

MICROPARASELLIDS FROM PHREATIC WATERS OF GREECE  
(ISOPODA, ASELOTOTA)

BY

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During researches on the fauna of phreatic waters of Greece, carried out at the Zoological Institute of the University of L'Aquila, Italy, a large number of isopods of the family Microparasellidae were obtained.

The majority of these belong to the genus *Microcharon* Karaman, which until now was represented in Greece only by the species *Microcharon latus* Karaman, 1933, from the island of Lefkas (Karaman, 1958), *Microcharon stygius hellenae* Chappuis & Delamare Deboutteville, 1954, from Attica and a *Microcharon* species (Coineau, 1971) from the islands of Euboea; the others are referable to the genus *Microparasellus* Karaman which is for the first time reported from Greece.

The present paper provides the description of the above materials, together with remarks on their ecology and systematics, and numerous new records for the family Microparasellidae in Greece.

Moreover, *Microparasellus hellenicus* n. sp. and *Microcharon othryis* n. sp., two new species from phreatic systems of Epirus-Etholia-Peloponnesus and of Thessalia-Attica, respectively, are described and discussed.

***Microparasellus hellenicus* n. sp. (figs. 1-2)**

Material. — 1 ♂ (holotype), on slide, completely dissected and mounted in Faure solution; 1 ♀ (allotype), preserved in alcohol 70% with glycerol; 1 ♂, 2 ♀♀ and 3 juveniles, from freshwater wells among the houses of the Village of Glikorizo, Arta (Epirus), 24 February 1976, Argano, Pesce & Bianco coll.; 1 ♂ and 7 ♀♀ from the same locality as the holotype, 6 May 1977, Pesce, Maggi & Miranda coll.; 1 ♀ from a freshwater well near Anfitea, Agrinion (Etholia), 6 May 1977, Pesce, Maggi & Miranda coll.; 1 ♀ from a freshwater well along the "Old Road" Patras-Athens, near Egion (Peloponnesus), 9 May 1977, Pesce, Maggi & Miranda coll.

Types preserved in the collections of the "Zoölogisch Museum, Universiteit van Amsterdam", Amsterdam, Netherlands (ZMA Is. 10S. 114-122).

Diagnosis. — Body completely rolled up; pleotelson very large, with the transverse section subcircular; pleopod 1 of male very slender with the extremity

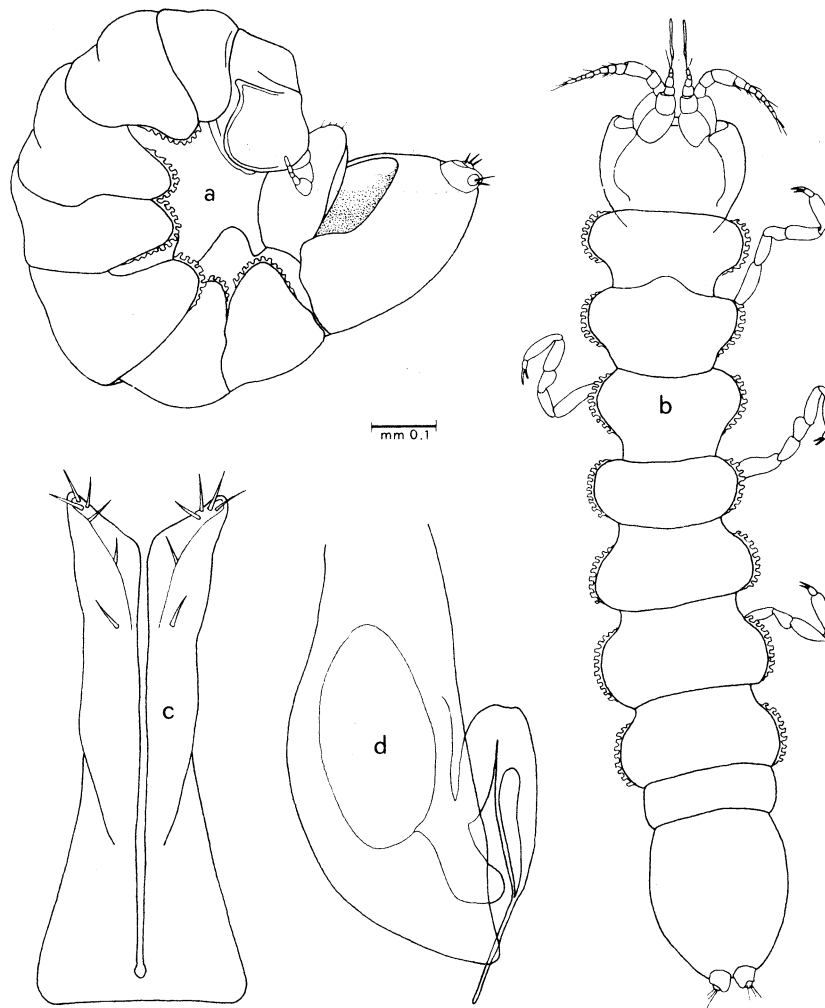


Fig. 1. *Microparasellus hellenicus* n. sp. a, body, lateral view; b, body, dorsal view; c, male pleopod 1; d, male pleopod 2.

of each half obliquely truncate and directed inwards; pleopod 2 of male with an elongated sympodite and the distal part of the endopodite very slender and acutely pointed, overreaching the tip of the sympodite.

