

MICROPARASELLIDS OF SPAIN*
(CRUSTACEA ISOPODA: JANIROIDEA)

BY

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ABSTRACT

A collection of microparasellid isopods from different groundwater habitats of Spain has been studied. Seven taxa, all belonging to the genus *Microcharon* Karaman, 1933, are identified: *M. hispanicus* n.sp., *M. meijersae* n.sp., *M. cf. marinus* Chappuis & Delamare, 1954, *M. notenboomi* n.sp., *M. longistylus* n.sp., *M. letiziae* n.sp., *M. juberthiei juberthiei* Coineau, 1968. Damaged material and some samples lacking in males are provisionally reported as *Microcharon* sp.

Taxonomic and zoogeographic remarks are made for the species *M. marinus* and *M. juberthiei*.

The possible taxonomic and phylogenetic value of the armature of second maxilla and mandibular palp in the genus *Microcharon* are briefly discussed.

A map with the distribution of the species of the genus *Microcharon* of Spain is provided.

RÉSUMÉ

Etude d'une collection d'Isopodes Microparasellides d'habitats aquatiques souterrains d'Espagne. Sept taxa appartenant tous au genre *Microcharon* Karama, 1933 ont pu être identifiés: *M. hispanicus* n.sp., *M. meijersae* n.sp., *M. cf. marinus* Chappuis & Delamare, 1954, *M. notenboomi* n.sp., *M. longistylus* n.sp., *M. letiziae* n.sp., *M. juberthiei* Coineau, 1968. Des exemplaires détériorés ainsi des échantillons ne contenant pas de mâle, sont mentionnés comme *Microcharon* sp. Des remarques taxonomiques et zoogéographiques sont faites à propos de *M. marinus* et *M. juberthiei*. On discute brièvement la valeur possible de l'armature de la 2ème maxille et du palpe mandibulaire pour la taxonomie et la phylogénie. Une carte de distribution en Espagne des espèces de *Microcharon* est fournie.

INTRODUCTION

In contrast to other European countries, such as France, Yugoslavia, Italy, Greece, Bulgaria and Roumania, the groundwater microparasellid fauna of Spain has hardly been investigated so far.

Up to now, only three species, all belonging to the genus *Microcharon* Karaman, 1933, have been recorded from this country, Balearic islands included, viz.: *M. angelieri* Coineau, 1963, from a hyporheic habitat of Río Mugo (Coineau, 1986), *M. marinus* Chappuis & Delamare, 1954, from phreatic (Pesce et al., 1981) and coastal interstitial (Coineau, 1986) habitats in southern Spain, and *M. comasi* Coineau, 1985, from cave waters of Majorca; moreover,

* Groundwater Crustaceans of Spain, 11.

some *Microcharon* species, from different hyporheic habitats of the northern district of the Iberian Peninsula, were recently mentioned by Coineau (1986).¹

The present paper deals with the results of the study of a large collection of microparasellid isopods, collected from different groundwater habitats of several regions of Spain, from 1983 to 1985, in the context of a Ph.D. thesis project by J. Notenboom with the collaboration of I. Meijers, P. Van den Hurk and R. Leys, Zoölogisch Museum, Universiteit van Amsterdam, the Netherlands.

The material was entrusted to us for identification through the kindness of Ir. J. Notenboom, Amsterdam, to whom we wish express our sincere thanks.

Seven taxa, all belonging to the genus *Microcharon*, are identified, viz.: *M. hispanicus* n.sp., *M. meijersae* n.sp., *M. cf. marinus*, Chappuis & Delamare, 1954, *M. notenboomi* n.sp., *M. longistylus* n.sp., *M. letiziae* n.sp. and *M. juberthiei juberthiei* Coineau, 1968; other material of the same genus, lacking in males or partially damaged, is provisionally reported only at generic level.

The material is preserved in the collections of the Zoölogisch Museum of Amsterdam, the Netherlands (ZMA) and in the senior author's collections at the Dipartimento di Scienze Ambientali, University of L'Aquila, Italy (GPC).

Detailed information about locations and descriptions of the stations, collecting methods, chemical and physical parameters and biological associations, are reported by Notenboom & Meijers (1985) and van den Hurk & Leys (1986).

In the locality records, the name of the locality is followed by the name of the province, station number, and UTM coordinates. The abbreviation SBR means that the sample has been collected with the aid of a Bou-Rouch biophreatical pump. The abbreviation E.c. stands for electric conductivity.

