

*MICROTHAMBEMA TENUIS* N. GEN., N. SP. (ISOPODA ASELOTA)  
AND RELATIONS OF SOME ASELOTE ISOPODS

BY

J. A. BIRSTEIN

Biological Faculty of the Moscow State University

During the expeditions of the Soviet research vessel "Vitjaz" in the North-western Pacific many deep-sea Isopods mainly belonging to the suborder Asellota were collected. Among them one species presents a great interest. This species must be assigned to a new genus closely related to the genera *Thambema* Stebbing, *Microparasellus* Karaman, *Microcharon* Karaman, *Angeliara* Chappuis and Delamare (= *Brevipleonida* Gnanamuthu), *Microjaera* Bocquet and Lévi, *Mackinia* Matsumoto, *Caecianiropsis* Menzies and Petit, *Protocharon* Chappuis and Delamare and probably too to the genus *Ectias* Richardson.

**Microthambema** new genus

**Definition.** Body extremely slender. Head with round prominent frontal area. Eyes absent. First antenna short, with 6 segments. Second antenna longer than head, multiarticulated, squama lacking. Mandibles normal, molar process well developed and truncated at apex, lacinia present on left mandible, palp 3-segmented. Maxilliped with 2 coupling hooks. Maxillipedal palp 5-segmented, the first three segments expanded, wider than endite. All peraeon somites free. Peraeon somite 1 shorter than all others, peraeon somites 4-7 elongated. Peraeopod 1 prehensile, the last six peraeopods of moderate length, their dactyli with one claw. Carpus of peraeopods 2-4 expanded. Pleon consists of two movable somites. Pleotelson elongated, oval, with rounded posterior margin. Pleopods 1 and 2 normal, pleopods 3 and 4 uniramous. Uropods biramous, with peduncle, exopodite short.

Type species: *M. tenuis* n. sp.

**Microthambema tenuis** new species (figs. 1, 2)

**Material:** One male. 2.7 mm long and 0.32 mm wide at first peraeonal somite; "Vitjaz", station No. 3886, 31°11.0' N. 143°09.7' E., depth 5680-5690 m.

**Description:** Body elongated, 8.5 times longer than broad (width of peraeon somite 1).

Head longer than broad, protruding between the antennae into a semicircular lobe. Eyes lacking.

Peraeon somites 1-3 increase in length but decrease in width from 1 to 3. Anterior margin of these somites broader than the posterior. Peraeon somites 4-7 equally long, each somite  $1\frac{3}{4}$  as long as somite 1, anterior margin narrower than posterior.

Pleon consists of two movable somites, the first narrower and only  $\frac{1}{6}$  as long as the second. The second somite oval,  $1\frac{3}{4}$  as long as broad, with semicircular posterior margin, longer than each of the posterior peraeon somites.