Female second pleopod subcircular, armed with 4 setae on distal margin.

**Description.** — Body completely covered by slightly irregular (calcareous?) plates which, on the whole, show a characteristic mosaic. Body length, excluding antennules, antennae and uropods, 1.41-1.65 mm; width on the 7th pereopod about 0.25-0.27 mm. Body typically rolled up, cephalosome wider than long, with well developed protruding antero-lateral margins. Thoracic segments 1-3 enlarged

anteriorly, 4 not enlarged at all, 5-7 enlarged posteriorly. All the pereionites show the typical lateral chitinous lamellae which consist of small irregular edges. Pleotelson much longer than wide, with rounded margins, and the transverse section subcircular; ornamentation without remarkable characteristics.

First antenna six-segmented, with the 5th article very much reduced; the basal article is both the longest and the widest; segment 2 with two setae and, distally, an aesthete-like element; a long aesthete is found on segments 5 and 6; segments 4 and 6 each with a slender, plumose seta.

Second antenna short, with flagellum consisting of 7-8 segments, bearing long, simple setae.

Mouthparts without remarkable differences as compared to those of the other species of the genus.

Pereiopod 1 with dactylus bearing 3 small setae and 2 long claws of different size; pereiopods 2-7 rather similar both in shape and in ornamentation, dactylus with 2 small setae and 2 claws.

Male first plopods rather elongated, wider at the base and consisting of two coalescent halves, each lobe truncate apically with the extremity directed inwards; ornamentation consisting of 4 distal and 2 subdistal setae on each half.

Male first pleopods rather elongated, wider at the base and consisting of two rounded mediiodistal corner; endopodite claw-like, with the distal part elongated and sharp-pointed, clearly overreaching the tip of the sympodite; exopodite reduced to a small, rounded lobe.

Pleopod 3 with exopodite two-segmented, distal segment bearing slender apical seta; endopodite irregularly rounded.

Uropods reduced and consisting of a large sympodite which bears 2 unequal setae and a small exopodite armed with 4 apical setae.

The female differs from the male only in lacking the 1st pleopod, and for the shape of the second pleopod which is subcircular and assumes the shape of an operculum with 4 small spinules along the distal margin. Other appendages and body without marked differences as compared to the male.

Ecology. — *Microparasellus hellenicus* n. sp. lives in phreatic underground waters of the following localities:

1) Valley of the Arachthos River (Epirus), man-made wells in the surroundings of the village of Glikorizo, Arta (water depth 6.5-9.5 m; temperature 11.5°-13.1° C; pH 6.7-7; NO<sub>2</sub> 0.5-0.7 mg/L; bottom sediment composed of fine sandstone with small organogenic detritus). From the same wells we collected other microparasellids and asellids, i.e., *Microparasellus puteanus* Karaman, 1933, *Microbaron latus prespensis* Karaman, 1954, *Proasellus* sp., and the following other groups: amphipods (*Salentinella angelieri*, *Niphargus* gr. *orcinus*), copepods *Acanthocyclops* (*Megacyclops*) n. sp., *Acanthocyclops* (*Megacyclops*) *viridis*, *Diacyclops crassicaudis*, *Paracyclops fimbriatus*), blind and depigmented ostracods, gastropods, oligochetes, nematodes, and some mosquito larvae.

2) Plain of Agrinion, Anfitea (Etholia), man-made well near Anfitea (water depth 6 m; temperature 24.9° C; pH 7.2; NO<sub>2</sub> 0.3 mg/L; bottom sediment composed of fine sandstone); associated fauna: amphipods (*Niphargus* sp.) copepods (*Paracyclops fimbriatus*, *Encyclops serrulatus* and *Diacyclops crassicaudis*), and numerous blind and depigmented ostracods.