***Microcharon hispanicus* n.sp. (figs. 1-15)**

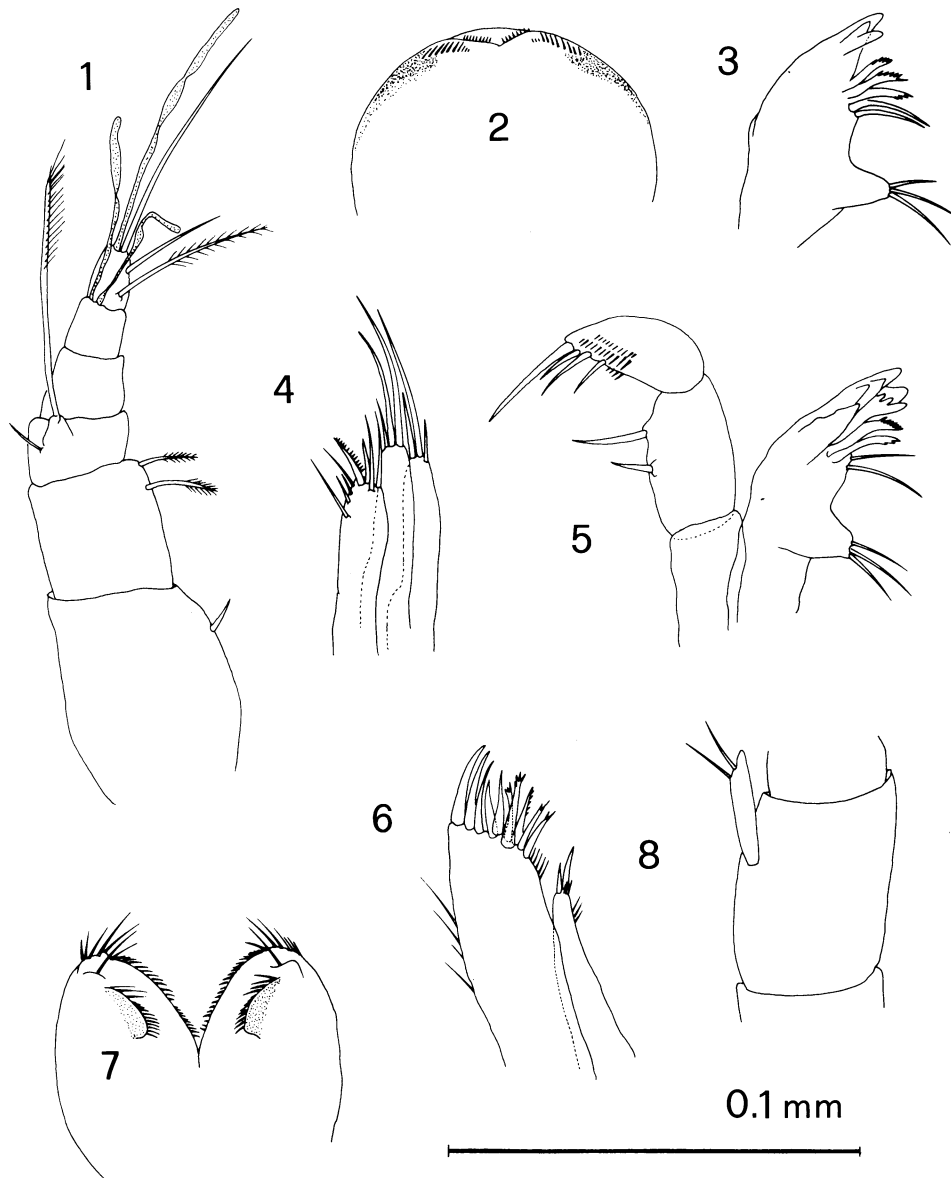
Material. — Ermita de Santa Lucia. Guadalbullón river (Carchelejo), Jaen (st. A85-7/63) (type-locality), VG 471625 (19-39), 830 m a.s.l., 21.7.1985, coll. Van den Hurk and Leys; hyporheic habitat, SBR (water temperature 17.1°C; O₂ 6.9 mg/l; E.c. 0.86 mS/cm; pH 7.51; Cl⁻ 23 mg/l); 7 ♀♀, 2 ♂♂ and 4 juveniles. Holotype: 1 ♂, completely dissected and mounted on slide, in Faure's medium (coll. no. ZMA Is. 105 397). Paratypes: 4 ♀♀, mounted as above and 3 ♀♀, 1 ♂, preserved in alcohol 70°C, in GPC collections. Deifontes, Granada (st. 84-8/2), VG 4732, 580 m a.s.l., 1.8.1984, coll. Notenboom and Meijers; large resurgence, SBR (water temperature 17.6°C; E.c. 0.772 mS/cm; Ph 7.24; Cl⁻ 16mg/l); 2 ♀♀, and 3 ♂♂, mounted as above, in GPC collections.

Description. — Body length of adults (excluding first and second antennae and uropods) 1.49-1.54 mm; no marked size difference between the sexes. Cephalosome longer than wide. Pleotelson slightly longer than wide (length/width ratio: 1.20-1.25), with slightly rounded lateral margins; armed as in fig. 15.

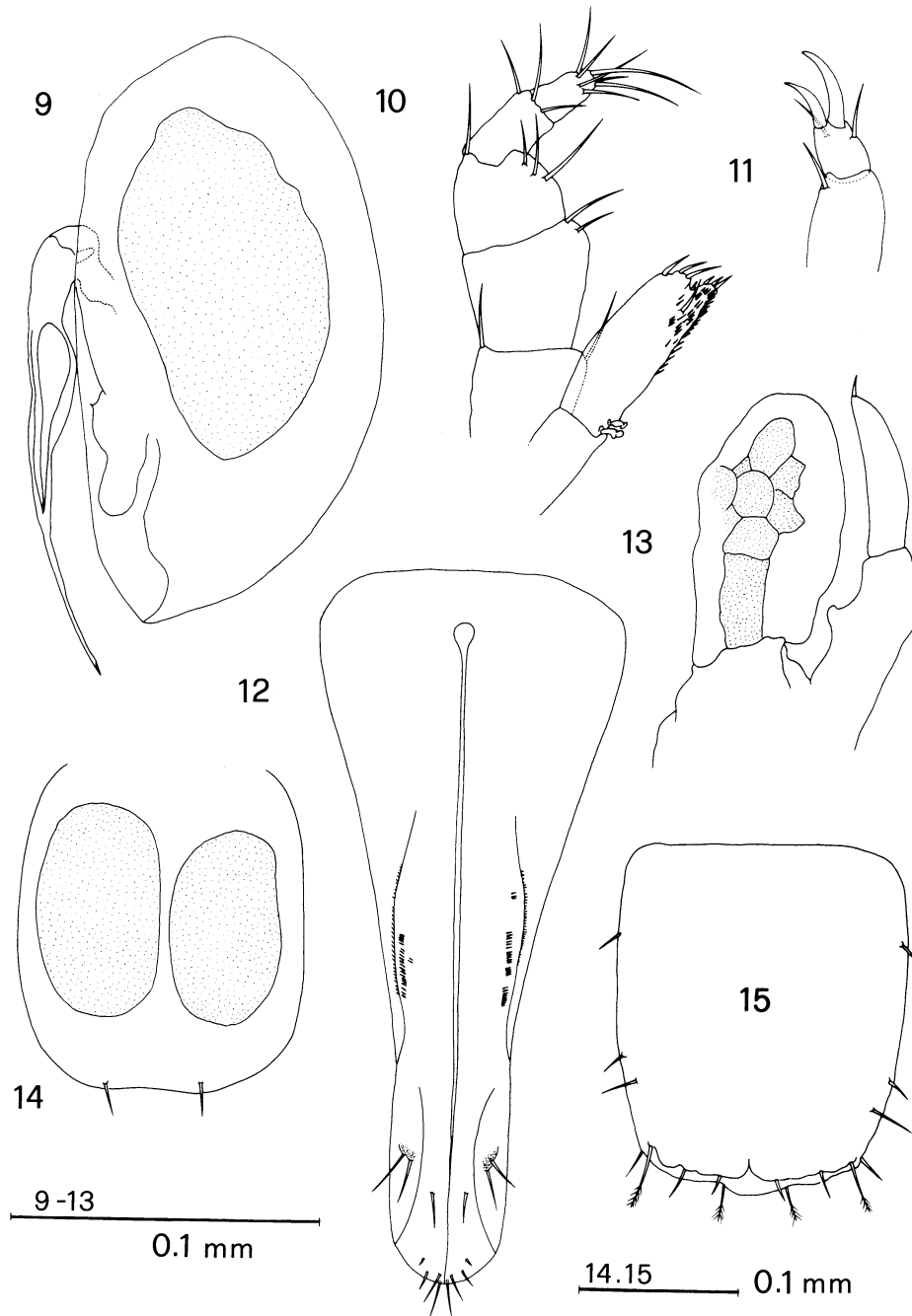
¹ Recently, F. Sabater and J. De Manuel (Stygologia, 4:267) described another species, *M. margalefi*, from hyporheal of the river Ter (Catalonia, N.E. Spain).

