteropod ooze. Bottom temp.: c.  $1.1^{\circ}$ C. – 1 female consisting of head + four anterior perconites.

#### Description:

Body (Pl. II H-J). When compared with *I. bruuni* (the species probably most closely related to *ana-canthus*), it seems that both species are equally slender (i.e. about 8.5 times longer than broad), judging from the ratio between length of head + pereonites 1-3 and width of prn. 2; this ratio is, in both cases, 3:1. Colour milky white and integument very fragile.

*Head* longish – as in *bruuni* – but more rounded posteriorly.

*Pereonites 1-3* with strongly vaulted lateral parts; these are entirely devoid of the spines or processes. Prns. 2 and 3 subequal in shape, with two, abruptly cut off, convergent furrows separating the central area from the vaulted lateral parts; prn. 3 one-seventh longer than 2.

*Pereonite 4* broken; anteriorly, without spines and with the same dorsal furrows as 2 and 3. Laterally, on prns. 3 and 4, a distinct seam in the integument runs from the insertion of the leg to the posterior margin, forming a bend anteriorly (Pl. II J); this feature is not present in *bruuni*. Rather thick developing oostegites on prns. 1-4; those on prn. 1 being very small and insignificant.

Antennula (Fig. 33a) reaches backwards to the posterior margin of pereonite 3 only. Joint 1 short and thick and almost triangular. Joint 2 very long and slender, almost twice as long as all the succeeding joints together; it has some thin setae and a very long ventral spine distally. Flagellum of right antennula with six joints (the left one lacking).

Antenna – of which the peduncle only is preserved, is exactly as in *bruuni*.

Mandibles differ mainly from those of bruuni by the lack of palp. They are rather sturdy and somewhat s-curved (Fig. 33b), with the distal part rather compressed. Molar process strong and somewhat excavated (33e). Left mandible with a broad, spoonshaped incisive part with four teeth (33d) and nine closely-set spines in the spine-row. Movable lacinia with four teeth (33c) and a proximal projection forming what appears to be a hinge, with a nodule at the base of the incisive part. A similar projection is indicated on my fig. 7a of I. bruuni (1956a), and a more detailed figure of the feature is included here (Fig. 34). This figure also shows that bruuni has actually only nine spines in the spine-row, but three of them are more elaborate than in anacanthus. -Right mandible with a 5-dentate incisive part and seven spines – some of them with a very odd shape (33f).



Fig. 33. *Ischnomesus anacanthus* n. sp., ♀ holotype; a, antennula from outside; b-d, left mandible; b, from inside; c, movable lacinia in frontal view; d, apex in side view; e-f, right mandible; e, side view; f, apex in frontal view; g, inner lobe of maxillula; h, maxilla; j, labium; k, maxilliped.

*Maxillula* with two short, combed spines on the inner lobe (33 g). – *Maxilla* (33 h) with three strong, combed spines on each of the outer lobes and, at least, two similar, but shorter and stronger, spines on the inner lobe (one of them is partly hidden in the close tuft of setae – which may obscure more spines). None of the distal spines in *bruuni* (1. c., fig. 7c) are combed.

Labium (33j) rather thick, with the distal tuft of spines faintly combed.

*Maxilliped* with a narrower palp and broader epipod than in the other species. In Fig. 33k the maxilliped has been mounted on a slide allowing the sympod and the inner, distal part of the endite (which otherwise form a right angle with rest of the maxilliped), to be seen in the same plane. Near the distal margin of the endite is a row of combed spines which are difficult to focus. More of these are found on the inner distal corner, but it was impossible to make out their number. A close examination of the endite of *bruuni* revealed three (?) somewhat similar spines distally. Five coupling hooks.

*Pereopods I-IV* lacking, with the exception of the basipodites; of these that of prp. I is one-third shorter than that of II, which is again, one-eighth

shorter than the uniform length of the basipodites on prps. III and IV.

*Size:* In comparison with the closely related *bruuni*, the species seems to reach the considerable length of about 18.8 mm with a width of 2.3 mm across pereonite 2.

#### Remarks:

Although only the anterior half of the specimen is present I find conclusive evidence for regarding it as belonging to a distinct, new species, differing from all other species of *Ischnomesus* in lacking spines or processes on the (preserved) pereonites. Only *simplissimus* Menzies is also devoid of spines



Fig. 34. Ischnomesus bruuni Wolff; apex of left mandible.

on prn. 1, but it differs from *anacanthus* in having a palp on the mandible and five joints only in the flagellum of the antennula. As mentioned above, *anacanthus* seems in many respects closest to *bruuni*, but differs in the following major features: Lateral seam on pereonites 3 and 4; second joint of antennula very long, and flagellum with six joints instead of eight; mandibles without palp, and minor differences in number of teeth on the incisive part and movable lacinia and in shape of spines; combed spines on all remaining mouthparts, and narrower palp and broader epipod on the maxilliped.

#### Occurrence:

Tasman Sea off New Zealand, 3710 m, c. 1.1°C.

# *Ischnomesus roseus* n. sp. (Pl. III E-H; Text-figs. 35-37)

## Material:

Galathea St. 716, East Pacific Ocean off Costa Rica (9°23'N, 89°32'W), 3570 m, 6 May 1952. Bottom: dark, muddish clay. Bottom temp.: c.  $1.9^{\circ}$ C. – 1 fragmentary female consisting of head + four anterior pereonites (holotype). Galathea St. 726, Gulf of Panama (5°49'N,

*Galarhea* St. 720, Guil of Fahana (54) R, 78°52'W), 3270-3670 m, 13 May 1952. Bottom: clay. Bottom temp.: c. 2.0°C. – Pereonites 5-7 + pleon of female.

It is my opinion, albeit with some hesitation, that these two fragments belong to the same species. Given below is a separate description of each of them, followed by a discussion of their affinity to each other and to related species.

## Description of anterior half (St. 716).

Body (Pl. III E-F). The ratio between width and

length of preserved parts of the body indicates a slenderness comparable to that of *bruuni* and *ana-canthus*. Colour (after ten years in alcohol) white with a beautiful rosy to light green tinge, not seen in the other species.

Head and pereonites 1-4 exactly as in anacanthus, except that there is also a lateral seam on prn. 2. There is, further, a pointed process, too small to be called a spine, on the antero-lateral corner of the vaulted side parts of prn. 1. Rather thick developing oostegites on prns. 1-4.

Antennula and antenna. Of the former, only the first and most (if not all?) of the second joint is preserved; of the latter the peduncle is present. Their shape is akin to anacanthus.

*Mandibles* with palp, but otherwise rather similar in shape to those of *anacanthus*, although the keel from the distal, inner part of the molar process down to the basal area is considerably more pronounced (Fig. 35a). Joint 2 of the palp a little more than twice as long as joint 1 and with two distal spines. Joint 3 somewhat twisted and with six distal spines or setae (35d). Incisive part with five teeth (35b and f), movable lacinia with one very dominant tooth (35c), and spine-row with uniform spines – nine in the left and ten in the right mandible (35a and e).

Maxillula (36c) with thirteen serrated spines on the outer lobe, and three on the inner, one being conspicuously combed. – Maxilla as in anacanthus but with an extra (rather short) spine on the outer lobe. – Labium (36b) with a large number of fine, short hairs and faintly combed spines at the apex.

Maxilliped (36 a) has a very broad sympod and a rather slender palp. Endite with 11-12 combed spines and four coupling hooks (left mxp.) which have a peculiar hand-like shape. Epipod of the same general shape as in *anacanthus*, but almost as slen-



Fig. 35. Ischnomesus roseus n.sp.,  $\bigcirc$  holotype; a-d, left mandible; b-d, incisive part, movable lacinia and last joint of palp in frontal view; e-f, right mandible.

Fig. 36. Ischnomesus roseus n.sp.,  $\beta$  holotype; a, maxilliped; b, distal part of labium; c, maxillula.



der as in *armatus;* being more than three times longer than wide.

*Pereopod I* lacking the three distal joints. The relative length of the others as in *bruuni*, but setae on merus longer and more numerous. Only basis of prp. II preserved; it is (as in *anacanthus*) one-third longer than basis of prp. I.

*Size:* Compared with *bruuni* the specimen was probably *c*. 20 mm; the width across pereonite 2 is 2.3 mm.

### Description of posterior half (St. 726).

*Body* (Pl. III G-H). The ratio between the length of the present fragment and the width of pereonite 5 (anterior end) is only 7.7; this is considerably less than the ratio of 9.1 in *bruuni*. The integument is smooth, as the anterior half, but with a much fainter rosy tinge.

*Pereonite 5* has a lateral seam, stretching from the anterior margin to the leg. The fragmentary prn. 5 of the anterior half from St. 716 has a similar seam, not encountered in *bruuni*. The segment is a little more than three times longer than broad anteriorly. Neither on this, nor on the succeeding segments are there any postero-lateral spines.

*Pereonites 6 and 7* have the lateral parts, where the legs are inserted, bent considerably downwards; thus, they are only one-third broader than long, and prn. 7 almost rectangular in dorsal view (Pl. III G).

Pleon with the first segment ring-shaped and more than three times broader than long. Pleotelson more slender than is usual in the genus, being almost twice as long as wide; it is one-seventh longer than pereonites 6 + 7. Its median part is almost as broad as the pereonites and with parallel margins, although it does have a slight convexity anteriorly. In side-view it shows the same convexity throughout as *bruuni*. Near the ventral side there is a widening to receive the operculum, which is considerably shorter than the entire segment (Fig. 37).

Pereopods VI and VII have the basipodites present. They are of uniform length (as in *bruuni*, *spärcki*, and *bacillus*), but that of prp. VII is a little more slender. The total length of the appendages is certainly less than in *bruuni* – judging from a comparison between length of basis and height of the corresponding pereonite, indicating the total leg length in *roseus* to be only about two-thirds of that in *bruuni*. The basipodite of prp. II in the holotype from St. 716 shows a similar difference in comparison with *bruuni*.

*Operculum* (37) pear-shaped and flat, except for two longitudinal, low convexities towards the proximal end.

Uropods lost, the innermost part of the right one can be seen on Fig. 37.



Fig. 37. Ischnomesus roseus n.sp.; pereonite 7 and pleon of  $\Im$  from St. 726 (x, ? excrement).

*Size:* The length of perconites 5-7 and pleon is 4.6 mm which (in comparison with *bruuni*) gives a total length of about 8.7 mm.

#### Remarks:

Although the size of the posterior fragment is considerably less than that of the anterior, its rosy tinge is less pronounced and it seems relatively broader, I consider it most probable that owing to the shape of the pereonites and the relative length of the legs, etc. the two fragments belong to one species. The species differs mainly from *anacanthus* in colour, presence of palp on mandible, and shape of maxilliped; from *bruuni*, in colour, lack of spines on the pereonites, and in the presence of combed spines on all mouthparts, and from *simplissimus*, with which it seems most closely related, it differs in colour, shape of pleotelson and length of joint 3 of palp on mandible.

## Occurrence:

Off Pacific Central America and Gulf of Panama, 3270-3670 m, 2.0°C.

Ischnomesus planus n. sp. (Pl. III J; Text-fig. 38)

Material:

Galathea St. 716, East Pacific Ocean off Costa Rica (9°23'N, 89°32'W), 3570 m, 6 May 1952. Bottom: dark, muddish clay. Bottom temp.: c. 1.9°C. – 1 pleon of a female.

## Description:

In addition to a mutilated fragment of pereonite 7 only the two pleonites are preserved. The surface of the integument consists of tiny polygons visible only at great magnification (Fig. 38a); the colour is not completely white, but faintly yellowish.

Pleon. The visible part of the anterior pleonite is

ring-shaped and about three times broader than long. Pleotelson (Pl. III J) is pear-shaped, about one third longer than broad, with a median, vaulted area stretching longitudinally to the posterior end. In front of this it widens a little, thus closely resembling the pleon of the female of *Haplomesus quadrispinosus* (G.O.Sars). The lateral parts are planed. Ventrally, the operculum covers the whole underside, leaving only a very restricted area for the terminal face and the insertion of the uropods. The operculum is even a little broader than pleotelson.

*Operculum* (Fig. 38 b) almost circular, only a trifle longer than broad, with a low bend posteriorly. It is flat, except for a median, low, longitudinal keel.

*Pleopod 3* according to Fig. 38c; the outer branch is very short (as in *bruuni*) and apparently there are no distal setae on the inner.

Uropod (38d) with the second joint one-third longer and one-third narrower than the first.

Size: In the other species of *Ischnomesus* pleotelson takes up between one-sixth and one-seventh of the total length. Thus, the present pleon probably comes from a giant specimen of around 35-40 mm – by far the largest size of any representative of the family (cf. p. 230).

## Remarks:

The two, non-coalesced segments of pleon and the 2-jointed uropods clearly refer the present fragment to *Ischnomesus*. Due to the scanty remnants it may seem irrelevant to name it, but since I am convinced that the large size and the circular, flattened shape of the pleotelson separate it from any other known species of the genus with a preserved pleon, it will be easily recognizable in the future.