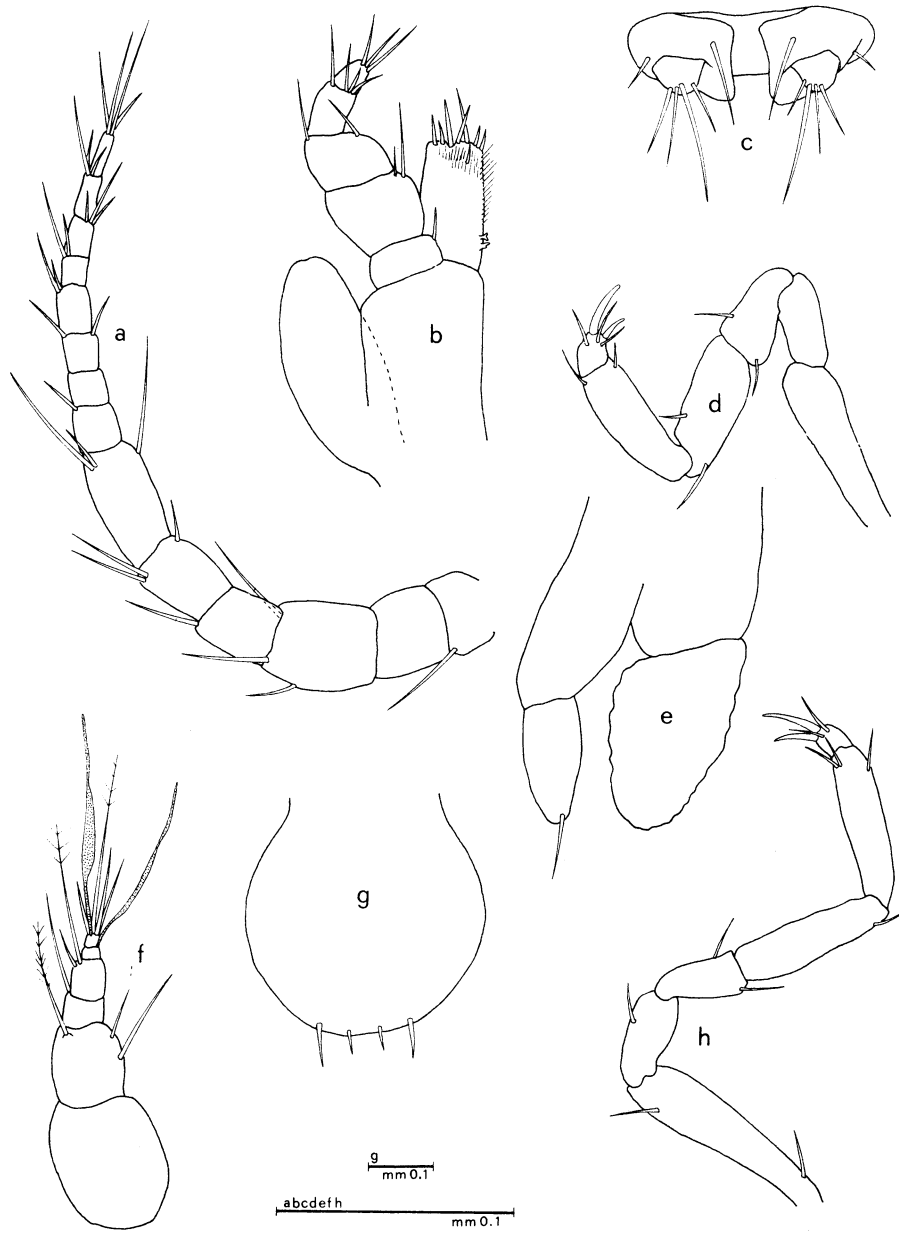


Fig. 2. *Microparasellus hellenicus* n. sp. a, second antenna; b, maxilliped; c, uropods; d, first pereiopod; e, pleopod 3; f, first antenna; g, female pleopod 2; h, pereiopod 7.

3) Northern Peloponnesus, surroundings of the village of Egion, freshwater well (water depth 10.5 m; temperature 16.2° C; pH 6.9; NO<sub>2</sub> 0.2 mg/L; bottom sediment composed of fine sandstone); associated fauna: amphipods (*Niphargus* sp.) copepods (*Paracyclops fimbriatus*, *Dia-cyclops languidoides* and *Nitocrella* sp.), ostracods, and another microparasellid, *Microcharon latus prespensis*.

Remarks. — Until now the genus *Microparasellus* included four species, i.e. *M. puteanus* Karaman, 1933, from phreatic waters of Yugoslavia, *M. libanicus* Chappuis & Delamare Deboutteville, 1954, from a cave in northern Lebanon, *M. aboufi* Coineau, 1968 from phreatic waters of Lebanon and *M. hellenicus* n. sp. from phreatic waters of northern Greece.

The new species is closely related to *M. puteanus*, from which it differs mainly in the subcircular transverse section of the pleotelson and in the morphology of the pleopods 1 and 2 of the male and pleopod 2 of the female.

The main feature of *M. hellenicus* n. sp. is its remarkable attitude, viz., rolling up completely.