First antenna, 6-segmented, not sexually dimorph; segment 2 bears, distally implanted on a protuberance, a long plumose seta; 2 short and 1 longer aesthetascs are found on segments 5 and 6, respectively.

Second antenna lacking main flagellum, exopod slender and armed with 2 subdistal setae.



Figs. 1-8. *Microcharon hispanicus* n.sp., holotype: 1, first antenna; 2, upper lip; 3, right mandible; 4, second maxilla; 5, left mandible and palp; 6, first maxilla; 7, lower lip; 8, second antenna, exopod.



Figs. 9-15. *Microcharon hispanicus* n.sp., holotype (9-13), female paratype (14, 15): 9, second pleopod; 10, maxilliped; 11, 7th pereopod, dactylus; 12, first pleopod; 13, third pleopod; 14, second pleopod; 15, telson.

Left mandible with lacinia mobilis with 4 teeth; pars incisiva with 4 teeth; pars molaris with 3 distal setae; remaining armature as in fig. 5. Right mandible differing chiefly in lacking lacinia mobilis and in having 3 instead of 4 teeth on pars incisiva. Mandible palp as usual in the genus; distal segment bearing 4 crooked spines.

Upper lip rounded, ciliated. Lower lip deeply cleft, ciliated.

First maxilla consisting of 2 endites: the outer bears a distal row of 10-11 spines, some finely pectinated; inner endite narrow and tapering distally, armed with 2 distal spines and some apical and inner setules. Second maxilla with 3 endites; outer and central each bearing 3 setae of different length; inner with 6-7 setae and 1 finely pectinated element.

Maxilliped without particular characteristics, with slender, naked epipodite; endite and palp as in fig. 10.

Pereopods rather similar in shape and length, showing small differences in the armature; dactylus of pereopod 1 bearing 2 unguli and 2 posterior and 3 distal setulae; dactylus of other pereopods with 2 unguli and 1 posterior and 1 subdistal setae.

Male first pleopod elongated, consisting of two coalescent halves, deeply cleft and distally rounded (length/basal width ratio: 2.38-2.41); armature consisting of 4 distal and 3 subdistal setulae and 2 rows of short cilia along medial margin of each half (fig. 12).

Male second pleopod with large (length/width ratio: 1.89-2.00) and rounded sympodite, distal corner of which slightly pointed; endopod long and slender, not much recurved, overreaching corner of sympodite (endopod/sympodite length ratio²: 0.78-0.80); exopod reduced to small, rounded lobe.

Female second pleopod longer than wide (length/width ratio: 1.14-1.16), distal margin armed with 2 setulae.

Third pleopod not sexually dimorphic; exopod slightly curved inward, distal segment bearing a short, apical setula; endopod large, subovoid, without armature.

Fourth pleopod, also similar in both sexes, consisting of naked, 1-segmented rudiment.

All specimens lost uropods.

Affinities. — Following Coineau's (1968) review of the genus *Microcharon*, *M. hispanicus* n.sp. shows intermediate features between marine (endite of second maxilla with pectinated seta, unguli on dactylus of pereopods not much elongated, second female pleopod with distal setulae) and fresh-water (first antenna usually 6-segmented, naked endopod of third pleopod) species of the genus. It could be regarded as a primitive, fairly recent (Mio-Pliocene) immigrant in underground freshwater networks.

² Conventional endopod length measured from bending point to distal tip.

The new species shares the above characteristics with *M. karamani* Pesce & Teté, 1978 and *M. zibani* Pesce & Teté, 1978, both from groundwaters of Algeria. Particularly, it is most close to the former as shown by the similar armature of first and second maxillae, the armature of the mandibular palp and the armature of the second female pleopod; the main differences are seen in the armature of first antenna, the morphology of the first male pleopod and the construction of male second pleopod.

Moreover, *M. hispanicus* n.sp. is related to other taxa herein described, viz. *M. meijersae* n.sp., *M. letiziae* n.sp., *M. cf. marinus*, in the presence of a pectinated spine on the second maxilla; however, from these species, it is easily distinguishable by several characteristics, such as the armature of antenna, the male first and second pleopods, and the morphology of the female second pleopod.