First antenna (fig. 2a) shorter than head, consists of six segments. The second

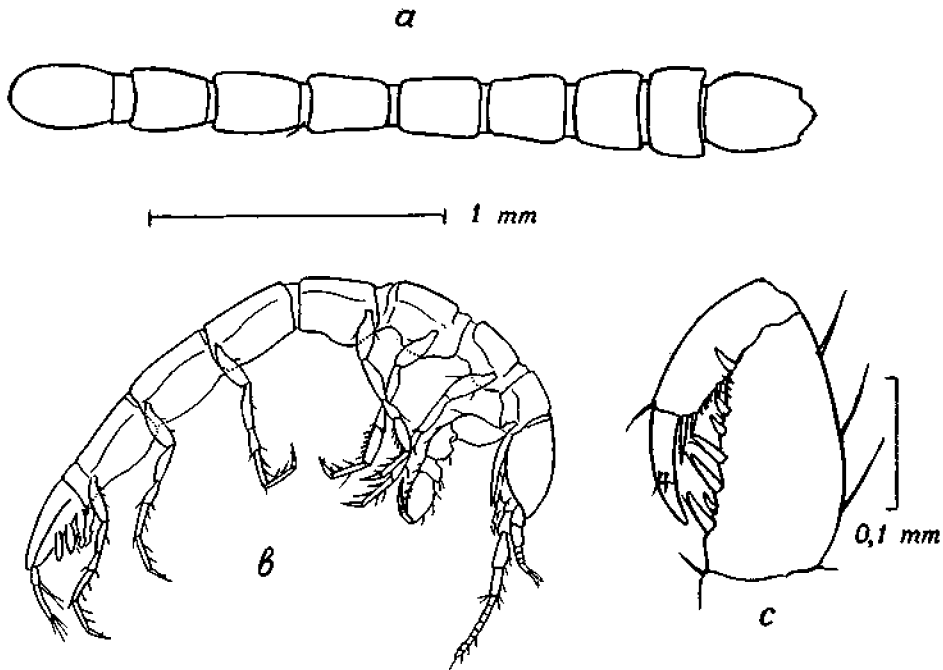


Fig. 1. *Microthambema tenuis* n. gen., n. sp. a, in dorsal view; b, in lateral view; c, terminal part of pereopod 1.

segment is  $1\frac{1}{2}$  times longer than the first. Second and last segments furnished with one large sensory filament.

Second antenna (fig. 2b) twice as long as the first antenna. The first three segments of peduncle short, the fourth slightly shorter than the fifth; the fifth and sixth segments subequal in length, but the last somewhat broader. The 8-segmented flagellum about as long as the last two segments of the peduncle together.

Right mandible (fig. 2c) has a cutting edge with five blunt teeth. Five spines in the spine-row. Molar process strong, sub-cylindrical, the three-segmented palp well developed, with strongly curved terminal segment. Left mandible with cutting edge like that of the right mandible, spine-row consists of three spines only, the movable lacinia short, with four teeth.