#### Occurrence:

Off Pacific Central America at a depth of 3570 m and a temperature of about  $1.9^{\circ}\text{C}$ .

Fig. 38. *Ischnomesus planus* n.sp., ♀ holotype; a, detail of structure of integument of operculum; b, operculum; c, pleopod 3; d, uropod from below.





#### Bactromesus n. gen.

Diagnosis:

Shape of body as in *Stylomesus* (WOLFF 1956a, p. 97). All perconites free and movable and prn. 7 not fused with pleon. This consists of two segments which are fused. Antennulae with two joints only,

thus without flagellum. Maxillipeds as in *Stylome-sus*. Carpus of pereopod I of almost equal width throughout. Uropods 2-jointed. (Cf. discussion above, p. 72).

Type species: Stylomesus gracilis Birstein.

## Key to the species of Bactromesus

#### Genus Stylomesus Wolff, 1956

Diagnosis – as WOLFF 1956a (p. 97), with the exception that the pleon consists of two *or three* tennula.

#### Key to the species of Stylomesus

| 2 | I. Pleon composed of two fused segments                                                                 | 1. |
|---|---------------------------------------------------------------------------------------------------------|----|
| 4 | 1. Pleon composed of three fused segments                                                               | 1. |
|   | 2. Pereonite 5 three times longer than its greatest width. Posterior pereonites and pleon strongly      | 2. |
|   | granulate granulosus Menzies, 1962 b                                                                    |    |
|   | 2. Prn. 5 less than twice as long as its greatest width. Posterior pereonites and pleon, at most, mode- | 2. |
| 3 | rately granulate                                                                                        |    |
|   | 3. Lateral margins of pleotelson convex. Peduncle of uropod reaching, at least, to end of pleon.        | 3. |
|   | Apex of male pleopods 1 with a lateral projection and 5-6 apical setae inermis (Vanhöffen, 1914)        |    |
|   | 3. Lateral margins of pleotelson concave. Peduncle of uropod does not reach end of pleon. Apex of       | 3. |
|   | male plps. 1 with rounded postero-lateral corners and three apical setae pacificus Birstein, 1960       |    |
|   | 1. Prn. 5 less than three times longer than its smallest width. Apex of male plps. 1 without projec-    | 4. |
|   | tionsimplex Menzies, 1962b                                                                              |    |
|   | 4. Prn. 5 more than three times longer than its smallest width. Apex of male plps. 1 with a lateral     | 4. |
| 5 | projection                                                                                              |    |
|   | 5. Pleotelson subcircular and its apex between the uropods broadly trian-                               | 5. |
|   | gular regularis Menzies, 1962 b                                                                         |    |
| 6 | 5. Pleotelson with apex produced backwards, evenly rounded                                              | 5. |
|   | 5. At most one-fourth of peduncle of uropods reaching beyond apex of pleotelson; inner margin of        | 6. |
|   | peduncle spinulate spinulosus Menzies, 1962b                                                            |    |
|   | 5. At least one-third of peduncle of uropods reaching beyond apex of pleotelson; inner margin of        | 6. |
| 7 | peduncle smooth                                                                                         |    |
|   | 7. More than half of peduncle of uropods reaching beyond apex of pleotelson. Lateral margin of          | 7. |
|   | male plps. 1 with two lobes at distal half productus Menzies, 1962b                                     | _  |
|   | 7. Less than half of peduncle of uropods reaching beyond apex of pleotelson. Lateral margin of          | 7. |
|   | male plps. 1 with only one distinct lobe at distal half simulans Menzies, 1962b                         |    |
|   |                                                                                                         |    |

MENZIES' key (1962b) has been substituted by the above, partly to include *pacificus* and partly since only male specimens could be determined from it. Moreover, it was stated that *spinulosus* has no lateral projections on the male pleopods 1. I found considerable difficulty in separating the species *pro*- *ductus* and *simulans* as only the posterior half of each is available. MENZIES stated that they have a close connexion but *productus* has "two large swellings behind apex", *simulans* only one. According to MENZIES' fig. 26 C and E, this difference is not very convincing. Most of MENZIES' new species of *Stylomesus* were described on fragmentary specimens. Their total length has been calculated in the same way as in *Ischnomesus* (p. 75):

| S. productus 3:               | <i>c</i> . 4.8 mm |
|-------------------------------|-------------------|
| S. simulans 3:                | c. 4.6 mm         |
| S. spinulosus $\mathcal{Q}$ : | <i>c</i> . 3.7 mm |
| S. simplex 3:                 | <i>c</i> . 3.6 mm |

## Stylomesus inermis (Vanhöffen, 1914) (Pl. III D)

In the re-description of this species (WOLFF 1956a, p. 98), it was stated that joint 3 of the antennula was only a trifle narrower than joint 2 and one-third as long. In actual fact, the peduncle consists of two joints only, the second having a distinct narrowing one-third the distance from the distal end, but no articulation. As stated, the flagellum is 3-jointed, or with perhaps, a tiny joint distally. Since only one antenna is preserved in the holotype it was not dissected. MENZIES (1962b, p. 123) does not mention the antennulae in the *Vema* specimens he examined.

A photograph of the holotype is shown on Pl. III D.

## Stylomesus pacificus Birstein, 1960

Stylomesus inermis pacificus Birstein, 1960, p. 18, figs. 12-13.

When BIRSTEIN described *pacificus* as a subspecies of *inermis* he had access to two descriptions of *inermis* (VANHÖFFEN 1914 and WOLFF 1956a), both, however, based on the female holotype only. MEN-

ZIES (1962b) also described the male of *inermis*; a comparison between BIRSTEIN's fig. 13 and MENZIES' fig. 23 B and D of the male pleopods 1 and 2, clearly indicates that *pacificus* should be regarded as a separate species. The somewhat dissimilar shape, the relative size of pleon and the shorter uropods in *pacificus*, support this belief (cf. the key above).

#### Gomphomesus n. gen.

Diagnosis:

Body moderately slender. Pereonites 1-6 mutually free and movable, prns. 6 and 7 and the pleonites fused. Pleotelson longer than broad. Antennulae with six joints. Maxillipeds as in *Stylomesus* (WOLFF 1956a, p. 97). Carpus of pereopod I of almost equal width throughout. Uropods 2-jointed. (Cf. discussion above, p. 72).

Type species: Stylomesus wolffi Birstein.

#### Helomesus n. gen.

Diagnosis:

Shape of body as in *Stylomesus* (WOLFF 1956a, p. 97). Pereonites 1-5 all free and movable; prns. 5-7 and the pleonites fused. Pleotelson broader than long. Antennulae with six joints.<sup>1</sup> Carpus of pereopod I of almost equal width throughout. Uropods 2-jointed. (Cf. discussion above, p. 72).

#### Type species: Stylomesus menziesi Birstein.

1. GURJANOVA (1946, p. 294) stated, regarding the antennulae in *gorbunovi*, that the "third joint is very long, four times as long as the second joint; flagellum 3-jointed". However, her fig. 2 (p. 273) indicates clearly that the peduncle is of the usual shape, with the second joint very long, and, also, that the flagellum is 4-jointed.

## Key to the species of Helomesus

Perconite 1 with a pair of long spines. Antennulae reaching backwards to the front margin of prn. 4. Length of uropods less than one-fourth the width of pleotel-

son..... gorbunovi (Gurjanova, 1946) Prn. 1 without spines. Antennulae do not reach the front margin of prn. 1. Uropods more than half the width of pleotelson..... menziesi (Birstein, 1960)

#### Genus Heteromesus Richardson, 1908

Diagnosis - see HANSEN 1916, p. 66.

#### Remarks:

In his diagnosis, MENZIES (1962b) stated that pleon has only one segment. In *dentatus* there are prob-

ably three and in all the remaining nine species there are two segments.

MENZIES transferred three of BIRSTEIN'S new species of *Haplomesus* (1960) to this genus without commenting on the reasons. I do not consider this move justified for the following reasons: (1) BIR-STEIN'S figs. 3 and 6 of *gigas* and *robustus* show pereonites 5 and 6 to be fused, as they are in Haplomesus. In his fig. 5 of the third species, scabriusculus, not only prns. 5 and 6 but also prns. 6 and 7 and prn. 7 and pleon are drawn to give the impression that they are free and movable. If this really is the case, scabriusculus cannot belong to Heteromesus either (here prns. 6 and 7 and prn. 7 and pleon are fused). I doubt whether prns. 5-7 and pleon are actually free: BIRSTEIN's new subspecies, Haplomesus insignis orientalis (fig. 10) is shown with prns. 5-7 free. In the nominal species (to which the subspecies has a definite relation), they are all fused with each other (HANSEN, pl. V, 3a). Furthermore, in all three species (2) flagellum of antennula is with four joints, (3) first joints of palp of maxilliped are expanded and (4) carpus of pereopod I is normal, as in Haplomesus (in Heteromesus the flagellum has 2-3 joints, the palp is narrow and the carpus greatly expanded, reaching its broadest point just beyond the middle).

MENZIES' key to the species (1962b) has been substituted with the key given below for the following reasons: (1) MENZIES separated similis and dentatus by the presence of two lateral spines on each side of perconite 1 in the former, one in the latter; dentatus also has two lateral spines, although one is rather small. (2) spinosus was ranged under species without lateral spines on pleon; it has a distinct one on each side. (3) longiremis cannot be separated from the following species by the elongated uropods, those in the female being no more elongated than in, e.g. the male of frigidus. (4) greeni and frigidus were separated from granulatus and schmidti in having two lateral spines on pereonite 1, while the latter two have only one. However, in greeni there is also one spine only and in *frigidus* there is only one spine in the male and one spine and a tubercle in the female. (5) granulatus and schmidti cannot be separated by the uropods; in the male of granulatus they are practically as elongated as in schmidti.

#### Key to the species of *Heteromesus*

| 1. | Pleon with a lateral spine or spine-like projection on each side well in front of the insertion of |    |
|----|----------------------------------------------------------------------------------------------------|----|
|    | the uropod                                                                                         | 2  |
| 1. | Pleon without lateral spines or spine-like projections                                             | 5  |
| 2. | Pereonite 1 with three lateral spines on each side and two transverse rows of small dorsal spines. |    |
|    | Prn. 5 with two longitudinal rows of dorsal spines spinosus (Beddard, 1886a)                       |    |
| 2. | Prn. 1 with, at most, two lateral spines and a few dorsal spines. Prn. 5 without spines            | 3  |
| 3. | Apex of pleon concave. Lateral margins immediately behind projections on pleotelson                |    |
|    | serratedbifurcatus Menzies, 1962b                                                                  |    |
| 3. | Apex of pleon convex. Lateral margins behind projections not serrated                              | 4  |
| 4. | Lateral margins of prn. 4 without distinct spines, those of prn. 7 with one spine                  |    |
|    | each dentatus Hansen, 1916                                                                         |    |
| 4. | Lateral margins of prn. 4 with four spines each, those of prn. 7 without                           |    |
|    | spines similis Richardson, 1911 a                                                                  |    |
| 5. | Prns. 2 and 3 with one or two rows of small dorsal protuberances (at least three)                  | 6  |
| 5. | Prns. 2 and 3 granulated, without protuberances                                                    | 9  |
| 6. | Prns. 2 and 3 with three protuberances, prn. 1 with one in the female schmidti Hansen, 1916        |    |
| 6. | Prns. 2 and 3 with at least five protuberances                                                     | 7  |
| 7. | Uropods curved somewhat inwards. Prn. 1 with one antero-lateral                                    |    |
|    | spine frigidus Hansen, 1916, male                                                                  |    |
| 7. | Uropods straight or curved slightly outwards. Prn. 1 with two lateral spines on each side (un-     |    |
|    | known in longiremis)                                                                               | 8  |
| 8. | Prns. 2 and 3 with 2-3 rows of protuberances. Length of uropods, at most, half the maximum         |    |
|    | width of pleon spinescens Richardson, 1908 b                                                       |    |
| 8. | Prns. 2 and 3 with one row of protuberances. Uropods more than half the width of                   |    |
|    | pleon longiremis Hansen, 1916                                                                      |    |
| 9. | Prn. 1 with a lateral tubercle behind the antero-lateral spine. Uropods curved somewhat in-        |    |
|    | wards. Flagellum of antennula with one minute joint frigidus Hansen, 1916, female                  |    |
| 9. | Prn. 1 only with a pair of antero-lateral spines. Uropods straight                                 | 10 |

- 10. Flagellum of antennula with one minute joint. Length of prn. 5 in the female less than 1.1 times the max. width...... granulatus Richardson, 1908 b

MENZIES' new species, *bifurcatus*, described on a female fragment, has an estimated total length of about 8 mm.

#### Genus Haplomesus Richardson, 1908

Diagnosis – see HANSEN 1916, with the exclusion of length of joint 3 of antenna and length of maxil-lipedal palp.