Assuming that *M. puteanus* and *M. hellenicus* show overlapping distributions (see below) and occasionally live close together in the same ecological association (see, e.g., the collecting station of Glikorizo), the question arises for explaining the adaptative significance of the morphological differences between the above species. In this last regard, the attitude for volvation in *M. hellenicus* is more accentuated than in *M. puteanus*. Particularly this feature, in *M. hellenicus*, seems to be a peculiar adaptative trend which is related to the competition with *M. puteanus* in the interstitial habitat.

If we suppose the volvation a defensive strategy (see, e.g., for *Caecosphaeroma burgundum* Dollfus, cf. Marvillet, 1976), we might accept this behaviour as an evolutionary trend in the adaptation to the phreatic media with coarser detritus and lacunae, which enclose forms of greater size like amphipods, asellids, etc.

The above trend contrasts to that of other groups of the same size, like *Microcharon*, harpacticids, etc., which evolved to environments with smaller spaces among the granules.

### ***Microparasellus puteanus* Karaman, 1933**

Material examined. — Numerous ♂♂, ♀♀ and juveniles, collected from the same wells in which lives *Microparasellus hellenicus* n. sp. except the one in the plain of Agrinion, and in the following other localities:

1) Plataria, Igoumenitza (Epirus), freshwater well in the surroundings of the village of Plataria (water depth: 10.5 m; temperature: 13.2° C; pH: 7; bottom sediment composed of fine sandstone; accompanying fauna: *Proasellus* sp., *Niphargus* gr. *orcinus*, *Thermocyclops stephanidesi*, *Diacyclops* sp., blind and depigmented ostracods and numerous gastropods), 21 February 1976, Argano, Pesce & Bianco coll.

2) Argostolion (Cephalonia), freshwater well among the houses of Argostolion (water depth 5 m; temperature 17.2° C; pH 7; NO<sub>2</sub> 0.2 mg/L; bottom sediment composed of sandstone and lots of plant detritus; accompanying fauna: *Microcharon latus latus*, *Salentinella angelieri*, *Hadzia* sp., *Thermocyclops stephanidesi*, *Eucyclops serrulatus*, syncarids and gastropods), 9 May 1977, Pesce, Maggi & Miranda coll.

3) "Old Road" Thebes-Lamia, between Thebes and Levadia, freshwater well (water depth 10 m; temperature 16.1° C; pH 6.8; NO<sub>2</sub> 0.1 mg/L; bottom sediment composed of fine sandstone and much plant detritus; accompanying fauna: *Thermocyclops stephanidesi*, *Diacyclops bicuspidatus odessanus*, oligochetes and blind, depigmented ostracods), 10 May 1977, Pesce, Maggi & Miranda coll.

Until now, *M. puteanus* was known only from the type-locality, i.e., wells near Skopje (Yugoslavia). The new records here reported, increase the known distri-

bution of this species considerably. Particularly they indicate a rather extensive distribution in the interstitial freshwater environments along the southern and western coasts of the Adriatic Sea.

### *Microcharon othrys* n. sp. (fig. 3)

**Material.** — 1 ♂ (holotype), 1 ♀ (allotype), preserved in alcohol 70% with glycerol, 1 ♂ and 7 ♀♀, all from a freshwater well along the "Old Road" Thebes-Lamia, near the village of Scamnos (Thessalia), 9 May 1977, Pesce, Maggi & Miranda coll.; 1 ♂, 2 ♀♀ and 2 juveniles, dissected and mounted on slides in Faure solution, from a freshwater well near the cross-road of Palamas, along the "Old Road" Lamia-Laritza (Thessalia), 11 May 1977, Pesce, Maggi & Miranda coll.

Types preserved in the collections of the "Zoologisch Museum, Universiteit van Amsterdam", Amsterdam, Netherlands (ZMA Is. 105. 110113, 105. 127-132).

**Diagnosis.** — A *Microcharon* having the first male pleopod with the external margins subparallel, the internal ones coalescent, the distal margin of each half directed inwards and bearing a small unisetose lobe at the external tip.

**Description.** — Body length, excluding antennules, antennae and uropods, 1.65-2.01 mm, width on the level of the 7th pereopod about 0.30 mm; cephalosome larger than long, with only two small setae on the lateral margin; thoracic segments subparallel and slightly larger than wide; pleotelson subquadrangular,  $1.3 \times$  as long as wide ( $L/l = 1.31$ ), armature consisting of 10 setae on the distal margin, 4-5 on each of the lateral margins and 6-8 on the dorsal surface.

First antenna six-segmented, proximal segment smooth, segment 2 bearing a simple and 2 plumose setae, segment 4 with a short aesthete-like element, segment 5 with 1-2 small setae, segment 6 bearing 2 simple setae and 1 aesthete apically.