***Microcharon meijersae* n.sp. (figs. 16-31)**

Material. — Baños de Fuente Podrida, Requena, Valencia, Cabriel river (st. 84-5/71) (type locality), XJ 430559, 400 m a.s.l., 17.5.1984, coll. Notenboom and Meijers; hyporheic habitat, SBR (water temperature 16.1°C; E.c. 1.021 mS/cm; pH 8.2; Cl⁻ 102 mg/l); 19 ♀♀, 10 ♂♂, 3 juveniles. Holotype: 1 ♂, completely dissected and mounted on slide in Faure's medium (coll. no. ZMA Is. 105 398). Paratypes: 19 ♀♀, 9 ♂♂ and 3 juveniles, mounted as above, in GPC collections. San Bernardo, 0.5 km NWW of Villa Lota, Corbera de Alcira, Valencia (st. 34-3/17, 84-5/57, 85-7/32), YJ 277385, 10 m a.s.l., 25.7.1985, coll. Notenboom and Meijers; well (water temperature 19.5°C); 4 ♀♀, 2 ♂♂ and 3 juveniles, mounted as above, in GPC collections. Huerto de Los Perros, Partida Barraquet, W of the road to Pobra Llarga, Carcagente, Valencia (st. 85-7/34), YJ 205311, 40 m a.s.l., 16.7.1985, coll. Notenboom and Meijers; well (water temperature 18.0°C); 1 ♀, preserved in alcohol 70°, in GPC collections.

Description. — Body length (without first and second antennae, and uropods) 1.28-1.32 mm; no marked size differences between the sexes. Cephalosome slightly longer than wide. Pleotelson longer than wide (length/width ratio: 1.18-1.20), with subparallel margins, slightly tapering anteriorly.

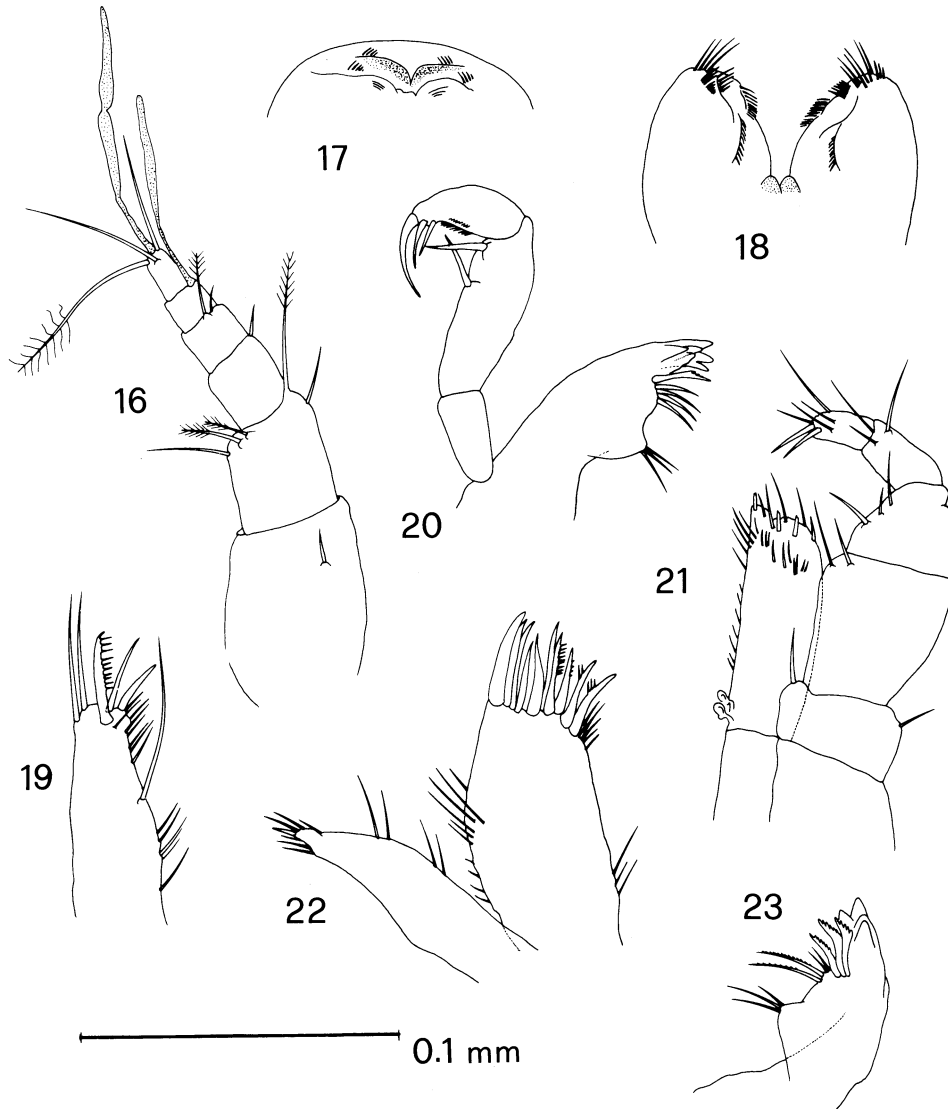
First antenna 6-segmented; segment 2 with a short plumose element, implanted on a distal protuberance; segments 5 and 6 each with a short distal aesthetasc. Second antenna: all specimens lost flagellum, exopod as usual in the genus.

Left mandible with lacinia mobilis, consisting of 2 rounded teeth; pars incisiva with 4 teeth; pars molaris subconical, armed with 3 distal setae; remaining armature as in fig. 20. Right mandible lacking lacinia mobilis, armature as in fig. 23. Mandibular palp built as usual in the genus, with 3 crooked spines on distal segment. Upper lip rounded, with 3 rows of thin setules (fig. 17). Lower lip deeply cleft, ciliated.