Remarks:

In his diagnosis of the genus, MENZIES (1962b)

stated that joint 3 of the first antenna (misprint for second) is elongate, two and a half times or more longer than joint 4. However, in his new species, *tropicalis*, it is less than twice as long as joint 4 (fig. 20 M). He also stated that pleon has only a single segment. This is the exception rather than the rule, since at least *angustus*, *insignis*, *gigas*, *robustus* and probably *quadrispinosus*, have two segments; *tenuispinis*, and probably *modestus*, have three.

The following key has been prepared to substitute MENZIES' key which does not include BIRSTEIN'S many new species.

#### Key to the species of Haplomesus

| 1   | Pereonite 3 with lateral oblique forward-directed spines                                          | 2  |
|-----|---------------------------------------------------------------------------------------------------|----|
| 1   | Prn 3 without this kind of spine                                                                  | 7  |
| 2   | Prn 4 with lateral spines                                                                         | 3  |
| 2   | Prn 4 without lateral spines                                                                      | 5  |
| 3.  | Body smooth. Apex of pleon evenly rounded modestus Hansen, 1916                                   |    |
| 3.  | Body with tubercles. Apex of pleon with two processes                                             | 4  |
| 4.  | Lateral margins of pleotelson smooth brevispinis Birstein, 1960                                   |    |
| 4.  | Lateral margins of pleotelson with three backward-pointing teeth thomsoni (Beddard, 1886b)        |    |
| 5.  | Apex of pleon medianly incised bifurcatus Menzies, 1962b                                          |    |
| 5.  | Apex of pleon truncated or rounded                                                                | 6  |
| 6.  | Dorsal part of pleotelson with a single median swelling quadrispinosus (G.O.Sars, 1879)           |    |
| 6.  | Dorsal part of pleotelson with paired carinae medianly ornatus Menzies, 1962b                     |    |
| 7.  | Prn. 4 with distinct lateral spines                                                               | 8  |
| 7.  | Prn. 4 without distinct lateral spines (sometimes with rounded processes)                         | 11 |
| 8.  | Prn. 6 less than twice as broad as long. First pleonite with a pair of dorsal                     |    |
|     | spines tenuispinis Hansen, 1916                                                                   |    |
| 8.  | Prn. 6 more than twice as broad as long. First pleonite without spines                            | 9  |
| 9.  | Lateral spines on prns. 1 and 4 short, no longer than wide, directed forwards. Lateral margins of |    |
|     | prns. 2 and 3 rounded. Joint 3 of antenna short, only about twice as long as                      |    |
|     | broad tropicalis Menzies, 1962 b                                                                  |    |
| 9.  | Lateral spines on prns. 1 and 4 long and strong, 3-4 times longer than broad. Lateral margins     |    |
|     | of prns. 2 and 3 acute. Joint 3 of antenna elongated, almost five times longer than broad         | 10 |
| 10. | Apex of pleon not projecting beyond uropods. Joint 3 of antennula as long as joints 4-6 com-      |    |
|     | bined insignis insignis Hansen, 1916                                                              |    |
| 10. | Apex of pleon projecting beyond uropods. Joint 3 of antennula about as long as joints             |    |
|     | 4, 5 or 6 insignis orientalis Birstein, 1960                                                      |    |
| 11. | Body extremely elongated. Pleon almost triangular, with strong, postero-lateral                   |    |
|     | spines angustus Hansen, 1916                                                                      | 10 |
| 11. | Body fairly robust. Pieon subcircular, oval or rhomboldal                                         | 12 |
| 12. | Lateral spines on prn. I large, projecting beyond the nead. Distinct lateral spines on prns. 2    |    |
|     | and 3. Pleon subcircular <i>cornutus</i> Birstein, 1960                                           |    |

| 12. | Lateral spines on prn. 1 short and inconspicuous. No lateral spines on prns. 2 and 3. Pleon oval |    |
|-----|--------------------------------------------------------------------------------------------------|----|
|     | or rhomboidal                                                                                    | 13 |
| 13. | Pleon oval, twice as long as broad. Joint 2 of antennula without setae on the inner              |    |
|     | margin gigas Birstein, 1960                                                                      |    |
| 13. | Pleon rhomboidal, only slightly longer than broad. Joint 2 of antennula with two or three long   |    |
|     | setae on the inner margin                                                                        | 14 |
| 14. | Apex of pleon with two projections. Median part of prns. 1-4 with short spines. Joint 2 of an-   |    |
|     | tennula with two long setae on the inner margin scabriusculus Birstein, 1960                     |    |
| 14. | Apex of pleon rounded. Median part of prns. 1-4 without spines. Joint 2 of antennula with        |    |
|     | three long setae on the inner margin                                                             |    |

## Haplomesus thomsoni (Beddard, 1886) (Text-fig. 39)

RICHARDSON (1908 b) referred BEDDARD'S Ischnosoma thomsoni to Heteromesus. In 1960 BIRSTEIN transferred it to Haplomesus as the posterior end of pleotelson resembled that of the new species Hapl. gigas and scabriusculus, and the margins of pleotelson and the armament of perconite 1 were as in Hapl. robustus. MENZIES (1962 b) referred it to Heteromesus.

BEDDARD (1886 b, p. 171) stated that the anterior part of pleon "forms a distinct free abdominal segment". In order to check the possible coalescense of prns. 5-7 and the pleonites, I asked Mr. R. W. INGLE of the British Museum (Nat. Hist.) to study the holotype and only specimen. He was kind enough to inform me that, as far as he could see, the pereonites were separated dorsally but there appeared to be no ventral sutures (Fig. 39 c), although the discoloured balsam made observation difficult (the specimen was mounted on a slide and in a poor state). Thus, BIRSTEIN is correct in transferring *thomsoni* to *Haplomesus*. Two other sketches sent by Mr. INGLE give a general impression of the present appearance of the holotype (39a), and a dorsal aspect of the posterior part, showing the actual shape of pleon and indicating a break in pereonite 7 (39b).

*H. thomsoni* is very close to *brevispinis* Birstein in general shape (cf. the key above), and they may be conspecific. Unfortunately, the antennulae, antennae, mouthparts and pleopods are unknown in *thomsoni*.

## Haplomesus modestus Hansen, 1916 (Pl. III B-C; Text-fig. 40)

Found among the unidentified material from the *Ingolf* Expedition was a tube containing the posterior half of both a female and a male from St. 24. HANSEN himself had written on the label (translated): "I. dubius n. sp.  $\mathcal{J}, \mathcal{Q}$ . Too poor for description." The fact that pereonites 5-7 and pleon are fused is evidence enough that the fragments do not belong to *Ischnomesus*, but to *Haplomesus*, and within the latter, most probably to *modestus*. The description of this species (HANSEN 1916, p. 65, pl.



Fig. 39. *Haplomesus thomsoni* (Beddard); a, male holotype; b-c, posterior part from above and below. (R.W.INGLE, British Museum, del.).



Fig. 40. *Haplomesus modestus* Hansen; ♀ from *Ingolf* St. 24; a, posterior part from below; b, operculum; c, pleopod 3.

V, 5a-b) was based on a fragmentary subadult female specimen, consisting only of pereonites 2-7 and pleon; it was taken by the *Ingolf* at the same station (24).

## Comparison of females:

Body (Pl. III B). The holotype is considerably more slender than the adult female; the ratio between the length of percentes 4-7 + pleon and the maximum width (a), and between this length and the minimum width (b) is:

|         | type ♀ | adult 🗣 | adult 🕉 |
|---------|--------|---------|---------|
| ratio a | 5.0    | 4.8     | 6.9     |
| ratio b | 12.5   | 6.2     | 10.3    |

Thus, the difference between minimum and maximum width, especially of pereonites 4 and 5, is much less in the adult female. The relative length of the segments is almost equal. The integument is much more calcified in the adult female.

*Pereonites.* In the adult female, prn. 4 lacks the tiny acute processes, and prn. 5 is of almost equal width throughout, except at the distal end. The sideparts of prn. 6 are about equally swollen in both specimens, i.e. considerably more so in the type than in HANSEN's fig. 5a.

*Pleon* exactly as in the type, except that on the underside the proximal part of pleotelson (surrounding the branchial opening) is raised like a pad and that the thick, articulated spine on the postero-lateral corner is longer (Fig. 40a). The anal opening is triangular.

*Pereopods*. All the basipodites are present. Those of pereopods V and VI are of equal sturdiness and length, those of IV are stronger and one-tenth shorter, while on prp. VII they are more slender and one-seventh shorter.

Operculum (40b) evenly vaulted and with a more

straightly-cut hind margin than in HANSEN's fig. 5b. However, in the text HANSEN writes (p. 65): "- the posterior margin, long and very feebly convex." About ten feathered setae on the posterior margin.

*Pleopod 3* (40c) rather short and broad. Exopod with one joint only.

Uropod shorter than in the type, hardly reaching as far back as the posterior margin of pleon (40a).

#### Description of male:

*Body* (Pl. III C) considerably more elongated than in the adult female (see statement of ratio above). Integument more transparent and probably less calcified than in the female.

*Pereonites and pleon.* Prn. 4 is not very broad proximally, prn. 5 is, except posteriorly, equally broad throughout. Otherwise pereonites and pleon are as in the adult female.

*Pereopods.* Only basis of prp. VII is preserved; it is a little longer but much more slender than in the adult female. No male pleopods were preserved.

Size: Female fragment is 2.8, male fragment 2.7 mm. In comparison with female and male of H. quadrispinosus, the total length of the adult female was about 3.8 mm and that of the adult male about 3.6 mm.

## Remarks:

Although the adult female differs from the type specimen in being less slender, lacking the small processes on pereonite 4 and having shorter uropods, I am convinced that they belong to the same species. They were, moreover, dredged in the same locality.

#### Occurrence:

Davis Strait (63°06 'N, 56°00 'W), 2258 m, 2.4°C.

#### Mixomesus n. gen.

Diagnosis:

Body rather broad, pereonites 1-4, in particular, of considerable width. All pereonites free and movable and prn. 7 not fused with pleon. This consists of two segments which are fused. Antennulae with five joints in the peduncle. Third joint of antennae only slightly longer than the others. Maxillipeds with a not very large sympod, the endite at least as long as broad, and less than half as broad as the sympod; the palp at least as long as the sympod, with joints 2 and 3 greatly expanded. Pereopods I unknown. Uropods not developed.

## Remarks:

With regard to the general shape of the body and the antennae, this new genus should be referred to Ischnomesidae. It resembles *Heteromesus* in the considerable width of the pereonites and *Ischnomesus* in the shape of the maxilliped and palp. Due to the transparency and softness of the integument it is rather difficult to decide whether pereonites 5-7 are free or not. However, it is fairly certain that they are free and movable and that there is also an articulation between prn. 7 and pleon. Furthermore, the two pleonites are definitely fused, i.e. analogous to those found in *Bactromesus* n. gen. *Mixomesus* does differ, nevertheless, from all other genera in having a 5-jointed peduncle in the antennula and in total lack of uropods.

## Mixomesus pellucidus n. sp. (Text-figs. 41-42)

### Material:

Galathea St. 626, Tasman Sea ( $42^{\circ}10$  'S, 170°10 'E), 610 m, 20 January 1952. Bottom: Globigerina ooze. Bottom temp.: c. 7.6°C. – 1 female.

## Description:

Body (Fig. 41 a) flattened and roughly as elongated as in the *Heteromesus* females, the ratio between length of animal and width of first perconite being 4.7. The integument not brittle as in the abyssal species of this family. The posterior part of the alimentary canal and the ovaries (with 36 eggs) clearly visible through the integument.

*Head* broader than long, deeply embedded in pereonite 1; the lateral sutures clearly visible, the posterior one inconspicuous.

*Pereonites 1-3.* The first is broadest, the third longest medianly. No spines on the segments.

*Pereonite 4* a little mutilated and probably slightly broader posteriorly than shown in Fig. 41a. Its width, anteriorly, is the same as its total length. Developing oostegites on prns. 1-4.

*Pereonites 5-7* probably free. Prn. 5 one-fourth longer than 4 and 2.5 times longer than prns. 6+7.

*Pleotelson* one-ninth longer than broad. Medianly, there is a longitudinal convex area, less than onethird of the maximum width of pleon and bent somewhat upwards posteriorly. On the ventral side only pleopods 3 and 4 remain, probably indicating that the lost operculum covered the entire ventral part of pleon.

Antennula (41 b) with a short and thick first joint

as in the other species of the family. However, in place of the usual, very long joint 2 and the moderately long and somewhat narrower joint 3 found in a few species of the family (especially in *I. spärcki* and *paucispinis*), there are four elongated joints of almost equal length and width. These must all belong to the peduncle and are followed by a short flagellum with two joints only. The long peduncular joints are furnished with many long and fine setae.

Antenna (41 c) has only the peduncle preserved. Joint 1 as broad as and half as long as 2. Joint 3 somewhat narrower and only 1.7 times longer than 4; on its underside is a small nodule with one seta; this is perhaps a squama.