Second antenna longer than cephalosome and the first two thoracic segments together; exopodite one-segmented, armed with 2 sub-apical small setae, flagellum consisting of 8-9 segments bearing simple setae.

Mouthparts without remarkable differences, compared to the other species from freshwater.

Pereopods (P1-P7) rather similar, both in shape and in armature, to those of the other species of *Microcharon*.

Male first pleopods rather elongated and about equally wide at the base and in the distal part; they consist of two halves completely coalescent, at the base; internal margins jointed through a gut-like hyaline membrane; each half with the distal margin directed inward, and with the distal external corners protruding in a small unisetose lobe; moreover, there are three long setae on the distal lateral margins and two other ones dorsally, implanted along a structure appearing as a margin. At last, a dorsal subrectangular elevation (visible in dark field, subparallel light) is found on the distal part of each half.

Second male pleopod, sympodite with an obliquely truncate distal margin; endopodite slender and completely recurved, with the distal part claw-like and overreaching the tip of the sympodite; exopodite reduced to an irregular, rounded lobe.

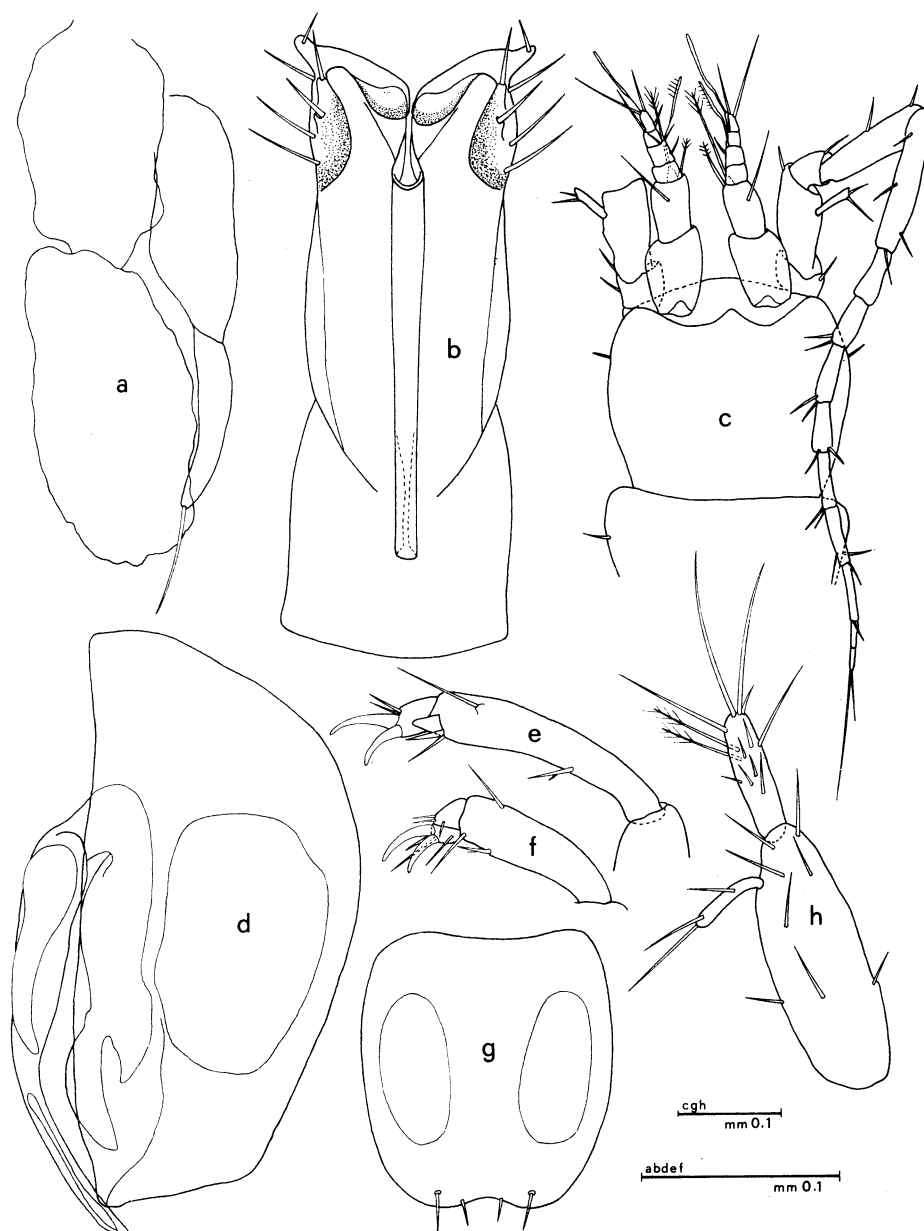


Fig. 3. *Microcharon othrys* n. sp. a, pleopod 3; b, male pleopod 1; c, cephalosome, first and second antenna; d, male pleopod 2; e, pereopod 7; f, pereopod 1; g, female pleopod 2; h, uropod.