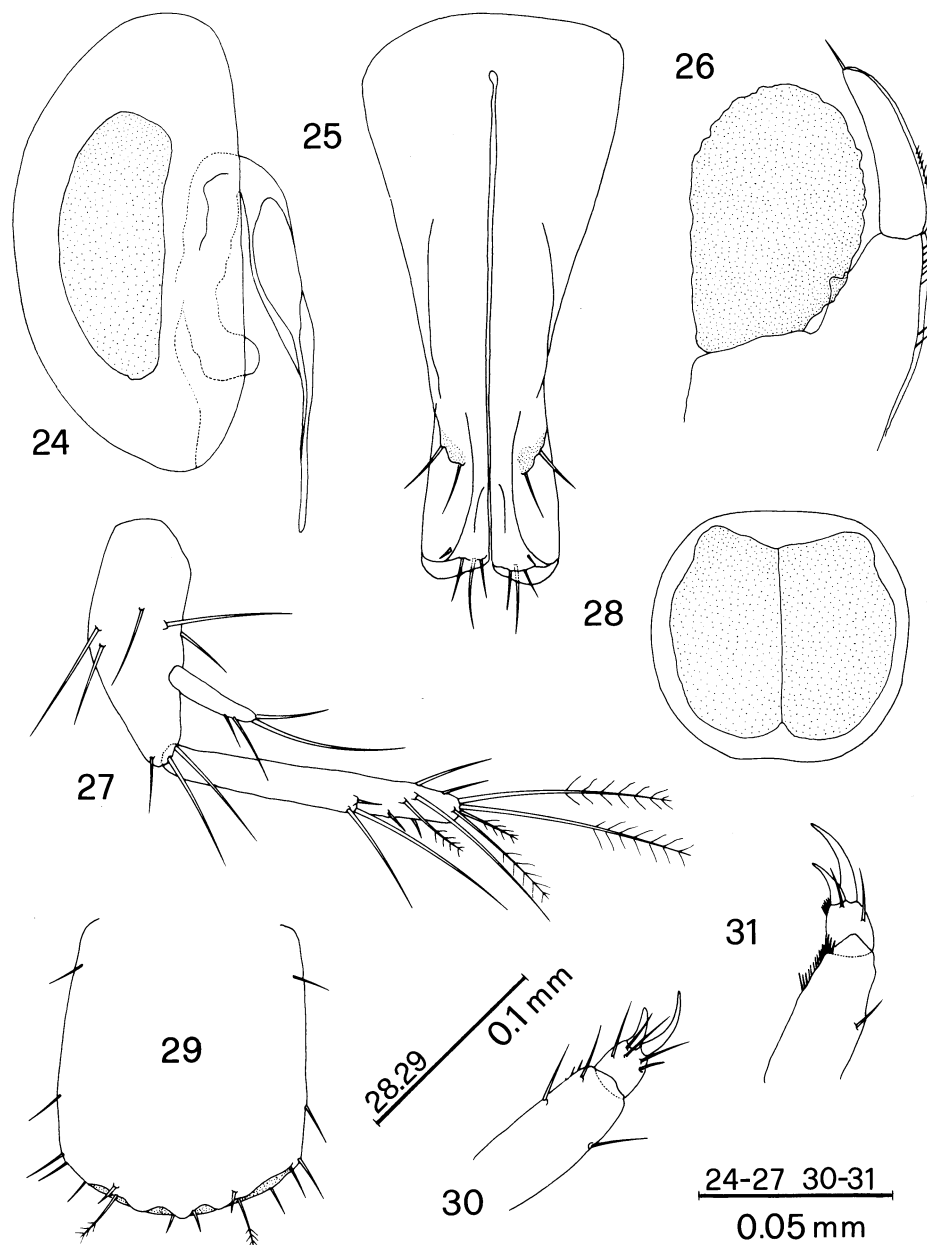
First maxilla consisting of 2 endites; outer endite with row of 10-11 apical spines, some pectinated, and some long setiform elements on both inner and outer margins; inner endite tapering apically, with 1-2 short spinules on distal margin and some distal and outer setae.

Second maxilla consisting of 3 endites of about same length; outer and central endites each with 3-4 apical setae and some setules on inner margin; inner endite with 4 distal setae, 1 distal, strongly pectinated spine, and 1 long and some shorter setae on inner margin.

Maxilliped without particular characteristics, armed as in fig. 21.



Figs. 16-23. *Microcharon meijersae* n.sp., holotype: 16, first antenna; 17, upper lip; 18, lower lip; 19, second maxilla, inner endite; 20, left mandible and palp; 21, maxilliped; 22, first maxilla; 23, right maxilla.



Figs. 24-31. *Microcharon meijersae* n.sp., holotype (24-27), female paratype (28-31): 24, second pleopod; 25, first pleopod; 26, third pleopod; 27, uropod; 28, second pleopod; 29, telson; 30, first pereopod, dactylus; 31, 7th pereopod, dactylus.

Pereopods similar to those of freshwater species of genus, dactylus of pereopod 1 with 2 long unguli, 1 inner and 4 subdistal setae; dactylus of pereopods 2 to 7 with 2 unguli as well, and 1 posterior and 1 subapical setae.

Male first pleopod bilobed, distally rounded (length/basal width ratio: 2.18-2.22); armature as in fig. 25.

Female second pleopod slightly wider than long (length/width ratio: 0.95-0.97), with a faint distal convexity.

Male second pleopod: sympodite subovoid (length/width ratio: 2.1-2.3), with a rounded distal corner; endopod long and slender, not recurved, well overreaching corner of sympodite; exopod reduced to small, subovoid lobe.

Pleopods 3 and 4 not sexually dimorphic. Pleopod 3: exopod 2-segmented, slightly curved inward, armed with an apical setula, and with a thin hyaline membrane and numerous setules on the outer margin; endopod large, without armature. Pleopod 4: 1-segmented, rudimentary.

Uropods: sympodite 2.5-2.6 times longer than wide, tapering posteriorly; exopod reduced, shorter than sympodite (exopod/sympodite length ratio: 0.39-0.41) and endopod (exopod/endopod length ratio: 0.31-0.32); endopod longer than sympodite (endopod/sympodite length ratio: 1.22-1.24); armature as in fig. 27.