*Mandibles* rather sturdy, with a moderately long molar process. Spine-row of the *right mandible* with two stout spines (with a row of fine nodules) and three slender ones (42a); four irregular teeth in the incisive part (42b). In the *left mandible* this is more spoon-shaped (42c); movable lacinia with three teeth (42c-d), and spine-row with four slender spines, one being conspicuously combed (42e).

Maxillula and distal end of labium according to Fig. 42f and g.

Maxilliped (42h) almost as in Ischnomesus, with



Fig. 41. Mixomesus pellucidus n.gen., n.sp.; a, ♀ holotype from above; b, antennula from above; c, antenna from below; d, pleopod 3.



Fig. 42. *Mixomesus pellucidus* n.sp.; a-b, right mandible; b, incisive part from outside; c-e, left mandible, incisive part, movable lacinia and spine-row; f, maxillula; g, apex of labium; h, maxilliped.

the sympod one-fifth longer than broad. Endite less than half as broad as the sympod, with two coupling hooks (left mxp.); three combed spines and three short setae terminally. Palp about one-eighth longer than the sympod (not including the endite). It has unusually few setae on the inner margin of joints 2 and 3. Epipod very narrow, especially in the proximal part, and has a bend near apex.

*Pereopods.* Only the basipodite of prps. I, II, and III is preserved. The former is one-sixth shorter than the other two, which are of about equal length.

*Pleopod 3* (41d) with probably only two, very short, distal setae on the inner branch and none on the outer.

*Uropods* are absent. On each side of the very small anal face is a tiny groove, probably indicating the place of insertion, but there is no break in the integument indicating that the uropods have been torn off; it is, indeed, obvious that they were not developed.

Size: 5.5 mm long and 1.2 mm across pereonite 1.

## Remarks:

This species is clearly separated from all the others by the features of the genus. At present it is impossible to state its closer affinity to any of the other genera.

#### Occurrence:

Tasman Sea off New Zealand, 610 m, c. 7.6°C.

## FAMILY MACROSTYLIDAE

Macrostylini Hansen, 1916, p. 74; WOLFF 1956a, p. 99.

Macrostylidae Gurjanova 1933b, p. 411 (pars); MENZIES 1962a, p. 28; 1962b, p. 127.

#### Diagnosis:

Head free, broader than long. Body elongated and sharply subdivided between pereonites 3 and 4, prns. 1-3 thus constituting a separate subquadrangular section with the segments fused or only slightly movable. Pleon with one subquadrangular segment and with anus separated from branchial cavity and situated in a longitudinal excavation stretching to apex of pleon. Eyes lacking. Antennulae short or minute, with 3-5 joints. Antennae short or only moderately long, with three short and two long joints in flagellum; squama absent. Mandibles with molar process reduced, subacute and setiferous on apex; palp lacking. Maxillipeds with a long and narrow basipod, endite and epipod; joints 1-3 of palp expanded and joints 4-5 minute. Pereopod III fossorial, strongly setiferous, and, ischium in particular, extended laterally and furnished with a strong spine. Prp. IV shorter than all other legs (except occasionally prp. I?). Male pleopods 1 long and narrow; female operculum oblong. Uropods elongated, uniramous, 1-, 2- or manyjointed.

Remarks:

This family which contains only one genus, *Macrostylis*, is unique in having the body subdivided between pereonites 3 and 4, a ventral furrow on pleon and marked differences in the shape and length of the legs. None of these characters were pointed out in MENZIES' recent diagnosis of the family (1962 b, p. 127), although he did mention that prp. IV was shorter than the others in his diagnosis of the genus. He stated that the uropods are 2-jointed; in *hadalis* they are 1-jointed, in *elongata* many-jointed, in all other species where they are preserved they are 2-jointed.

One species, *spiniceps* Barnard, 1920, differs in three respects from the others: (1) the postero-lateral corners of pereonites 1-3 are subacute, the lateral margins of the three first segments thus not forming an almost uninterupted convex line; (2) the antennulae are rather long, the last joint being longer than the others; (3) joint 3 of the antennae is as long as joints 1 and 2 combined. However, since *spiniceps* seems to agree with the other species in all other respects, it does not, in my opinion, warrant the establishment of a separate genus.

The reasons for not including *Pseudomesus* in Macrostylidae are given below (p. 93).

#### Genus Macrostylis G.O.Sars, 1864

Synonymy – see WOLFF 1956a, p. 99.

MENZIES (1962b) prepared a key for the species. In couplet 13 he stated with reference to M. abyssicola that the head is "quadrate in shape, as wide in front as behind". This is not so in the female, whose head is almost semi-circular (HANSEN 1916, pl. VII, 2a). M. abyssicola can, however, be distinguished from the remaining four species in the key in the following way: from galatheae, in having a ventral process on pereonite 1, etc. - cf. my key (1956a, p. 99); from latifrons, in the length of the pleon and the length and number of joints in the antennula (cf. my key); from elongata, in pereonite 4 being broader than the succeeding segments and the uropod being 2jointed only; from bipunctatus, in having the postero-lateral corners of the head pointed and with a seta, and the lateral margins of pleon being subparallel or concave distally.1

Furthermore, it is not known whether statocysts are present or absent in *latifrons;* in his original description BEDDARD may easily have overlooked them and the present state of the only available specimen is too poor to ascertain their presence or absence (WOLFF 1956a, p. 102). Thus, this character cannot be used to distinguish *latifrons* from *elongata* in the key, but they do differ markedly in body shape: *latifrons* has pereonite 4 broader than the succeeding segments, *elongata* prn. 4 distinctly narrower.

In that part of the *Ingolf* material unidentified by H.J. HANSEN, were two fragments belonging to this genus. One belongs to M. subinermis and the other is significant enough to be described as a new species, in spite of its fragmentary condition.

#### Macrostylis subinermis Hansen, 1916

The present fragment of a subadult female consists of pereonites 5-7 and pleon. It was procured at Ingolf St. 22 (South of Davis Strait - 58°10'N, 48°25'W), at a depth of 3474 m and at a bottom temperature of 1.4°C. On the label HANSEN wrote (translated) "Close to M. subinermis". The shape of the body and of percopods II-VII, which were all preserved, agrees with subinermis. The only disagreements with HANSEN's description and figures (1916, p. 80, pl. VII, 4a-h) are as follows: (1) The sternite of pereonites 5-7 furnished with a rather prominent process; (2) the uropod almost twothirds the length of pleon. When comparing this subadult female to other specimens of the same size (for instance a subadult female from St. 139) I have found identically conspicuous processes on the three pereonites in question, as well as uropods up to two-thirds of pleon. Thus, there can be no doubt as to the identity of the fragment, although it was taken at a somewhat higher temperature than any other specimens.

## Macrostylis magnifica n. sp. (Pl. IV A-B; Text-fig. 43)

#### Material:

*Ingolf* St. 38 ( $59^{\circ}12'N$ ,  $51^{\circ}05'W$ ), 3521 m, 30 July 1895. Bottom temp.:  $1.3^{\circ}C.$  – Pereonites 5-7 and pleon of 1 female.

## Description:

*Pereonites 5-7* (Pl. IV A-B) each with a lateral, backward-pointing, very strong process which is not found in any other species. There is on prn. 5 a more pronounced "shoulder" than in the two following segments. Prns. 5 and 7 of equal length, 6

<sup>1.</sup> MENZIES (1. c., p. 133) stated that his new species *bipunctatus* is closely allied to *galatheae*. According to his figures and diagnosis it is much closer to *abyssicola*, differing only in the two characters mentioned and in the shape of the head in the males.



Fig. 43. *Macrostylis magnifica* n.sp.; <sup>Ω</sup> holotype; a, preserved pereonites and pleon from left side; b, pleon from above; c, operculum; d, pereopod VII; e-f, left pleopods 3-4.

between one-fourth and one-fifth longer. The pereonites not particularly vaulted from side to side but having longitudinally, a distinct convexity (Fig. 43a). On prn. 5 there is a short, but sturdy process on the posterior margin of the sternite (probably also on prns. 6 and 7, but these are a little mutilated).

*Pleon* (43b) of the ordinary shape but shorter and broader than usual (only one-tenth longer than broad). The posterior margin less convex than in any other species; it is furnished with about ten long setae. The dorsal surface strongly vaulted both longitudinally and transversely. On the ventral side the operculum reaches almost as far back as in *subinermis* (HANSEN 1916, pl. VII, 4g).

*Pereopods.* Of prps. V and VI only basis and ischium are preserved. According to their mutual length prp. VI seems to have been one-fifth longer than V. In prp. VII (43d) basis is longer than usual, being as long as ischium + merus; carpus and propodus of equal length. On the whole, the leg is considerably stouter than in the other species.

*Operculum* (43c) egg-shaped and very short, being only one-fourth longer than broad. On the proximal half it has a low, rounded keel in the middle. Long terminal setae and other setae scattered over the surface.

*Pleopod 3* (43e) with joint 2 even shorter than joint 1. Exopod equally wide throughout and consisting of one joint only as in *spinifera*. The tip of the exopod of pleopod 3 in *hadalis* was broken off (WOLFF 1956a, fig. 22c). An examination of the right plp. 3 (Fig. 44a in this paper) showed the exopod to be 2-jointed, as in *galatheae*.

*Pleopod 4* (43f) differs from this appendage in other species. In *hadalis* and *spinifera* (44b-c), it has the same general shape as other Asellota in which it was described (see e.g. SARS 1899, pls. 43, 50, 53 55, 60, 63, and 66). But in *magnifica* I found a faint, although distinct suture, dividing the outer joint of the endopod into two.

Uropod (43b) has only the first joint preserved. It is five-eighths the length of pleon.

Size: The fragment is 1.7 mm, which should indicate a total length of about 3.3 mm.

#### Remarks:

*M. magnifica* differs from the eighteen other species of *Macrostylis* in the following major respects: Presence of very strong processes on pereonites 5-7; pleon and operculum very short and broad; pereopod VII with a large basis and the whole leg very



Fig. 44. a-b, *Macrostylis hadalis* Wolff, right pleopods 3-4; c, *M. spinifera* Hansen, right pleopod 4.

stout; pleopods 3 and 4 differently shaped. The shape of pleon may indicate that it is closest to *longiremis, subinermis* and *truncatex*.

Occurrence:

South of Davis Strait, 3521 m, 1.3°C.

## FAMILY PSEUDOMESIDAE

Pseudomesini Hansen, 1916, p. 72. Macrostylidae Gurjanova, 1933b, p. 411 (pars).

So far, only one species (*Pseudomesus brevicornis* Hansen, 1916) has been described. In the shape of the body it resembles Ischnomesidae but HANSEN referred it to a separate group since it differs from that family in having the head free, differently shaped mandibles, the two anterior pairs of legs subsimilar, a different insertion of the uropods, etc.

GURJANOVA (1. c.) united it with *Macrostylis* in the Macrostylidae because of similarity in the shape of mouthparts, legs and uropods and the lack of a squama in both genera. Due to the presence of statocysts in the pleon of *Macrostylis*<sup>1</sup> and the reduced fourth joint of the maxillipedal palp,<sup>2</sup> GURJANOVA divided Macrostylidae into two subfamilies, Pseudomesini and Macrostylini (correct names, Pseudomesinae and Macrostylinae). MENZIES (1962 b) found it "quite possible that *Pseudomesus* should be referred to Macrostylidae" but hesitated to do so without having seen specimens. However, he did not include Pseudomesidae in his key to the families.

*Pseudomesus* agrees with *Macrostylis* only in the shape of the mandibles and the maxillipeds, which are, however, also very similar to those of Nannoniscidae and Desmosomatidae. The two genera are different in very many characters, the following being the most essential:

(1) *Pseudomesus* with head longer than broad and pereonites 4 and 5 elongated as in e.g. *Heteromesus; Macrostylis* with head broader than long and pereonites 1-3 forming a rectangular section, sharply

1. Statocysts are absent in, at least, *M. galatheae* and *hadalis* and in four of MENZIES' new species of *Macrostylis* (1962 b).

2. Not reduced in, at least, galatheae and hadalis.

marked off from the four succeeding segments. (2) Pleon oval and broader than the preceding pereonites in *Pseudomesus*, subquadrangular and narrow in *Macrostylis*. (3) No longitudinal excavation on ventral part of pleon in the former, but present in the latter. (4) Antennulae with joint 2 very elongated in the former, always shorter than joint 1 in the latter. (5) Legs almost equal in length and pereopod III shaped as the succeeding legs in *Pseudomesus*, while in *Macrostylis* prp. IV is shorter than all other legs and prp. III is fossorial. (6) Uropods inserted ventrally, with two short and thick joints in the former, elongated and inserted terminally in the latter.