The 3rd pleopod is elongated and consists of an exopodite slightly curved inward, which bears apically a long slender seta, and a totally smooth endopodite.

The uropod has a slender peduncle which bears some small setae; the exopodite is short and thin, it is armed with one median and two apical simple setae; the

endopodite, half as long as the peduncle, is armed with 3 long terminal setae, 1 short terminal seta and 3 submedian setae, 2 of which are plumose; some short setules are implanted along the median dorsal surface.

The female differs from the male only in lacking the 1st pleopod and in the morphology of the 2nd pleopod, which consists of a subquadrangular plate, about  $1.2 \times$  as long as wide ( $L/l = 1.21-1.23$ ), armed with four distal setules. The lateral margins are rounded, the distal one shows a median notch.

No marked differences were noted between the sexes.

**Ecology.** — *Microcharon othrys* n. sp. was collected in two man-made wells, one along the "Old Road" Lamia-Laritza, near the cross-road of Palamas (Thessalia) (water depth 7 m; temperature  $14.1^{\circ}\text{C}$ ; pH 6.7;  $\text{NO}_2$  0.5 mg/L; bottom sediment composed of thin sandstone and limestone with small plant detritus; associated fauna: *Thermocyclops stephanidesi*, *Eucyclops serrulatus*, ostracods, oligochetes and gastropods); the other one situated along the "Old Road" Thebes-Lamia, near the village of Scamnos (Thessalia) (water depth 8 m; temperature  $12.8^{\circ}\text{C}$ ; pH 6.6;  $\text{NO}_2$  0.1 mg/L; bottom sediment composed of sandstone and plant detritus; associated fauna: *Thermocyclops stephanidesi*, *Eucyclops serrulatus*, ostracods, oligochetes and gastropods.

**Remarks.** — *Microcharon othrys* n. sp., for its diagnostic features, is easily distinguishable among the other species of the genus. By the shape of the uropods and by the structure of the terminal end of the male first pleopods, the new species is related to *M. major* Karaman, 1954, and *M. profundalis* Karaman, 1940.

The three species live in phreatic environments of the same areas: *M. major* is reported from different localities near Skopje, Yugoslavia (Karaman, 1954) and from Strouma valley from southern Bulgaria (Cvetkov, 1967); *M. profundalis* is known from phreatic waters of Skopje (Karaman, 1940).

### ***Microcharon latus* Karaman, 1933**

Material examined. — Numerous ♂♂, ♀♀, and juveniles from the following localities:

#### *Microcharon latus latus* Karaman, 1933

1) Sami (Cephalonia), freshwater well near the village of Sami (water depth 6.5 m; temperature  $16.5^{\circ}\text{C}$ ; pH 7.3;  $\text{NO}_2$  0.1 mg/L; bottom sediment composed of fine sandstone with much plant detritus; accompanying fauna: *Diacyclops languidoides*, *Thermocyclops stephanidesi*, *Nitocrella* sp. *Elaphoidella* sp., ostracods, gastropods, oligochetes and nematodes), 6 May 1977, Pesce, Maggi & Miranda coll.

2) Assos (Cephalonia), freshwater well among the houses of Assos (water depth 8 m; temperature  $17.2^{\circ}\text{C}$ ; pH 7.4;  $\text{NO}_2$  0.1 mg/L; bottom sediment composed of fine sandstone and plant detritus; accompanying fauna: *Salentinella angelieri*, *Niphargus* sp., *Eucyclops serrulatus*, *Diacyclops languidoides*, *Thermocyclops stephanidesi*, ostracods and oligochetes), 6 May, 1977, Pesce, Maggi & Miranda coll.

3) Argostolion (Cephalonia), in association with *Microparasellus puteanus*.