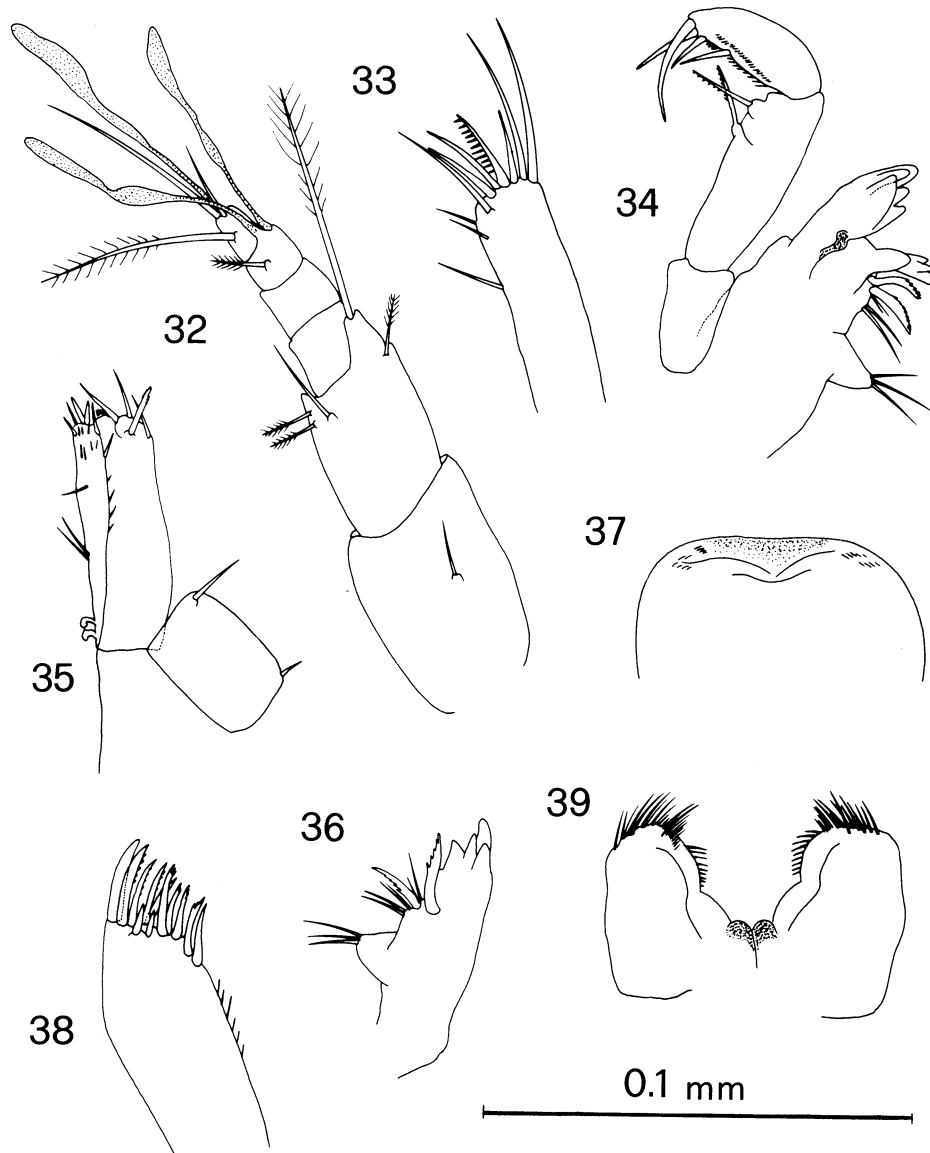
Etymology. — Specific epithet after Mrs. Ine Meijers who participated in the field work and collected the new species.

Affinities. — Compared with all the other freshwater species of the genus, the species most closely related to *M. meijersae* n.sp. appear to be *M. doueti* Coineau, 1968, from ground waters of France, and *M. silverii* Pesce & Galassi, 1988, from phreatic habitats of Sardinia; with the former it shares the similar morphology and armature of the male first pleopod, with the latter the shape and armature of male first and second pleopods. The new species, due to the presence of setules on the outer margin of the exopod of the third pleopod, shows also some resemblance to *M. rouchi* Coineau, 1968, known for ground waters of France, *M. thracicus* Cvetkov, 1965, from ground waters (wells, hyporheic habitats, springs) of Bulgaria and *M. longistylus* n.sp. (described in the present paper). From all the above species, *M. meijersae* n.sp. differs mainly in having a strongly pectinated spine on the inner endite of the second maxilla, and in an original combination of morphological characteristics, such as the armature of the first maxilla, the morphology and ornamentation of male and female pleopods, and the construction and armature of the uropods.

Microcharon cf. **marinus** Chappuis & Delamare, 1954 (figs. 32-46)