For these given reasons I find it impossible to refer *Pseudomesus* to Macrostylidae. Nor can it be referred to Nannoniscidae with which, as pointed out by HANSEN, it is most closely related. It disagrees with that family in i.a., the shape of body which has pereonites 4 and 5 elongated and is not depressed and expanded laterally, in lack of a squama, legs inserted laterally, not ventrally, pereopods I and II being subequal, and uropods being uniramous.

#### FAMILY ILYARACHNIDAE

Ilyarachnini Hansen, 1916, p. 120.

#### Diagnosis:

Body rather oblong; first four pereonites (usually prn. 3) generally broader than and very different in shape to prns. 5-7. All pereonites movable. Pleon subtriangular. Head broad, without frontal area and eyes. Antennulae terminal or subterminal, with first joint plate-shaped. Antennae longer than body, squama indistinct. Mandibles short and thick, with obtuse incisive part and reduced, setiferous molar process. Pereopods I and II somewhat prehensile; basis very long, considerably longer than ischium. Prps. III and IV moderately or very long; basis short, ischium extremely long. Prps. V-VII (or V-VI) natatory; dactylus long and slender. Uropods ventral, with flattened, generally oval, setiferous peduncle, a much smaller endopod and a minute (or missing) exopod.

## Key to the genera of Ilyarachnidae

Perconite 2 and percopod II much larger than the preceding and succeeding segments and legs. Antennulae minute, placed far apart and with joint 1 lamellarly expanded on the outer side

Pseudarachna G.O.Sars, 1899

Prn. 2 and prp. II not much larger than the other segments and legs. Antennulae well developed, close together and with joint 1 subquadrangular ...... Ilyarachna G.O.Sars, 1864

#### Genus Ilyarachna G.O.Sars, 1864

Synonymy - see WOLFF 1956a, p. 106.

#### Diagnosis:

No distinct frontal area, the antennulae being situated close together; their first joint subquadrangular, usually with outer corner projecting; flagellum well developed. Mandibles robust, with an oblique crest or keel on the outer (front) side; movable lacinia and spine-row almost always present. Pereopods I and II not appreciably different in size, both somewhat prehensile. Prps. III and IV considerably longer than I and II. Prps. V and VI almost equal, with carpus exceedingly or somewhat expanded. Propodus much narrower and oblong; both joints abundantly furnished with feathered setae. Prp. VII much narrower than V and VI, with feathered setae almost always present on most joints. Female operculum oblong, with a median keel and densely setous along the distal margins. Male pleopods 1 curved longitudinally and elongated.

#### Remarks:

In MENZIES' key to the families of Asellota (1962a, p. 28; 1962b, p. 94) and his diagnosis to Ilyarachnidae (p. 155), it was stated that percopods VII are simple walking legs. Although carpus is only moderately expanded and propodus not expanded at all they are (in all cases in which they were described or figured, with the exception of *aspidophora* n. sp.) as clearly natatory as prps. V and VI, with well developed and almost always feathered setae (cf. e. g. SARS 1899, pls. 59-62).

## Key to the species of *Ilyarachna*

The following key was prepared with considerable difficulty. BARNARD's species *affinis* and *crassiceps* were not figured and in these and the following

seven species in the key (except *indentifrons*) the uropods were either lacking or not described or figured.

| 1. | Body smooth, glabrous. Antero-lateral corners of pereonites 1-4 (especially prn. 2) acute. Prn.     |   |
|----|-----------------------------------------------------------------------------------------------------|---|
|    | 5 narrower than 4. Basal margin of pleon straight, with a transverse ridge, narrowing to a subacute |   |
|    | apex. Joint 1 of antennula with spines on both inner and outer margins affinis Barnard, 1920        |   |
| 1. | These characters not combined                                                                       | 2 |
| 2. | Body smooth, glabrous. Prn. 1 narrower than head, very short. Antero-lateral corners of prns.       |   |
|    | 1 and 2 rounded, of prn. 4 rounded-quadrate. Pleon about as long as broad, with obtuse apex. Joint  |   |
|    | 1 of antennula without anterior projections. Outer rami of male pleopods 1 distinct, a little       |   |
|    | longer than peduncle crassiceps Barnard, 1920                                                       |   |
| 2. | These characters not combined                                                                       | 3 |
| 3. | Prn. 6 subtriangular, almost as broad as long. Antero-lateral corners of prns. 1 and 2 rounded.     |   |
|    | Head and body without dorsal spines. Pleon with one segment, 1.5 times longer than                  |   |
|    | broad triangulata Menzies, 1962b                                                                    |   |
| 3. | Prn. 6 not usually subtriangular but, if so, antero-lateral corners of prns. 1 and 2 are acute      | 4 |
| 4. | Prn. 1 with two spines on each side of the segment (not on the coxal plates). Lateral parts of      |   |
|    | prn. 6 distinctly set off from the broad median part by an incision in the anterior margin. Pleon   |   |
|    | with two segments spinoafricana Menzies, 1962b                                                      |   |
| 4. | Prn. 1 at most with one spine on the segment. Anterior margin of prn. 6 at most with a concavity    | _ |
|    | laterally                                                                                           | 5 |
| 5. | Coxal plates of prn. 2 pointed and strongly recurved. Head and body without dorsal spines.          |   |
|    | Apex of pleon pointed. Outer corner of joint 1 of antennula projecting. derjugini Gurjanova, 1946   |   |
| 5. | Coxal plates of prn. 2 are, if pointed, not recurved                                                | 6 |
| 6. | Maximum width of head less than four times that of joint 1 of antennula – which is broader than     |   |
|    | long and without anterior projections. Head and body without dorsal spines. Pleon with one          | - |
|    | segment                                                                                             | 1 |
| 6. | Max. width of head more than four times that of joint 1 of antennula – which is rarely broader      | 0 |
| _  | than long                                                                                           | 8 |
| 7. | Antero-lateral corners of prns. 1-4 pointed. Apex of pleon evenly                                   | - |
|    | rounded indentifrons Menzies, 1962 b                                                                |   |

| 7.   | Antero-lateral corners of prn. 1 rounded, of prns. 2-3 angular. Apex of pleon                      |         |
|------|----------------------------------------------------------------------------------------------------|---------|
|      | triangular africana Menzies, 1962b                                                                 |         |
| 8.   | Prns. 1-3 with at least four strong dorsal spines each. Carpus of pereopod I expanded, broader     |         |
|      | than ischium. Eight spines on head. Apex of pleon subacute starokadomskii Gurjanova, 1933a         |         |
| 8.   | When prns. 1-3 have at least four strong spines, carpus of prp. I is at most as broad as ischium   | 9       |
| 9.   | Head and body smooth dorsally. Lateral margins of head and antero-lateral corners of pleotelson    |         |
|      | with one spine on each side. Coxal plates of prns. 2 and 3 spinous. Pleon with two segments,       |         |
|      | apex narrowly rounded simplex Menzies, 1962b <sup>1</sup>                                          |         |
| 9.   | If there are lateral spines on head and on antero-lateral corners of pleotelson, the body is also  |         |
|      | spinous dorsally                                                                                   | 10      |
| 10.  | Uropods biramous                                                                                   | 11      |
| 10.  | Uropods uniramous                                                                                  | 20      |
| 11.  | Head and body without dorsal spines. Head considerably narrower than prn. 1. Pleon with one        |         |
|      | segment, apex evenly rounded                                                                       |         |
| 11.  | If the body is without dorsal spines, the head is broader than prn, 1 (incl. of the antero-lateral |         |
|      | spines)                                                                                            | 12      |
| 12.  | Mandibular palp present. Prn. 5 at most as broad as 4 (incl. of the antero-lateral spines) ("Echi- |         |
|      | nozone").                                                                                          | 13      |
| 12.  | Mandibular palp absent                                                                             | 18      |
| 13   | One median tubercle on priss 5-7 and pleon. Prin 5 considerably parrower                           | 10      |
|      | than 4. arctica (Hansen 1916)                                                                      |         |
| 13   | No tubercles on prns 5-7 and pleon Prn 5 as broad as 4                                             | 14      |
| 14.  | No spines on head and percentites. Carpus of prp. VII expanded <i>abvssorum</i> Richardson 1911    |         |
| 14   | Spines on pros 1-4 and sometimes on head Carpus of pro VII not greatly expanded                    | 15      |
| 15   | No spines on head Pleon with a backward-pointing process at insertion of the grounds Prp. VII      | 10      |
| 10.  | with rather short unfeathered setae                                                                | •       |
| 15.  | At least two spines on head Pleon with a blunt incision at insertion of the uropods Prn VII        |         |
| 10.  | with long feathered setae (as in prps V and VI)                                                    | 16      |
| 16   | Two spines on head Four spines on anterior margin of prns 1-4 No spines on prns                    | 10      |
|      | 5-7 <i>magnifica</i> (Vanhöffen 1914) juv                                                          |         |
| 16.  | Four spines on head                                                                                | 17      |
| 17.  | More than four spines on anterior margin of prns 1-4. No spines on prns 5-7 Last joint of          | 17      |
|      | peduncle of antenna at most as long as head $+$ prns 1-5 magnifica (Vanhöffen 1914) adult          |         |
| 17   | Four spines on anterior margin of prins 1-4 Spines on prins 5-7 often present Last joint of        |         |
|      | reduncle of antenna at least as long as head $\pm$ prins 1-6 auadrispinosa Beddard 1886a           |         |
| 18   | Head and prns 1-5 with strong spines Prn 5 narrower than 4 Joint 1 of antenna with two             |         |
| 10.  | strong spines strong spines. This is harrower than it some i of antenna with two strong spines.    |         |
| 18.  | Head without spines and pros. 1-5 at most with very inconspicuous spines. Pro. 5 broader than      |         |
| 10.  | 4. Joint 1 of antenna with two tiny spines only ("Aspidarachna")                                   | 19      |
| 19.  | No fine spines on anterior margin of in particular prins 2 and 3 Division between prins 5-7        |         |
|      | evenly arched Exopod of uropod reaches at most one-third the length of                             |         |
|      | endopod <i>chypeata</i> (G O Sars 1870)                                                            |         |
| 19.  | Three to five spines on anterior margin of in particular prns 2 and 3 Division between prns        |         |
|      | 5-7 undulating and somewhat pointed medianly. Exopod of uropod reaches about half the length       |         |
|      | of endopod aries (Vanhöffen 1914)                                                                  |         |
| 20   | Prns 5-7 and pleon with dorsal and lateral spines                                                  | 21      |
| 20   | Prns 5-7 and pleon completely without spines (although occasionally with a tiny spine on the       | 21      |
| 20.  | antero-lateral corners)                                                                            | 23      |
| 21   | Margin of pleon behind the insertion of the propods spinulate. Lateral margins of pro-7 with       | ل بند   |
|      | more than two spines each                                                                          |         |
| 21   | Margin of pleon behind uropods smooth. Lateral margin of prn 7 with one or two spines each         | 22      |
| 1. M | [ENZIES' illustration of the female holotype (fig. 47 F) is shown with eight perconites            | مىد بىر |
|      | ······································                                                             |         |