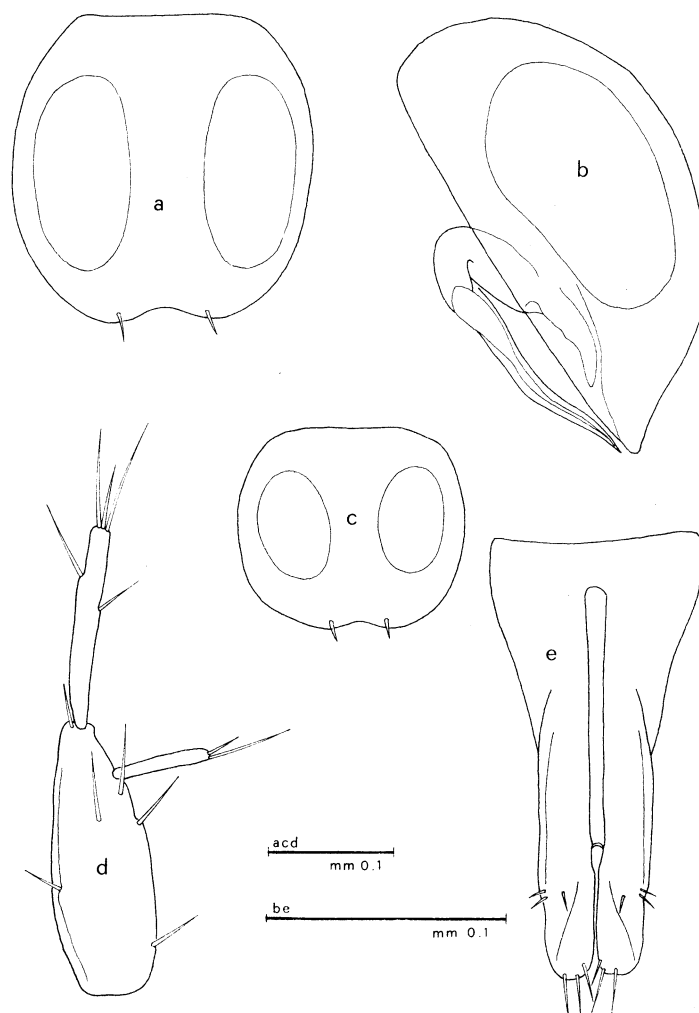


Fig. 4. a, *Microcharon* sp., female pleopod 2. b-e, *Microcharon latus prespensis* Karaman, 1954. b, male pleopod 2; c, female pleopod 2; d, uropod; e, male pleopod 1.

*Microcharon latus prespensis* Karaman, 1954

1) Bouteria, Main Road Ioannina-Igoumenitza, among the houses of the village of Bouteria, freshwater well (water depth 7 m; temperature 15.1° C; pH 6.6; NO<sub>2</sub> 0.5 mg/L; bottom sediment composed of small sandstone detritus; accompanying fauna: *Niphargus* sp., numerous blind and depigmented ostracods and oligochetes), 12 May 1977, Pesce, Maggi & Miranda coll.

2) Glikorizo, Arta (Epirus), in association with *Microparasellus puteanus*, and *Microparasellus hellenicus* n. sp.

3) Egion, "Old Road" Patras-Athens (Peloponnesus), in association with *Microparasellus hellenicus* n. sp.

Remarks. — *Microcharon latus latus* was reported from Greece (Lefkas Island) by Karaman (1958). The type-locality of the subspecies is in Macedonia. These

new records from Cephalonia might possibly indicate a more extensive distribution of the species in the Balcano-Dalmatian area.

*M. l. prespensis*, until now reported only from the type-locality (the shores of Prespa Lake, Macedonia), shows a similar situation. Particularly the two subspecies, *M. l. latus* and *M. l. prespensis* seem to have overlapping distributional areas, which, of course, makes their systematic status doubtful.

The biological value of the morphological information in situations like these can be ascertained only by suitable investigations, like those in *Stenasellus virei* Dollfus (cf. Magniez, 1974), considering the complexity of the interactions among the freshwater subterranean environments.

#### Microcharon sp.

Material examined. — 1 ♀ from a freshwater well near the village of Katsikà, Ioannina (Epirus) (water depth 9 m; temperature 11.1° C; pH 6.9; bottom sediment very poor and composed of fine sandstone; accompanying fauna: *Diacyclops* sp., *Eucyclops serrulatus*, *Proasellus coxalis* s.l, ostracods, gastropods, oligochetes and turbellarians), 23 February 1976, Argano, Pesce & Bianco coll.

The single female specimen available for study shows a second pleopod similar to that of *Microcharon stygius hellenae*; however, it is difficult, at this time, to identify this species more exactly.