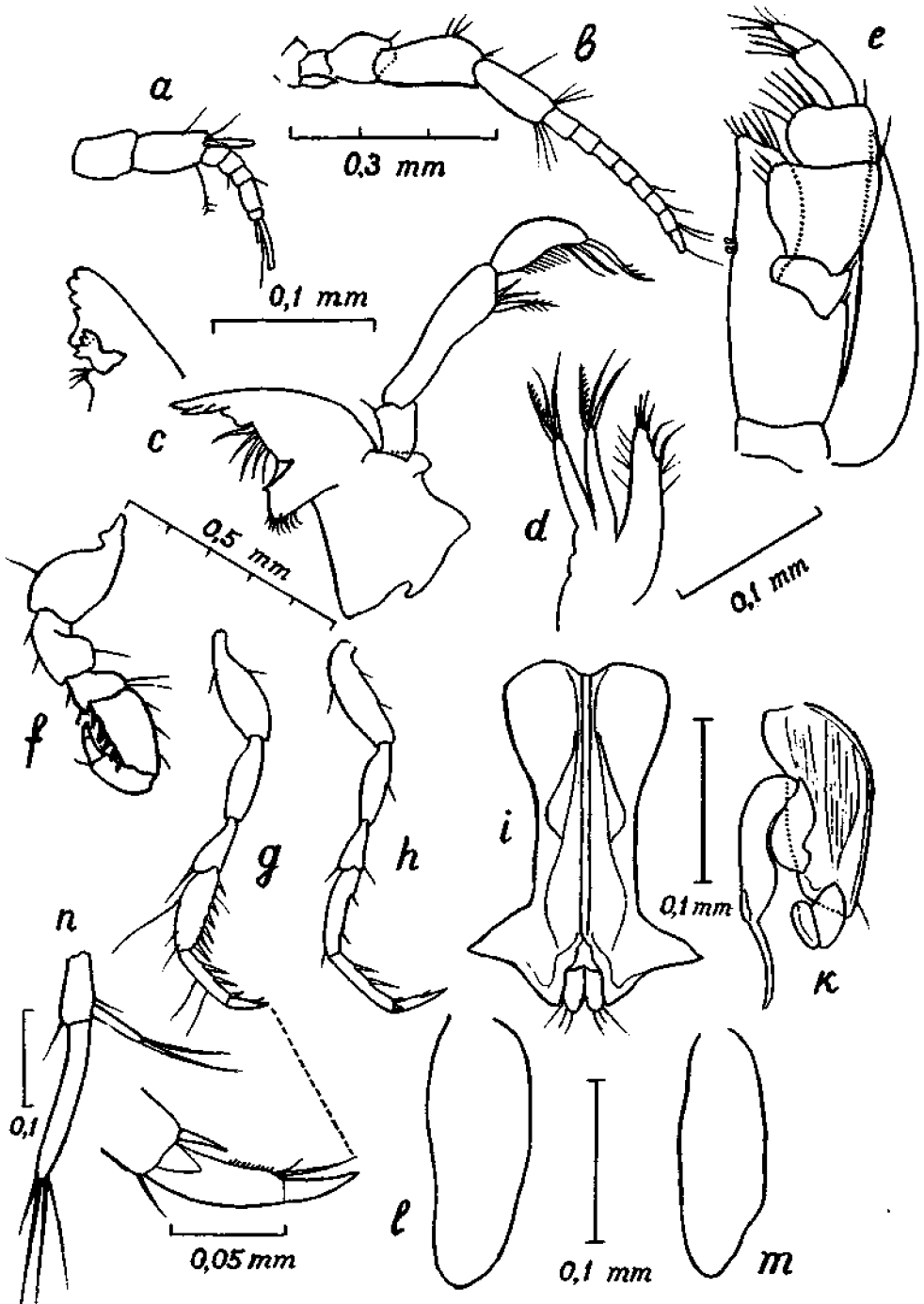


Fig. 2. *Microthambema tenuis* n. gen., n. sp. a, first antenna; b, second antenna; c, right and left mandible; d, second maxilla; e, maxilliped; f, first pereopod; g, second pereopod; h, seventh pereopod; i, first pleopod; k, second pleopod; l, third pleopod; m, fourth pleopod; n, uropod.

Maxilla 1 and 2 (fig. 2d) typically shaped, as in *Thambema amicum* Stebbing.

Maxilliped (fig. 2e) like that in *Th. amicum*, with two coupling hooks, but the epipodite longer than in *Th. amicum*, reaching the distal margin of the endognath. Palp 5-segmented, in its broadest part  $1\frac{1}{2}$  times wider than the endite.

Peraeopod 1 (figs. 1c, 2f) stouter but shorter than other peraeopods. Basis, ischium and merus much expanded distally. Carpus narrows distally, twice as long as its greatest width, with seven stout unequal spines on the lower margin. Propodus slightly curved, shorter than carpus, dactylus  $1\frac{1}{2}$  times shorter than the carpus.

Peraeopods 2 (fig. 2g), 3 and 4 subequal in shape and size. Basis longer than each of the succeeding segments, expanded at the middle. Ischium and merus almost equally long, ischium with six to seven spines, merus with two spines along the anterior convex margin. Propodus shorter than merus and ischium.

Peraeopods 5, 6 and 7 (fig. 2h) almost as long as the preceding peraeopods but basis more elongated and carpus more slender. No spines along the anterior margin of carpus. All dactyli provided with one claw.

Pleopod 1 (fig. 2i) in general form similar to that of an anchor. The base rounded, the outer distal corners protruding outwards in triangular lobes. The endopodites slightly projecting and furnished each with three hairs.

Pleopod 2 (fig. 2k) like in *Thambema amicum* but endopodite considerably longer. Exopodite two-segmented. Symopodite with one hair at the inner distal corner.

Pleopods 3 and 4 (figs. 2l, 2m) uniramous, oval.

Uropod terminal, shorter than pleotelson. Exopodite almost as long as peduncle, endopodite three times longer and broader than exopodite.

#### SYSTEMATIC POSITION

Though *Microthambema tenuis* n. sp. has many features in common with *Thambema amicum* Stebbing, a complete comparison of these species presents some difficulties because the description given by Stebbing (1913) is not quite correct, as has been already pointed out by Bocquet and Lévi (1955) and Menzies and Petit (1956).

Thus the uropods of *Th. amicum* are probably broken off, not lacking, as thought Stebbing (Bocquet and Lévi, 1955), and the pleon consists of two somites rather than of one, as described by Stebbing (Menzies and Petit, 1956); indeed a slight indication of a first free somite can be discerned on the figure given by Stebbing himself (plate 26). Furthermore the maxillipedal palp of *Th. amicum* is not four-segmented, but five-segmented. Here too our statement is confirmed by the figure of Stebbing, showing the beginning of a suture between the first and the second segments. If these corrections are accepted the close rela-

tion of *Microthambema tenuis* and *Thambema amicorum* becomes quite evident.