| 22.          | Prn. 4 with the antero-lateral corners rounded. Prn. 7 with only one lateral                                                          |    |
|--------------|---------------------------------------------------------------------------------------------------------------------------------------|----|
|              | spine spinosissima Hansen, 1916                                                                                                       |    |
| 22.          | Prn. 4 with a strong, bifid spine on the antero-lateral corners. Prn. 7 with two lateral                                              |    |
|              | spines gurjanovae Menzies, 1962b                                                                                                      |    |
| 23.          | Spines or conical processes on head                                                                                                   | 24 |
| 23.          | Head smooth or at most with short setae                                                                                               | 31 |
| 24.          | First joint of antennula reaches beyond distal end of joint 4 of antenna. Prns. 1-3 considerably broader than 5 polita Bonnier, 1896  |    |
| 24.          | First joint of antennula does not reach distal end of joint 3 of antenna                                                              | 25 |
| 25.          | Anterior margin of prns. 1-4 strongly serrated                                                                                        | 26 |
| 25.<br>26    | Anterior margin of prns. 1-4 at most with small, inconspicuous spines                                                                 | 28 |
| <i>2</i> .0. | ioint 1                                                                                                                               |    |
| 26           | Head about as broad as prn. 1 (incl. of lateral spines) or narrower. Joint 3 of antennula about                                       |    |
|              | half as long as joint 1                                                                                                               | 27 |
| 27.          | Inner margin of joint 1 of antennula twice as long as the width of the                                                                |    |
| 27           | joint <i>acarina</i> Menzies & Barnard, 1959 (p. 97)                                                                                  |    |
| 27.          | Inner margin of joint 1 of antennula no longer than the                                                                               |    |
| 20           | width                                                                                                                                 |    |
| 28.          | Coxal plates of prps. I and II without process. Joint 3 of antennula longer than joint 1 in female.                                   |    |
|              | Keel on remale operculum smooth and with scattered hairs only. Exopods of male pieopods 1                                             |    |
| 20           | Curved inwards <i>Nordensiami</i> il. sp. (p. 102)                                                                                    |    |
| 28.          | coxal plates of prps. I and II with a process. Joint 5 of antennula about half as folig as joint I                                    | 20 |
| 29.          | Prn. 5 as broad as 2. Joint 2 of mandibular palp one-fourth longer than others and joint 3 with                                       | 29 |
|              | a row of short setae. Inner margin of carpus of prp. I slightly convex and with a continuous row                                      |    |
|              | of short setae kermadecensis n. sp. (p. 102)                                                                                          |    |
| 29.          | Prn. 5 somewhat or considerably broader than 2. Joints of mandibular palp of equal length and                                         |    |
|              | joint 3 without a row of setae. Inner margin of carpus of prp. I concave and at most with scattered                                   |    |
|              | setae of unequal length                                                                                                               | 30 |
| 30.          | Apex of mandible straightly cut off. Inner margin of epipod of maxilliped straight. Basipodite                                        |    |
|              | of prp. I with several spines on both margins, and outer margin of ischium with two                                                   |    |
|              | spines bicornis Hansen, 1916 (p. 101)                                                                                                 |    |
| 30.          | Apex of mandible rounded. Inner margin of epipod convex. Only scattered setae on basipodite                                           |    |
|              | of prp. I, and a great number of slender setae along outer margin of                                                                  |    |
|              | ischium antarctica Vanhöffen, 1914 (p. 102)                                                                                           |    |
| 31.          | Peduncle of uropod narrow, with the elongated endopod inserted near proximal end, but never-                                          |    |
|              | theless reaching almost as far as the peduncle. Length of joint 3 of antennula three-fourths                                          |    |
|              | the maximum width of joint 1 nodifronoides Menzies, 1962b                                                                             |    |
| 31.          | Peduncle of uropod oval, endopod inserted distally (not described in <i>fusiformis</i> ). Length of joint                             |    |
|              | 3 of antennula at most slightly more than half the max. width of joint 1                                                              | 32 |
| 32.          | Triangular processes, resembling coxal plates, on the antero-lateral corners of prns. 3 and 4.                                        |    |
|              | Inner corner of joint 1 of the antennula projecting much further than the                                                             |    |
| 32.          | outer aspidophora n. sp. (p. 106)<br>No processes on antero-lateral corners of prns. 3 and 4. Inner corner of joint 1 less projecting |    |
|              | than the outer <sup>1</sup>                                                                                                           | 33 |
| 33.          | Joint 3 of mandibular palp falciform. Epipod of mxp. with proximal part of outer margin sub-                                          |    |
|              | parallel with inner, and distal part bevelled off straight to the subacute                                                            |    |
|              | apex fusiformis (Barnard, 1920)                                                                                                       |    |
| 33.          | Joint 3 of palp almost straight. Epipod of mxp. with rounded (convex) outer margin                                                    | 34 |
| 1 0          |                                                                                                                                       |    |

<sup>1.</sup> SARS' pls. 59 and 60 (1899) of female specimens of *longicornis* and *hirticeps* (syn. for *longicornis*), seen from above, are erroneous in showing the *inner* corner of the first joint of the antennula to project the furthest.

| 34. | Joint 5 of antenna longer than body. Outer margin of carpus of prps. V and VI a little con-       |    |
|-----|---------------------------------------------------------------------------------------------------|----|
|     | cave bergendali Ohlin, 1901                                                                       |    |
| 34. | Joint 5 of antenna shorter than body. Outer margin of carpus of prps. V and VI straight or a      |    |
|     | little convex                                                                                     | 35 |
| 35. | Head narrower than prns. 1 and 2 dubia Hansen, 1916 (p. 100)                                      |    |
| 35. | Head as broad as prns. 1 and 2                                                                    | 36 |
| 36. | Joint 1 of palp of mandible half as long as joint 2. Apex of male plps. 1 with outer corners tri- |    |
|     | angular, calcified, and devoid of setae. Sympod of plp. 2 with subparallel margins, proximally,   |    |
|     | with converging, slightly concave margins distally; copulatory organ not reaching                 |    |
|     | apex longicornis (G.O.Sars, 1864) (p. 97)                                                         |    |
| 36. | Joint 1 of palp as long as joint 2. Apex of plps. 1 with outer corners narrow and subacute, un-   |    |
|     | calcified, and with two short setae each. Sympod of plp. 2 with inner margin convex; copulatory   |    |
|     | organ reaching beyond apex thori n. sp. (p. 97)                                                   |    |

#### Ilyarachna multispinosa Menzies, 1962

Ilyarachna multispinosa Menzies, 1962b, p. 160, fig. 47 J-L.

Ilyarachna argentinae Menzies, 1962b, p. 160, fig. 48 A-D.

Among the ten new species of *Ilyarachna* described by MENZIES there were three with spines on, at least, the posterior half. Of two species, *multispinosa* and *argentinae*, only pereonites 5-7 and pleon were preserved (one specimen of each). The fragments are practically equal, differing only slightly in the spine armament: according to the diagnoses (1. c.), *multispinosa* has 3-4 lateral spines on prn. 7 and *argentinae* 3 spines (otherwise the diagnoses are in perfect agreement). According to the figures, the preserved parts of percon and pleon, as well as the uropods, are identical. There would appear to be rather more spines in *multispinosa* but the general arrangement is the same.

A marked variation in the spine armament on the head and the anterior margins of prns. 1-4 led HANSEN (1916) to cancel *I. denticulata* G.O. Sars, and HULT (1936b) to cancel *hirticeps* G. O. Sars and to include them in *longicornis* (cf. below). This procedure has been acknowledged by MENZIES (1962b). In view of this variation in another species within the genus, I find it impossible to accept argentinae as being specifically different from *multispinosa*.

The third spinous species, gurjanovae Menzies, is perhaps also a synonym of *multispinosa*, but since only one figure of this species was given it is impossible to make more than a surmise.

The length of the *multispinosa* fragment was recorded to be 2.4 mm. By comparison with the closely related *gurjanovae*, the total length can be esti-

## mated as about 5.0 mm. MENZIES did not give the length of the *argentinae* fragment.

#### Ilyarachna acarina Menzies & Barnard, 1959

I regard it as possible that this species is a synonym of *longicornis*. According to the authors it "bears a close resemblance to *I. denticulata* G.O. Sars from the west coast of Norway. It differs from that species by having longer and more delicate spines, fewer on the cephalon and more on the margins of the pereonal somites. The flagellum of antenna 1 has 9 articles in *I. denticulata*."

The usual variation in spine or setae armament was mentioned above. According to SARS (1899), *denticulata* has also eight joints in the antennular flagellum. The number of joints is also a matter of variation both from sex to sex and within the same sex, e.g. in *longicornis*. In the key above I have, however, maintained *acarina* as a separate species, primarily because of the apparent difference in the shape of joint 1 of the antennula mentioned in the key.

## Ilyarachna longicornis (G.O.Sars) and I. thori n.sp. (Text-figs. 45-47)

OHLIN (1901) and HANSEN (1916) showed that I. longicornis (G.O.Sars) and I. denticulata G.O.Sars belonged to the same species; HANSEN likewise included I. plunketti Tattersall in longicornis. Later HULT (1936b) put longicornis and hirticeps G.O. Sars together, after a thorough study of variation in most of the material available.<sup>1</sup> HULT paid

<sup>1.</sup> I agree with MENZIES (1962 b, p. 158) that *derjugini* Gurjanova, 1946, is probably also identical with *longicornis*, but this is impossible to decide conclusively without having seen GURJANOVA's material.

particular attention to the crenulation on the anterior margin of pereonites 1-4, to the setae on the head, to the epipods of the maxillipeds, and to the pereopods. The male pleopods 1 and 2 were not studied and compared.

In order to get an impression of the extent of variation in male pleopods 1 and 2 in species other than *I. antarctica* (see below), I began a comparison between the pleopods of males of *longicornis* kept in this Museum. These males were all labelled "*hirticeps*" by HANSEN and originate from the *Ingolf* and *Thor* Expeditions (HANSEN 1916, p. 124). This study showed a marked difference between most of the *Ingolf* material and the males from two *Thor* stations. Although I have been able to find only a few other characters by which the *Thor* males can

be separated, I feel convinced that they must represent a new species, especially in view of the evident differences in the copulatory organ. Given below are those features in which a close comparison revealed differences, most undoubtedly of specific significance. In features other than those mentioned here, no differences of any importance could be found.

#### Material of I. thori n. sp.

*Thor* St. 171, S. of Iceland (63°15'N, 20°04'W), 216-326 m, 16 July 1903. Bottom temp. (at 240 m): 7.5°C. – 2 males, one being the holotype. *Thor* St. 78, S.W. of the Faroes (61°08'N, 9°28'W), 710-820 m, 12 May 1904. Bottom temp.: 7.7°C. – 7 males.

## Comparison between and

#### I. longicornis 3

I. thori 3

#### ornis 3

Pleopods 1 Seen from inside (Fig. 45e and k): Distal twothirds of lateral margins subparallel. A pair of short, low, slightly curved and somewhat divergent keels are found laterally, about two-thirds of the total length from base to apex. The inward-bent plaits (x) near apex are rather long.

Seen from inside (Fig. 45n): Distal two-thirds of lateral margins somewhat convergent. In the middle third of the total length two long, straight, sharp keels are found; they are slightly divergent and form part of the lateral margins distally. The inward-bent plaits (x) are short.



Fig. 45. Pleopods 1; a-l, *Ilyarachna longicornis* (G.O.Sars); m-p, *I. thori* n.sp.; a, d, j, and m, from the side (in d the spines and setae on the outer (convex) surface have been omitted); b, from outside; e, k, and n, from inside; c, f, g, h, l, o, and p, apex from inside; a-c, *Ingolf* St. 102; d-f, *Ingolf* St. 35; g, *Ingolf* St. 24; h, *Ingolf* St. 27; j-l, *Ingolf* St. 27; m-o, *Thor* St. 78; p, *Thor* St. 171. (x, plaits bent inwards).



Fig. 46. a-c, *Ilyarachna longicornis* (G.O. Sars); d-f, *I. thori* n. sp.; a and d, pleopod 2 from inside; b and e, from the interior side; c and f, pleopod 3. (u-z indicate the same stylets, keels, margins, etc.).

Seen from the side (45a, d and j): Only moderately curved. Outer (convex) surface with a great number of setae, especially distally. Proximal setae spine-like.

A pex (45 c, f-h and l) with the outer corners somewhat convergent, thickened, and without setae. The median cut varying in depth, but usually not very deep and with a varying number of long and short setae. Seen from the side (45m): Rather strongly curved. Outer surface sparcely furnished with setae, especially distally.

A pex (45p) with the outer corners divergent and uncalcified and each with two setae. Median cut rather deep. Three long setae only on each side.

Seen from inside (46d): Outer margin with an

obtuse angle, inner gently rounded. Both joints of copulatory organ very long and narrow, proximally

reaching almost to the base of the sympod and distally, beyond apex. Only a few setae on outer

margin in the type, but in a male from Thor St. 78

#### Pleopod 2

Seen from inside (46a): Inner margin shaped almost as the outer and both margins subparallel proximally. Both joints of copulatory organ short and thick, the second not reaching beyond apex of the sympod. Distal part of outer margin and apex with setae.

Seen from the interior side (46b): Sympod only slightly curved. Endo- and exopod placed in an excavation; this is on the inner side covered by a thick keel (y) which is almost parallel with the outer surface of the pleopod.

(Fig. 46c): Both branches with several setae.

the entire margin is furnished with feathered, rather long distal setae. Seen from the interior side (46e): Sympod considerably curved. No distinct excavation for endo- and exopod. The distal keel is thin and trans-

endo- and exopod. The distal keel is thin and transparent and almost at a right angle to the surface of the pleopod, thus being clearly visible in lateral view.

#### Pleopod 3

(Fig. 46f): Inner branch with two or three setae, outer with one or more.

#### Mandibles

Right md. (47a) with a very blunt apex, seven spines in the spine-row, and a slender, (in side view) pointed molar process.

Left md. (47b): Apex, spine-row and molar process as in right md. Movable lacinia rather projecting. Right md. (Fig. 47d) with a somewhat less blunt apex, six spines, and molar process a little twisted, the chisel-shaped end being visible also in side view.

Left md. (47e): Apex, spine-row and molar process as in right md. Movable lacinia almost hidden inside an excavation.



Fig. 47. a-c, j, and l, Ilyarachna longicornis (G.O. Sars); d-f, k, and m, I. thori n. sp., I holotype; g-h, males from Thor St. 78; a and d, right mandible; b and e, left mandible; c and f-h, mandibular palp; j-k, distal margin of endite of maxilliped; l-m, epipod of maxilliped.

Palp (47c): Joint 1 only about half as long as joint 2 – which is very slender and has two serrated setae. Joint 3 also slender and slightly more than half as long as joint 2. It has one long and one short, finely serrated seta.

Palp (47f-g): Joint 1 as long as joint 2 – which is broad and without setae. Joint 3 also as long as joint 2. Considerable variation is found in the setae armament on joint 3 (47f-h).