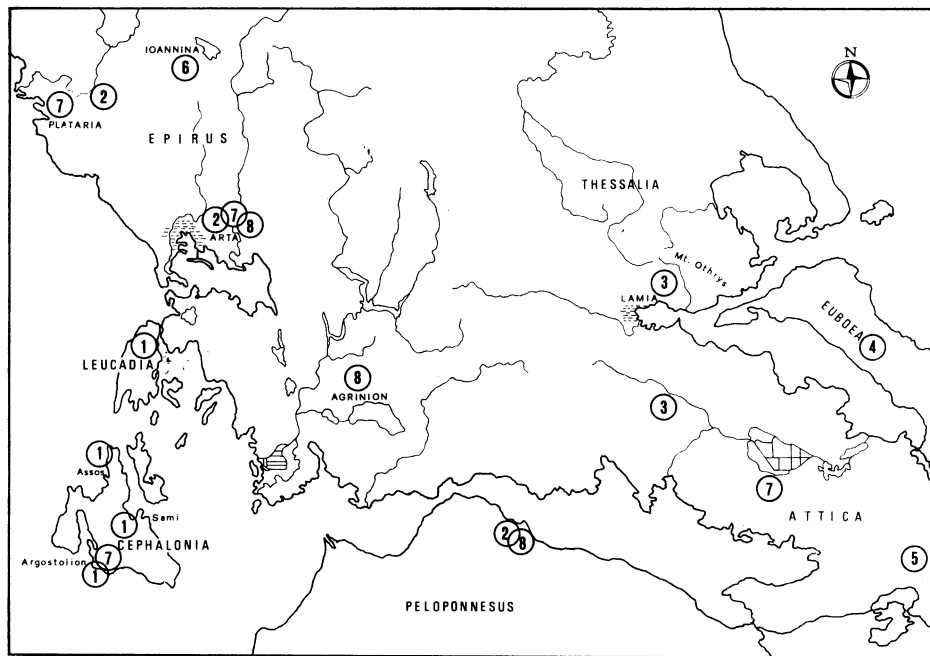


Fig. 5. Distribution of the species of the genera *Microcharon* and *Microparasellus* in Greece: 1, *Microcharon latus latus* Karaman, 1933; 2, *Microcharon latus prespensis* Karaman, 1954; 3, *Microcharon othrys* n. sp.; 4, *Microcharon* sp. (cf. Coineau, 1971); 5, *Microcharon stygius hellenae* Chappuis & Delamare Deboutteville, 1954; 6, *Microcharon* sp.; 7, *Microparasellus puteanus* Karaman, 1933, and *Microparasellus hellenicus* n. sp.

## RIASSUNTO

Le conoscenze sui Microparasellidi di Grecia erano sinora limitate al solo genere *Microcharon* Karaman: *M. latus* (Isola di Lefkas), *M. stygius hellenae* (Attica) e *M. sp.* (Isola di Eubea).

Oltre a dare indicazioni su altre località di *M. latus latus* (Isola di Cefalonia), viene resa nota la presenza di *M. latus prespensis* (Epiro e Peloponneso) e di *Microparasellus puteanus* (Isola di Cefalonia, Epiro, Attica).

Vengono, inoltre, descritte e discusse due nuove specie: *Microparasellus hellenicus* n. sp. (Epiro, Etolia e Peloponneso) e *Microcharon otbrys* n. sp. (Tessaglia e Attica).

## LITERATURE CITED

- CHAPPUIS, P. A. & CL. DELAMARE DEBOUTTEVILLE, 1954. Les Isopodes psammiques de la Méditerranée. Arch. Zool. exp. gén., **91** (1): 103-138.
- COINEAU, N., 1968. Contribution à l'étude de la faune interstitielle: Isopodes et Amphipodes. Mém. Mus. natn. Hist. nat., Paris, (A) **55** (3): 146-216.
- , 1971. Les Isopodes interstitiels: documents sur leur écologie et leur biologie. Mém. Mus. natn. Hist. nat. Paris, (A) **64**: 1-170.
- CVETKOV, L., 1967. Matériaux sur les isopodes souterrains de Bulgarie — *Microcharon major* Karaman et *Microcharon phlegethonis* n. sp. Comp. rend. Acad. Bulgarienne Sci., **20** (9): 951-953.
- KARAMAN, S., 1933. Beiträge zur Kenntnis der Isopoden-Familie Microparasellidae. Zool. Anz., **102** (1-2): 42-44.
- , 1940. Die unterirdischen Isopoden Südserbiens. Bull. Soc. scient. Skopje, **22**: 19-53.
- , 1954. Weitere Beiträge zur Kenntnis der Microparaselliden Mazedoniens, das Genus *Microcharon* Karaman. Fragm. Balcanica, **1** (12): 107-112.
- , 1958. Weitere Beiträge zur Kenntnis der Amphipoden und Isopoden Jugoslawiens und Griechenlands. Biol. Glasnik, **11**: 11-22.
- MAGNIEZ, G., 1974. Observations sur *Stenasellus virei* dans ses biotopes naturels (Crustacea Isopoda Asellota des eaux souterraines). Int. Journ. Speleol., **6**: 115-171.
- MARVILLET, C., 1976. Les adaptations à la volvation du squelette externe de la tête chez *Caecospaeroma burgundum*, Crustacés Isopodes des eaux souterraines. Int. Journ. Speleol., **8**: 331-358.
- PESCE, G. L. & D. MAGGI, 1977. Un nouveau cyclopede des eaux souterraines phréatiques de Grèce: *Acanthocyclops (Megacyclops) dussarti* n. sp. Vie et Milieu, (C) **27** (1): 77-82.

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