The two genera are similar in respect to the form of body, head and pleotelson; the structure of all appendages is very similar too, with the exception of pleopods 1, 3 and 4 (the structure of the uropods of *Tb. amicorum* is as yet unknown). The difference between the pleopods 1 is a minor one: in *Tb. amicorum* the exopodites of the pleopod 1 are less expanded distally and the endopodites are much longer and protrude farther out of the incisure of the distal margin of the exopodites as compared with *M. tenuis*. The difference in structure of pleopods 3 and 4 is essential: they are biramous in *Tb. amicorum* and uniramous in *M. tenuis*. Due to these differences the species considered must be referred to different though closely related genera.

They are nearer to one another than either of them to any other genus. From all the genera listed above, which resemble *Thambema* and *Microthambema* by their slender body and well developed first abdominal somite *Tb. amicorum* and *M. tenuis* differ by a strong prehensile first peraeopod and the presence of one claw on the dactyli of the other peraeopods, as well as by a longer epipodite of the maxilliped, extending beyond the second segment of the palp.

The position of these two genera as well as of the related genera *Microparasellus*, *Microcharon*, *Angeliara*, *Microjaera*, *Mackinia*, *Caecianiropsis*, *Protocharon* in the system of the suborder Asellota still remains obscure.

Bocquet and Lévi (1955), who did not recognise the Microparasellidae Karaman as a self-contained family, suggested that the genera *Microparasellus*, *Microcharon*, *Angeliara* and *Brevipleonida* referred to this family should be assigned, together with the new genus *Microjaera* and, possibly, the genera *Thambema* and *Ectias* to a new subfamily Microjanirinae, which, in their opinion, belongs to the family Janiridae. They regard the tendency to a reduction of respiratory pleopods as an essential distinguishing character of the Microjanirinae.

Chappuis (1959) in his critical analysis points out a basic difference between the Microparasellidae and the Janiridae, namely the structure of the mandibular molar process, cone-shaped in the Microparasellidae and subcylindrical in the Janiridae. As to the tendency to a reduction of respiratory pleopods Chappuis associates this feature with the small size of the animals that makes integumentary respiration possible. This statement of Chappuis is confirmed by the material studied by us: the respiratory pleopods of the small *Microthambema tenuis* are far more reduced than those of the larger *Thambema amicorum*.

According to Chappuis the genera *Microparasellus*, *Microcharon* and *Angeliara* (= *Brevipleonida*) belong to the family Microparasellidae, whereas the genera *Caecianiropsis* and *Microjaera* must be assigned to the family Janiridae; the systematic position of the genera *Mackinia* and *Protocharon* remains unknown, the genus *Ectias* has to be considered incertae sedis. No mention is made by this author of the genus *Thambema*.

Not all of these statements seem convincing. Thus the genera *Microjaera* and *Caecianiropsis*, though possessing well-developed mandibular molar processes can-

not be included into the family Janiridae because of their relatively large free first abdominal somite, never encountered in genera of the family Janiridae but inherent to the family Microparasellidae. This primitive character connects the genera *Microjaera*, *Caecianiropsis*, *Thambema*, *Microthambema*, all the Microparasellidae and *Protocharon*.

In regard to *Mackinia*, Matsumoto (1956) who has described this genus, does not indicate in his text the number of pleonal somites, though in his drawing two free somites are represented before the pleotelson. The attribution of *Mackinia* to the Paraselloidea is obvious and is accepted by Matsumoto too, but as no representatives of this superfamily are known to possess a three-segmented abdomen, which is characteristic of the superfamily Aselloidea, it must be surmised that an error has been committed in the figure given by Matsumoto and that in reality *Mackinia*, like all other genera mentioned above, has but one free abdominal somite before the pleotelson.

A second character which prevents the inclusion of *Caecianiropsis*, as well as of *Protocharon*, *Mackinia* and all the Microparasellidae into the family Janiridae is the structure of the first pair of peraeopods which in all these genera is like or nearly like that of all other peraeopods. In this respect *Microjaera* is near to the Thambematidae and most Janiridae, though among the latter representatives are known with an undifferentiated peraeopod 1 (as for instance *Jaera*).