#### Maxillipeds

Distal margin of endite (47j) with many, rather fine setae and four flat, double-serrated spines.

Epipod (47 l) somewhat more than half as broad as long and rather egg-shaped.

Distal margin of endite (47k) with fewer setae and five flat spines in the type (three-four in a male from *Thor* St. 78).

Epipod (47m) two-thirds as broad as long and almost right-angled distally.

Size of the type of *thori* 4.2 mm long and 1.4 mm broad.

## Remarks:

With the two males of *thori* from *Thor* St. 171 six females were found, and with the seven males of *thori* from *Thor* St. 78, three females. Having investigated the shape of the mandibles and palps in all these females, I find their apex to be as rounded as in *longicornis* (47a-b) and the palp identical with that species. Therefore, it can be concluded that these nine females do, in fact, belong to *longicornis*. I regard it as being highly improbable that a sexual dimorphism in the shape of the mandibles should exist. On the other hand, it is curious that all females occurring together with males of *thori* represent another species. Nevertheless, for the time being I consider this the most likely explanation, especially in view of the wide distribution and frequency of *longicornis*.

#### Distribution:

Of *longicornis:* See map in HULT 1941, pp. 98-99. Of *thori:* S. of Iceland and S.W. of the Faroes, 216-820 m, 7.5-7.7°C.

## Ilyarachna dubia Hansen, 1916 (Text-fig. 48)

HANSEN (1. c., p. 126) expressed his doubts as to the validity of this species which was characterized by the "smooth and narrow head". HULT (1936b) showed that presence or lack of setae on the head is of no specific value in this genus. Thus, the fact



Fig. 48. *Ilyarachna dubia* Hansen, ♂ lectotype; a, pleopods 1 from the side; b, apex from the side; c, pleopods 1 from outside; d-e, pleopods 2 and 3.

that the head is devoid of setae, is of no importance with regard to distinguishing *dubia* from the *hirticeps* forms of *longicornis*. However, on going through a large collection of *longicornis* I constantly found the proportion between the width of the head and pereonites 1-4 to be as figured by HULT (1936b, fig. 1), while in *dubia* the head is even slightly narrower than shown by HANSEN (pl. XI, fig. 9a).

The only male of *dubia* (from *Ingolf* St. 119) has been chosen as lectotype and its pleopods studied.

*Pleopods 1* (Fig. 48a) are less curved and excavated than in *longicornis* (45a) and the apex has rounded and only slightly projecting outer corners.

There are only four short setae on each side (48 b-c). The inner keels are large and bent outwards, being visible also when the pleopods are seen from outside (48 c).

*Pleopod 2* (48d) narrower proximally and with a slightly shorter and stouter copulatory organ than in *longicornis* (Fig. 46a).

Pleopod 3 (48e) with fewer distal setae.

## Ilyarachna bicornis Hansen, 1916 (Text-fig. 49)

Of this species only two female specimens exist and I have chosen the largest as lectotype (*Ingolf* St. 36). Some of the features which HANSEN regarded as specific have later proved to be subject to considerable variations (smoothness of head (apart from the presence of conical processes), presence of spines on anterior margin of pereonites 1-4, and shape of first antennular joint and its spine armament). I have therefore studied the mouthparts and the first pereopods of the lectotype and shall give a short description of differences between this species and the closely related *longicornis* and *antarctica*.

*Mandibles* with an almost straightly cut (not rounded) apex when seen from the edge (Fig. 49 b); moreover, the apex is slightly excavated (49 a). Movable lacinia (ml) short, thick and triangular in section. Spine-row with nine rather slender spines. The basal body (y) where the muscles are inserted, twice as long as in *longicornis*. The palp with the three joints almost equally long (49 c) as in *thori* and *antarctica*, but stouter than in the latter species (Fig. 51 b). There is one long and one short terminal seta.



Fig. 49. Ilyarachna bicornis Hansen, ♀ lectotype; a-c, left mandible; b, incisive part (ml, movable lacinia); c, palp; d, epipod of maxilliped; e, pereopod I.



Fig. 50. Right antennulae; a, Ilyarachna antarctica Vanhöffen, ♀ lectotype; b, I. nordenstami n. sp., ♀ holotype; c, I. nordenstami, ♂ allotype; d, I. kermadecensis, ♀ allotype; e, I. kermadecensis, ♂ holotype.

*Epipod of maxilliped* (49d) with interior margin almost straight. The margins setous in parts.

Pereopod I (49 e) considerably stouter than in the other species and with abundant spines on basis.

A comparison between the two females showed that in the small specimen there is a fine spine on a tiny nodule which lies on the left side of the head, slightly lateral to the two larger conical processes. On the right side there is a short seta. No other differences were found.

## Ilyarachna antarctica Vanhöffen – I. nordenstami n. sp. – I. kermadecensis n. sp.

In my paper on the hadal isopods (1956a) I made a study of four females and four males (half of them fragmentary), collected in the Kermadec Trench at depths between 4540 and 7000 m. After a careful investigation of these specimens (as well as VAN-HÖFFEN's material of *I. antarctica* from the *Gauss* Expedition and NORDENSTAM's material from the Swedish Antarctic Expedition), I found it most

likely that they all belonged to the same species, in spite of the differences pointed out. In a subsequent letter to me, Dr. R. J. MENZIES expressed his doubts as to the accuracy of this conception, regarding it as being especially improbable that the number of spines (conical processes) on the head should within one and the same species - vary to the extent I found. Because of this objection, and in view of my general revision of several species of Ilyarachna, I have once more studied the specimens in question and find it preferable to regard them as belonging to three different species. This decision, however, is not due to variation in the number of head spines which I still consider non-specific but to differences in other features which were not sufficiently stressed in the previous study.

Owing to the fact that these three species are very closely related and in view of the comprehensive comparison between them made previously (l. c.), they have been treated simultaneously.

The following differences were found (of *I. ant-arctica* only females were available):



Fig. 51. Left mandibles with palps; a-b, *Ilyarachna* antarctica Vanhöffen,  $\varphi$  lectotype; c-d, *I. nordenstami* n.sp.,  $\varphi$  holotype.

|                                     | I. antarctica Vanhöffen<br>(German Gauss Exp.)                                                                                                                                                                 | I. nordenstami n. sp.<br>(Swed. Antarc. Exp.)                                                                                                                                                          | I. kermadecensis n. sp.<br>(Galathea Exp.,<br>Sts. 651-658-664)                                                                                                                                                              |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lateral corners<br>of pereonite 1   | With a very short, rounded pro-<br>cess                                                                                                                                                                        | No process                                                                                                                                                                                             | With a distinct, rounded process                                                                                                                                                                                             |
| Lateral corners<br>of prn. 3        | Angular                                                                                                                                                                                                        | Rounded                                                                                                                                                                                                | Sts. 651 & 658: With a distinct,<br>almost squarish process<br>St. 664: Angular                                                                                                                                              |
| Lateral corners<br>of prn. 4        | With an indistinct pointed process                                                                                                                                                                             | Angular, no process                                                                                                                                                                                    | Sts. 651 & 658: A distinct point-<br>ed process<br>St. 664: An indistinct process                                                                                                                                            |
| Prn. 5                              | Narrower than prn. 2                                                                                                                                                                                           | As broad as prn. 2                                                                                                                                                                                     | As broad as prn. 2                                                                                                                                                                                                           |
| Coxal plates of pereopods I and II  | With process                                                                                                                                                                                                   | No process                                                                                                                                                                                             | With process                                                                                                                                                                                                                 |
| Dorsal surface of pleotelson        | Furrows indistinct                                                                                                                                                                                             | Furrows indistinct                                                                                                                                                                                     | Sts. 651 & 658: Furrows distinct<br>St. 664: Furrows indistinct                                                                                                                                                              |
| ♀ antennula                         | (Fig. 50a). Joint 1 with subpar-<br>allel lateral margins; outer, dis-<br>tal corner moderately produced.<br>Joint 2 five-ninths of joint 1.<br>Joint 3 five-twelfths of joint 1.<br>Flag. with 5 (? 6) joints | (Fig. 50b; NORDENSTAM 1933,<br>fig. 76a). Joint 1 broadest at base,<br>outer corner slightly produced.<br>Joint 2 less than half of joint 1.<br>Joint 3 longer than joint 1. Flag.<br>with 8-10 joints | (Fig. 50d; Wolff 1956a, fig. 27c). Joint 1 with inner margin convex; outer corner strongly produced. Joint 2 three-fifths of joint 1. Joint 3 five-ninths of joint 1. Flag. with 5 joints                                    |
| ് antennula                         |                                                                                                                                                                                                                | (Fig. 50 c). Joint 2 five-twelfths of<br>joint 1 and less than twice as<br>long as broad. Joint 3 two-thirds<br>of joint 1. Flag. with 9-10 joints                                                     | (Fig. 50e). Joint 2 seven-eighths<br>of joint 1 and three times as long<br>as broad. Joint 3 longer than<br>joint 1. Flag. with about 35 joints                                                                              |
| Left mandible                       | (Fig. 51 a). Apex evenly rounded,<br>strongly projecting; 4-8 spines<br>in spine-row                                                                                                                           | (Fig. 51 c). Apex with faint inci-<br>sion, moderately projecting; 7-8<br>spines in spine-row                                                                                                          | (WOLFF's fig. 26b). Apex with<br>blunt cutting edge, moderately<br>projecting; 12 spines in spine-row                                                                                                                        |
| Mandibular palp                     | (Fig. 51 b). Joints equally long.<br>No row of setae on joint 3                                                                                                                                                | (Fig. 51 d). Joint 2 almost twice<br>as long as the others. No row of<br>setae on joint 3                                                                                                              | (WOLFF's fig. 26c). Joint 2 one-<br>fourth longer than the others.<br>Joint 3 with a row of setae                                                                                                                            |
| Epipod of maxil-<br>liped (in situ) | Hardly reaching joint 2 of palp                                                                                                                                                                                | Hardly reaching joint 2 of palp                                                                                                                                                                        | Reaching well beyond joint 2 of palp                                                                                                                                                                                         |
| Number of coupling hooks            | Right 4, left 5                                                                                                                                                                                                | Right 4 or 5, left 6                                                                                                                                                                                   | St. 651: Right 9, left 10<br>St. 658: Right 6                                                                                                                                                                                |
| Pereopod I                          | (Fig. 52a). Carpus with a few<br>simple setae proximally on the<br>concave inner margin. Ischium<br>with many simple setae                                                                                     | (Fig. 52b, d). Carpus with some<br>simple setae proximally on the<br>slightly concave inner margin.<br>Ischium with many, partly<br>forked setae                                                       | (Fig. 52c, e). Carpus, distally<br>with a long row of spine-shaped<br>setae, proximally, with short,<br>simple setae on the slightly con-<br>vex inner margin. Ischium with<br>a rather few broad and trans-<br>parent setae |
| Prp. II                             | Ischium slender                                                                                                                                                                                                | Ischium less slender                                                                                                                                                                                   | Ischium slender                                                                                                                                                                                                              |
| Prps. V-VII                         | Dactylus shorter than propodus                                                                                                                                                                                 | D. longer than propodus                                                                                                                                                                                | ne.                                                                                                                                                                                                                          |
| ♀ operculum                         | Keel with low tubercles and short spines                                                                                                                                                                       | Keel smooth, with scattered hairs only                                                                                                                                                                 | (WOLFF's fig. 28a-b). Keel with low tubercles and short spines                                                                                                                                                               |
| ී pleopods 1                        |                                                                                                                                                                                                                | (Fig. 53d; NORDENSTAM's fig.<br>76b). Slight longitudinal curve.<br>Width distally and at base, al-<br>most equal. No median deep<br>furrow. Inner lobe subtriangu-<br>lar, outer lobe curved inwards  | (Fig. 53a-b; WOLFF's fig. 28c-d).<br>Strong longitudinal curve. Twice<br>as broad at base as distally. Deep<br>median furrow almost through-<br>out. Inner lobe knob-shaped,<br>outer lobe bent outwards                     |
| ♂ pleopod 2                         | _                                                                                                                                                                                                              | (Nordenstam's fig. 76c). The<br>distal keel low. Stylet rather<br>broad proximally                                                                                                                     | (Fig. 53c; WOLFF's fig. 28e). The<br>distal keel (k) high and thin. Sty-<br>let slender proximally                                                                                                                           |
| Largest ♀                           | 6.3 mm                                                                                                                                                                                                         | 5.3 mm (with ova)                                                                                                                                                                                      | 15.2 mm                                                                                                                                                                                                                      |
| Largest 3                           | -                                                                                                                                                                                                              | 3.9 mm                                                                                                                                                                                                 | 8.7 mm                                                                                                                                                                                                                       |



Fig. 53. a-c, Ilyarachna kermadecensis n.sp., & holotype; d-e, I. nordenstami n.sp., & allotype; a and e, apex of pleopods 1 from inside; b and d, pleopods 1 from the side; c, pleopod 2 from the side (o, basal joint of copulatory organ; s, stylet; k, keel on interior (dorsal) side; m, median margin of outer surface).