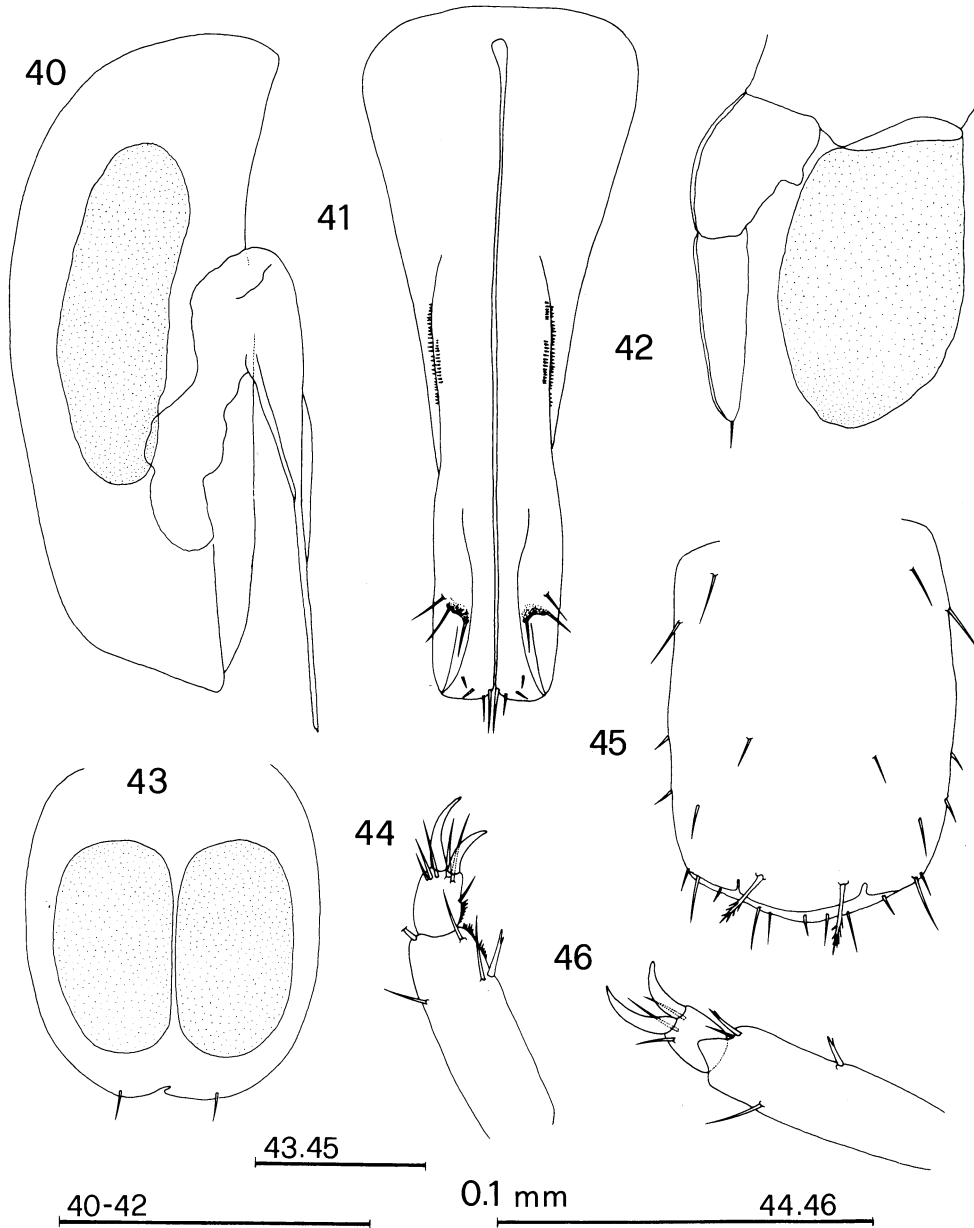
Material. — Pilar de la Horedado, Los Picos (Orhiuela), Alicante (st. 84-2/1), XG 932943, 50 m a.s.l., 1.2.1984, coll. Notenboom and Meijers; well (water temperature 17.4°C; O₂ 5.1 mg/l; E.c. 2.71 mS/cm; pH 7.67; Cl⁻ 550 mg/l); 1 ♀, completely dissected and mounted

on slide in Faure's medium, in GPC collections. Los Piñacos (San Pedro del Pinatar), Murcia (st. 84-2/4), XG 934909, 30 m a.s.l., 1.2.1984, coll. Notenboom and Meijers; well (water temperature 18.3°C; O₂ 4.8 mg/l; E.c. 10.81 mS/cm; pH 7.19; Cl⁻ 2960 mg/l); 1 ♀, 1 ♂ and 1 juv., mounted as above, in GPC collections. Murcia, 1.5 km N. of Puerto San Pedro (st. 84-2/7), XH 798005, 200 m a.s.l., 1.2.1984, coll. Notenboom and Meijers; well (water temperature 16.3°C; O₂ 6.1 mg/l; E.c. 2.22 mS/cm; pH 7.74; Cl⁻ 300 mg/l); 2 ♀♀, 1 juv., mounted as above, in GPC collections. San Benet Bajo, La Monja house, Alcoy, Alicante (st. 84-3/6), YH 177854, 560 m a.s.l., 3.3.1984, coll. Notenboom and Meijers; well (water



Figs. 32-39. *Microcharon* cf. *marinus*, female: 32, first antenna; 33, second maxilla, inner endite; 34, left mandible; 35, maxilliped, endite; 36, right mandible; 37, upper lip; 38, first maxilla, inner endite; 39, lower lip.

temperature 13.5°C; E.c. 0.841 mS/cm; pH 7.36; Cl⁻ 40 mg/l); 12 ♀♀, 3 ♂♂ and 3 juveniles, mounted as above, in GPC collections. Málaga, 2 km of Casarbermeja, N. of Guadalmedina river, El Moral farm (st. 84-7/37), UF 7484, 700 m a.s.l., 30.7.1984, coll. Notenboom and Meijers, well (water temperature 18.4°C; O₂ 5.0 mg/l; E.c. 1.664 mS/cm; pH 7.21; Cl⁻ 226 mg/l); 1 ♀, 2 ♂♂, mounted as above, in GPC collections. Málaga, Vélez river, 2 km from Viñuela,



Figs. 40-46. *Microcharon* cf. *marinus*, female (43-46), male (40-42): 40, second pleopod; 41, first pleopod; 42, third pleopod; 43, second pleopod; 44, first pereopod, detail of dactylus; 45, telson; 46, 7th pereopod, detail of dactylus.

Málaga (st. 84-7/40), UF 9979, 110 m a.s.l., 30.7.1984, coll. Notenboom and Meijers; hyporheic habitat, SBR (water temperature 23.5°C; E.c. 0.513 mS/cm; pH 7.50; Cl⁻ 22 mg/l); 6 ♀♀, 4 ♂♂ and 4 juveniles, mounted as above, in GPC collections. Los Pajares, (Cantillana), Sevilla (st. A85/6-50), TG 498672 (13-39), 30 m a.s.l., 30.6.1985, coll. Van den Hurk and Leys; well (water temperature 20.6°C; O₂ 7.6 mg/l); E.c. 2.4 mS/cm; pH 6.68; Cl⁻ 50 mg/l); 1 ♀, 1 ♂, mounted as above, in GPC collections. Los Pajares, (Cantillana), Sevilla (st. A85/6-51), 30 m from previous locality), TG.498670 (13-39), 30 m a.s.l., 30.6.1985, coll. Van den Hurk and Leys; well (water temperature 19.8°C; O₂ 6.9 mg/l; E.c. 4.9 mS/cm; pH 6.59; Cl⁻ 120 mg/l); 1 ♀, 1 ♂, mounted as above, in GPC collections. Venta del Molinillo, Fardes river (Huetór-Santillan), Granada (st. A85/7-55), VG 625291 (20-41), 1200 m a.s.l., 18.7.1985, coll. Van den Hurk and Leys; hyporheic habitat, SBR (water temperature 16.9°C; O₂ 7.7 mg/l; E.c. 1.70 mS/cm; pH 7.51; Cl⁻ 8 mg/l); 1 ♀, mounted as above, in GPC collections.