Such features as body form, the presence of a well developed first free abdominal somite and the number of claws on the dactyli of peraeopods 2-7 must be regarded as more important distinguishing characters than the form of the mandibular molar process, the more so that even among the typical Janiridae one finds representatives with a cone-shaped rather than a cylindrical molar process, as for instance in the genus *Katianira* Hansen.

Consequently the genera considered here, characterised by the presence of a first free abdominal somite and a slender elongated body, may be grouped into three families:

1. Thambematidae Stebbing. Peraeopod 1 prehensile, differing sharply from the others. Dactyli of peraeopods 2 to 7 with one claw. Mandibular molar process subcylindrical. *Thambema* Stebbing and *Microthambema* n. gen.

2. Microparasellidae Karaman. Peraeopod 1 not prehensile, similar in structure to all the others. Dactyli of peraeopods 2 to 7 with 2 to 3 claws. Mandibular molar process conical or reduced. Pleopod 1 of the male broader at the base than distally. *Microparasellus* Karaman, *Microcharon* Karaman and *Angeliara* Chappuis and Delamare.

3. Microjaniridae Bocquet and Lévi (new combination). Peraeopod 1 slightly differentiated or not differentiated. Dactyli of peraeopods 2 to 7 with 2 claws. Mandibular molar process subcylindrical. Pleopod 1 of the male narrower at the base than distally (with the exception of *Mackinia*). *Microjaera* Bocquet and Lévi, *Caecianiropsis* Menzies and Petit, *Protocharon* Chappuis and Delamare and *Mackinia* Matsumoto.

All three families are closely connected with the family Janiridae, though each of them by different characters. The family Thambematidae is similar to the Janiridae by their prehensile pereopod 1 but differs by the dactyli of all other pereopods. Contrariwise the Microjaniridae and the Microparasellidae, resembling the Janiridae in respect to the structure of dactyli of pereopods 2 to 7, differ by their pereopod 1 being not prehensile. However, the Microparasellidae differ from most Janiridae by the structure of mandibular molar process.

According to Menzies (1956) the new family Echinothambemidae, which he has described from the Puerto-Rico trench, is near to the Thambematidae. It seems to me, however, that these families are distant from one another, since in the Echinothambemidae the posterior thoracic somites are fused together and with both the abdominal somites; they have no mandibular palp and are characterised by a peculiar structure of the first antenna, single-segmented uropods, etc. The Thambematidae by their characteristic features are nearer to the Janiridae, Microparasellidae and Microjaniridae than to the Echinothambemidae.

The well-developed free first abdominal somite, inherent to the Thambematidae, Microparasellidae and Microjaniridae, distinguishing them from the Janiridae, can be considered a primitive character, indicative of a close relation between these three families. It is highly probable that they have retained this feature, associated with acute bending of the body, owing to their mode of life in capillaries between soil particles. We are as yet entirely ignorant of the mode of life of the abyssal Thambematidae, but it may be inferred from their body form similar to that of the Microparasellidae and Microjaniridae, that they too live in capillaries between soil particles.

#### DISTRIBUTION

The families Microparasellidae and Microjaniridae in the sense suggested in this paper have a similar distribution. Representatives of both families are known from interstitial fresh and marine shallow waters.

Among the three genera of the family Microparasellidae the genus *Microparasellus* with its two species occurs solely in fresh subterranean waters of Jugoslavia and North Africa. The genus *Microcharon* (identical with the genus *Dustenia* Lévi — see Birstein, 1952 and Chappuis and Delamare, 1954) included 10 species from fresh interstitial waters of Jugoslavia, Rumania, Hungary and Corsica and 3 marine shallow water psammophile species found in the English Channel off Plymouth and on the Mediterranean coasts of Italy and France (Chappuis and Delamare, 1954; Spooner, 1959; Karaman, 1959). And finally the genus *Angeliera*, with two species, occurs in fresh, brackish and marine interstitial waters of South France and Italy and in marine interstitial waters of India (Schulz, 1954; Gnanamuthu, 1954).

The family Microjaniridae includes four genera. Among them, the monotypic genera *Microjaera* and *Caecianiropsis* are recorded from marine shallow waters

of France and California, the monotypic genus *Mackinia* and the genus *Protocharon*, with two species, inhabit fresh interstitial waters of Japan, of Réunion Island and of Amsterdam Island.