Table 5. Number of conical processes on the head in three species of Ilyarachna.

|            |   | antarctica ♀ |   |   | nor | nordenstami ♀ |    | nordenstami ನೆ |   | kermadecensis ♀ |   |   | kermadecensis 3 |   |   |   |
|------------|---|--------------|---|---|-----|---------------|----|----------------|---|-----------------|---|---|-----------------|---|---|---|
| Right side | t | L            | 1 | 3 | 5   | 5             | 10 | 0              | 1 | 1               | 1 | 1 | $1^{1}/_{2}$    | 1 | 2 | 3 |
| Left side  | 1 | 1            | 1 | 3 | 5   | 5             | 10 | 0              | 1 | 1               | 1 | 1 | $1^{1}/_{2}$    | 1 | 3 | 3 |
|            |   |              |   |   |     |               |    |                |   |                 |   |   |                 |   |   |   |

In addition, differences were found in the number of conical processes on the head, but as shown in Table 5, the greatest variation is found within specimens from the same population (*I. nordenstami*, Cumberland Bay, South Georgia) and thus, cannot be of specific significance (cf. also NORDENSTAM's table (1933, p. 270) of variation in spine armament on pereonites 5-7 in *Ilyarachna (Echinozone) quadrispinosa)*. As mentioned above (p. 102), variation in this respect was also found in *I. bicornis*.

Only very slight variation was found in the specimens of each of the three species. Apart from the differences mentioned above in *kermadecensis* (lateral corners of pereonites, furrows on pleon, and number of coupling hooks in maxilliped), it should only be added that the first pleopods in a male of this species from St. 658 had outer lobes which were bent a little more outwards and slightly more pointed, lacking most of the distal setae on the outside surface, found in the male holotype from 651 (Fig. 53b).

Apart from the differences summarized above I have found an almost perfect agreement between the three species as well as agreement within each species. This applies for instance to shape of head, general shape of pereonites and pleon, proximal joints of antenna, mouthparts, pereopods II and V-VII, pleopods 3-5 and uropods. A thorough description of these features has been given by NORDEN-STAM (1933) and the present author (1956a).

## Ilyarachna antarctica Vanhöffen, 1914 (Text-figs. 50-52)

*Ilyarachna antarctica* Vanhöffen, 1914, p. 591, fig. 124a, b; WOLFF 1956a, p. 106.

## Diagnosis:

Body rather elongated, about 3.5 times longer than broad. Head as broad as pereonite 1. Pereonite 2 the broadest segment, distinctly broader than 5. Pereonites unarmed, except for a row of small inconspicuous spines along the anterior margin of 1-4. Coxae of pereopods I and II with a process. Joint 3 of female antennula very short, not even half as long as joint 1. Apex of mandible rounded, palp slender and with three joints of equal length. Palp of maxilliped broad, epipod large and oval. Inner margin of carpus of pereopod I concave, with only a few setae. Median keel of female operculum with low tubercles and short spines. Uropod uniramous.

Affinities: This species is very close to *bicornis* from which it differs very slightly in shape of the mandibular apex, lacinia and palp (Fig. 51 a-b), and in setae and spine armament on pereopod I. The two species should perhaps be combined, but the present lack of males has prevented me from doing so, in view of the great taxonomic importance which must be ascribed to the male pleopods. *I. antarctica* is also, of course, close to the two new species, diagnosed below. It differs mainly from *nordenstami* in the shape of coxae, antennulae, mandibular palp and keel on operculum, and from *kermadecensis* in shape and armament of pereopod I and mandibular palp.

Type specimen: See Wolff 1956a, p. 107.

Occurrence: Antarctic Indian Ocean (65°15'S, 80°19'E), 3397-3423 m, -0.3°C.

## Ilyarachna nordenstami n.sp. (Text-figs. 50-53)

Ilyarachna antarctica Vanhöffen, NORDENSTAM 1933, p. 265, fig. 76a-e; WOLFF 1956a, p. 106.

Diagnosis: Body rather elongated, about 3.5 times longer than broad. Head as broad as pereonite 1. Prn. 5 as broad as 2. Pereonites unarmed, except for a row of small, inconspicuous spines along the anterior margin of 1-4. Coxae of pereopods I and II unarmed. Joint 2 of female antennula very short, only half as long as joint 1; joint 3 longer than joint 1. Joint 2 of male antennula short and broad; flagellum with about ten joints. Apex of mandible rounded; palp slender and joint 2 almost twice as long as the two others. Palp of maxilliped broad, epipod large and oval. Inner margin of carpus of pereopod I slightly concave and with a few, proximal setae. Female operculum with a smooth median keel. Male pleopods with a moderate longitudinal curve, almost as broad distally as proximally, without a deep median furrow and with the digitiform outer lobes curved inwards. Pleopod 2 without a distinct keel. Uropod uniramous.

Affinities: This species seems to be closest to *antarctica* or *bicornis* (see above).

Type specimen: As holotype I have selected the best preserved female, 5.1 mm long.

Occurrence: South Georgia, off the mouth of Cumberland Bay (54°11'S, 36°18'W), 252-310 m,  $+1.5^{\circ}$ C.

## Ilyarachna kermadecensis n.sp. (Text-figs. 50, 52, 53)

Ilyarachna antarctica Vanhöffen, WOLFF 1956a, p. 106, figs. 24-28.

Diagnosis: Body rather elongated, about 3.5 times longer than broad. Head as broad as pereonite 1. Prn. 5 as broad as 2. Pereonites unarmed, except for a row of small, inconspicuous spines along the anterior margin of 1-4 and a more or less distinct process on the antero-lateral corners of the same segments. Coxae of pereopods I and II with a process. Joint 3 of female antennula a little more than half as long as joint 1. Joint 2 of male antennula almost as long as joint 1; flagellum with about 35 joints. Apex of mandible rounded, joint 2 of palp one-fourth longer than the other two and joint 3 with a row of short setae in addition to the two terminal ones. Palp of maxilliped broad, epipod large and oval. Inner margin of carpus of pereopod I slightly convex, with simple and short, spineshaped setae. Median keel of female operculum with low tubercles and short spines. Male pleopods

1 with a strong longitudinal curve, twice as broad proximally as distally, with a very deep, median furrow and broad, outward-bent outer lobes. Pleopod 2 with a high, thin, distal keel and a slender endopod which reaches somewhat beyond the sympod. Uropod uniramous.

Affinities: It appears to be most closely related to *antarctica* and *bicornis* (see above) and perhaps to *longicornis* (in shape of outer lobes of male pleopods 1).

Type specimen: The largest male (8.7 mm long, 3.3 mm broad) from *Galathea* St. 651 has been selected as holotype. Figs. 24a-b, 25, 26a-f, 27a-b, and 28c-g (1956a) were previously prepared from this specimen. The descriptions and illustrations of female characters were based on the largest female (15.2 mm long) from the same station.

The intestine contents are recorded in Table 17 (p. 240).

Occurrence: Kermadec Trench N.E. of New Zealand, 4540 m, 6660-6770 m, and 6960-7000 m  $(1.1-1.3 \,^{\circ}\text{C.})$ .

## *Ilyarachna aspidophora* n.sp. (Text-figs. 54-58)

#### Material:

*Galathea* St. 639, off E. New Zealand (37°31'S, 177°08'E), 213 m, 26 January 1952. Bottom: Black sand. Bottom temp.: *c*. 14.7°C. – 1 female.

#### Description:

Body (Figs. 54 and 55 a) very similar to that of *I. aries* (VANHÖFFEN 1914, p. 594) and in particular, to *clypeata* (SARS 1899, pl. 62), i.e. the two species





Fig. 55. *Ilyarachna aspidophora* n.sp.; a, from above; b, pereonites 5-7 and pleon seen directly from above; c, left antennula.

formerly regarded as belonging to the (invalid) genus *Aspidarachna (Aspidonotus)*. When both halves of the body are seen directly from above, it is 2-3 times longer than broad. It is quite smooth and only slightly calcified.

*Head* with the same ribbon-shape, when seen from the side (Fig. 54), as in *clypeata*. The straightly cut frontal margin covers an excavation with the basal part of antennulae and antennae.

Pereonites 1-2 of almost equal length medianly. When seen from above they have prominent, rounded antero-lateral corners, furnished with a few short setae. – Pereonites 3-4 broader and longer, and the antero-lateral corners shaped as triangular processes, set off from rest of the segment by a low furrow; thus, closely resembling coxal plates. They seem, however, to have no connexion with the legs which are inserted at a more posterior position on the segments (Figs. 54 and 55a).

*Pereonites 5-7 and pleon* (55b) form a distinct, evenly rounded shield, very dominant in size (more than twice as long as prns. 1-4). The segments decrease in length from 5 to 7, both medianly and laterally. Pleon about one-fourth broader than long and subacute. The abundant setae on the uropods visible from above.

Antennula (55c). The inner corner of joint 1 projects the furthest, and it is one-fourth longer than broad. Joint 2 unusually short, not much longer than joints 3 and 4. Only three elongated joints in the flagellum, provided the peduncle is 4-jointed.

Antenna (54) with the four proximal joints forming a rather regular and narrow pyramid, the separation between the joints being very inconspic-



uous. Squama distinct and furnished with a few setae. Joint 5 as long as head + pereonites 1-4, joint 6 still one-fourth longer than joint 5. Only a fragment of flagellum (with long and narrow joints) preserved.

*Right mandible* considerably lower and broader when seen in frontal view than in the other species, resembling that of *Pseudarachna hirsuta* (SARS 1899, pl. 63). Apex (56a-b) correspondingly blunt and no spine-row present, but molar process large and rounded and very indistinctly set off from mandibular body. On its interior side one strong, serrated spine (56a). The three joints of the palp are short and stout, especially the second. On joint 3 are two distal, finely serrated spines and a row of shorter, strongly serrated spines plus many setae at a more proximal position (56c). Left mandible not dissected.

*Maxilliped* (57a) with sympod very narrow. Endite also narrow and with deep incision distally, partly furnished with thin setae. Three (right mxp.) and four coupling hooks. Direction of palp the same as that of the peduncle, endite being thus entirely covered. Epipod very short and rather rectangular.

Pereopods I-VII. Prp. I (54) short and very slender with no widening of ischium and carpus. Prp. II



Fig. 56. *Ilyarachna aspidophora* n.sp.; right mandible; a, obliquely from inside; b, from outside; c, last joint of palp.



Fig. 57. Ilyarachna aspidophora n.sp.; a, left maxilliped; b, percopod VI.

more than twice as long as I and prp. III still a little longer than II, with ischium much longer and basis much shorter than in II. Prp. IV one-fifth longer than III, i.e. more than twice as long as the body; prps. V and VI almost equal (57b), with a rather broad propodus and very slender dactylus; prp. VII slender and without feathered setae.

*Operculum* (58 a-b) with a median, broad incision distally and the lateral margins forming an obtuse angle in the middle. The distal part of the operculum and the median, narrow and rather high keel covered with long setae, usually feathered.

*Pleopod 3* (58c) with three stout, feathered setae on both branches, the outer branch broad and apparently 1-jointed.

Uropod (58 d) rather angular with the endopod only present. The setae not feathered.

Size: Total length 3.2 mm, maximum width 1.4 mm.

*Embryos:* About twenty embryos present in the very prominent marsupium (Fig. 54). Each of them

measures  $0.30 \times 0.35$  mm and primordium of head and appendages are faintly visible (58e). They correspond closely to "2tes Embryonal-(Marsupial-) Stadium" (FORSMAN 1944, p. 23, pl. 1, 2).

#### Remarks:

This new species combines features of other species of *Ilyarachna* previously believed to belong to different genera. Thus, the general shape is reminiscent of "*Aspidarachna*" *clypeata* and *aries*, although the two latter have biramous uropods. The mandibles resemble those of the (valid) genus *Pseudarachna*. The species can be easily distinguished by the shape of the body, the first antennular joint, the mandibles, and the operculum. The aberrant shape of the mandibles may, perhaps, justify the erection of a new genus in the future.

#### Occurrence:

East of the North Island of New Zealand, 213 m, c. 14.7°C.

## FAMILY EURYCOPIDAE

#### Diagnosis:

Body usually oval, rarely elongated. Head free, eyes absent. Pereonites divided into sections, the first four being free and similarly shaped, the latter three with convex front and concave hind margin (except the hind margin of prn. 7), and often fused. Antennulae dorsal, with first joint plate-shaped (except in *Syneurycope*), and usually with an inner projection; flagellum with several joints. Antennae probably always longer than body. Mandibles normal, rarely reduced to any extent; palp very rarely absent. Palp of maxilliped with the first three joints nearly always expanded, as broad as or broader than endite. Pereopods I-IV equal, except in length, or prp. I distinctly prehensile; all basipodites more or less elon-