A characteristic feature of both families under consideration, besides their being confined to marine and fresh interstitial waters, is the discontinuity of the ranges of distribution of certain genera. Thus for instance the genus *Angeliara* is known from France, Italy and India, the genus *Protocharon* from two oceanic islands Réunion and Amsterdam, very distant from one another, the genus *Microcharon* occurs not only on the European continent but also on the Mediterranean islands Corsica and Leucas, the genus *Microparasellus* on the Balkan Peninsula and in North Africa. Such a pattern of distribution is indicative of the great antiquity of these genera.

The family Thambematidae in contrast to the Microparasellidae and Microjaniridae is restricted to the abyssal. *Thambema amicorum* Stebbing was found in the North Atlantic (54°33' N, 10°56' W) at a depth of 2490 m and *Microthambema tenuis* n. sp. in the northwestern Pacific (31°11.0' N, 143°09.7' E) at 5680-5690 m.

If on the basis of the similarities described above, and, above all, on the presence of a well-developed first abdominal somite, these three families can be considered being closely related and primitive, a fairly accurate notion is obtained of the range of distribution of this group of Isopoda. This archaic group inhabits at present on the one hand fresh and marine interstitial waters, and on the other great oceanic depths.

A similar distribution is observed in some other archaic crustaceans, in particular in the amphipods of the suborder Ingolfiellidea. Three species are known from interstitial fresh waters of Yugoslavia, one species from the caves of the Congo, one shallow-water marine species lives among corals in the Gulf of Siam, and, finally one abyssal species was found in Davis Strait in a depth of 3521 m. Concerning this type of distribution of the Ingolfiellidea Karaman (1959a) writes as follows: "Diese sonderbare Verteilung der Ingolfielliden auf vier Kontinente, überall in nur je einer Art, lässt vermuten, dass es sich um sehr alte, archaische Formen handelt, von welchen jede, als Relikt vergangener Zeit, wohl ein grösseres Areal der Verbreitung besitzen wird" (63).

Recently *Ingolfiella* was found in shell gravel off Plymouth from a depth of 42-48 m (Spooner, 1959a) and in interstitial cavities in rocky bottom on the coast of Peru (Siewing, 1959). These findings emphasize the similarity between the distribution of the group of genera of small Asellota considered here and that of the Ingolfiellidea.

Discussing the causes of the proximity of abyssal and shallow-water faunas, Siewing (1959) admits that: "... flockige Detritus kann möglicherweise in ruhigem Wasser ein ökologisches Äquivalent zum Sandbiotop bilden. Solche Stillwasserzonen werden in grösseren Tiefen häufiger sein als in Flachwassergebieten..." (102).



It must, however, be kept in mind that this similarity cannot be explained merely by ecological factors. The explanation of Siewing does not apply for instance to the isopod genus *Janirella* (which is now assigned to a special family Janirellidae, cf. Menzies, 1956), whose distribution is alike to that of Ingolfiellidea and Thambematidae-Microparasellidae-Microjaniridae. The genus *Janirella* includes seven deep-sea species from the North Atlantic, seven still undescribed deep-sea species from the North Pacific and one fresh-water species probably subterranean from Victoria. Nevertheless, *Janirella* with their flattened short body cannot be referred to the "Mesopsammal" and their life-habits are probably different from those of the Ingolfiellidea and the group of isopod families considered in this paper. To explain such a pattern of distribution not only ecological, but historical factors, too, must be taken into account as has been emphasised by Karaman (*loc. cit.*) in respect to the Ingolfiellidea.

The connection between the deep-sea oceanic fauna on the one hand and the interstitial freshwater and shallow marine fauna on the other, is of great significance to the controversial question on the age of the abyssal marine fauna. Groups where such connections are known to exist can be considered relicts of ancient faunas, once far more widely distributed. This lends strong support to the conception of the presence of many archaic elements in the deep-sea fauna (Zenkevitch and Birstein, 1960) and contradicts the idea of its geologically recent formation (Menzies and Imbrie, 1958).

#### ZUSAMMENFASSUNG

Aus dem nord-westlichen Pazifik aus der Tiefe von 5680-5690 m wird die neue Art und Gattung *Microthambema tenuis* beschrieben. Diese Art steht *Thambema amicorum* Stebbing aus grossen Tiefen des Atlantik nahe. Die Ähnlichkeit zwischen den Thambematidae und zwei Assel-familien mit interstitiellen marinen und limnischen Vertretern (Microparasellidae, Microjaniridae) legt die Vermutung nahe, dass eine Verwandtschaft zwischen einigen Komponenten der Tiefseefauna und der interstitiellen marinen und limnischen Fauna existiert, was auch durch die Verbreitung der Ingolfielliden (Amphipoda) bestätigt wird. Diese Verbreitung entspricht der Vorstellung vom Altertum und Archaismus eines gewissen Teiles der Tiefseefauna.

#### REFERENCES

- BIRSTEIN, J. A., 1952. Some data on the origin of phreatic fauna. Trans. Hydrobiol. Assoc. USSR, 4: 225-229 (Russian).
- BOCQUET, CH., and C. LÉVI, 1955. Microjaera anisopoda, n. sp. Isopode psammique de la sous-famille nouvelle des Microjanirinae. Arch. Zool. Expér. Gén., Notes et Revue, 92 (3): 116-134.
- CHAPPUIS, P. A., 1958 (1959). Crustacés des eaux douces de l'île Amsterdam. Protocharon antarctica n. sp. (Récoltes P. Paulian 1955-1956). Mém. Inst. Sci. Madagascar, 12: 13-24.
- CHAPPUIS, P. A. and C. DELAMARE DEBOUTTEVILLE, 1954. Les Isopodes psammiques de la Méditerranée. Arch. Zool. Expér. Gén., 91: 103-138.
- CHAPPUIS, P. A., C. DELAMARE DEBOUTTEVILLE and R. PAULIAN, 1956. Crustacés des eaux souterraines littorales d'une résurgence d'eau douce à la Réunion. Mém. Inst. Sci. Madagascar, (A) 11: 51-78.
- GNANAMUTHU, C. P., 1954. Two new sand-dwelling Isopods from the Madras sea-shore. Ann. Mag. Nat. Hist., (12) 7: 257-274.
- KARAMAN, ST., 1959. Über eine neue Microcharon Art (Crust., Isopoda) aus dem Karstgebiete der Herzegowina. Acta Zool. Acad. Sci. Hung., 4 (3/4): 333-338.
- , 1959a. Über die Ingolfielliden Jugoslaviens. Biol. Glasn., 12: 63-80.

- MATSUMOTO, K., 1956. On the two new subterranean water Isopods *Mackinia japonica* gen. et sp. nov. and *Asellus hubrichti* sp. nov. Bull. Japan. Soc. Scient. Fish., **21** (12): 1219-1225.
- MENZIES, R. J., 1956. New abyssal tropical Isopods, with observations on their biology. Amer. Mus. Nov., **1798**: 1-16.
- MENZIES, R. J. and J. IMBRIE, 1958. On the antiquity of the deep sea bottom fauna. Oikos, **9** (2): 192-210.
- MENZIES, R. J. and J. PETIT, 1956. A new genus and species of marine asellote isopod, *Caecianiopsis psammophila*, from California. Proc. U. S. Nat. Mus., **106** (3376): 441-446.
- SCHULZ, E., 1954. *Angeliella phreaticola* aus Ischia. Ein Beitrag zur Kenntnis und Verbreitung der Microparaselliden. Kieler Meeresforsch., **10** (2): 253-260.
- SIEWING, R., 1958. *Ingolfiella ruffoi* nov. spec., eine neue Ingolfiellide aus dem Grundwasser der Peruanischen Küste. Kieler Meeresforsch., **14** (1): 97-102.
- SPOONER, G. M., 1959. The occurrence of *Microcharon* in the Plymouth offshore bottom fauna, with description of a new species. Journ. Mar. Biol. Assoc. U. K., **38** (1): 57-63.
- , 1959a. New members of the British marine bottom fauna. Nature, **183** (4676): 1695-1696.
- STEBBING, T. R. R., 1913. On the Crustacea Isopoda of the Porcupine Expedition. Trans. Zool. Soc. London, **20** (4): 231-239.
- ZENKEVITCH, L. A. and J. A. BIRSTEIN, 1960. On the problem of the antiquity of the deep-sea fauna. Deep-Sea Research, **7**: 10-23.