Our specimens appear very close to *Microcharon marinus*, judging from the general body shape, the mandibular palp, the pereopods, the male first and second pleopods, third pleopod and uropods.

The rather concise description, given below, deals exclusively with the differences observed.

First antenna with 2 and 1 aesthetasc on the fifth and sixth segments, respectively.

First maxilla with 2 endites: outer endite with 10 apical spines (some finely denticulate) and 2 shorter subdistal spines. Inner endite of second maxilla with 1 strongly pectinate spine. Maxillipedal endite armed with distal spinules (one finely denticulate) and some lateral setules.

First male pleopod with 2 rows of thin setules along medial margin of each half; other characteristics as in *M. marinus*.

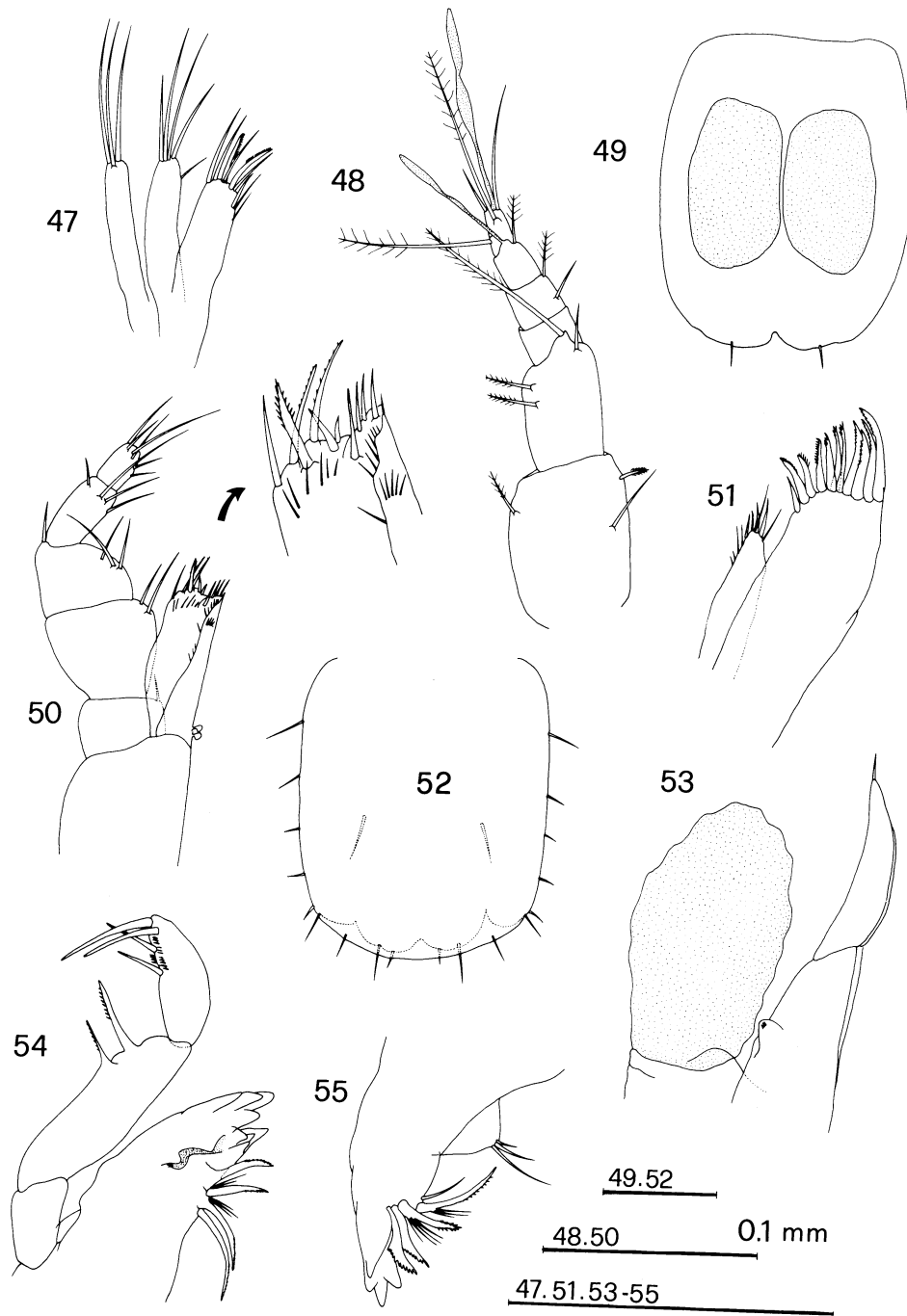
Female second pleopod sometimes with distal notch (this feature could be very likely an artificial folding).

Pleotelson longer than wide (length/width ratio: 1.45-1.47), with subparallel lateral margins; armature as in fig. 45.

The systematic status of the present material is, however, questionable and provisional, and classification must await additional information on the mouthparts of *M. marinus* from the type locality.

Microcharon sp. (figs. 47-55)

Material. — Orba field, 0.4 km S. of Girena river, Alicante (st. 84-2/27), YH 565993, 85 m a.s.l., 7.2.1984, coll. Notenboom and Meijers, well (water temperature 15.8°C; E.c. 0.860 mS/cm; O₂ 7.7 mg/l; pH 7.64; Cl⁻ 104 mg/l); 2 ♀♀, completely dissected and mounted on slides in Faure's medium, in GPC collections. Tormos field, 0.1 km E. of Girena river, Alicante (st. 84-2/28), YH 562996, 80 m a.s.l., 7.2.1984, coll. Notenboom and Meijers; well (water temperature 17.0°C; E.c. 0.761 mS/cm; O₂ 8.2 mg/l; pH 7.23; Cl⁻ 74 mg/l); 1 ♀ and 2 juveniles, mounted as above, in GPC collections. Alicante, 1.5 km from Denia, N. of main road Denia-Vergel (st. 84-2/30), BD 472038, 5-10 m a.s.l., 7.2.1984, coll. Notenboom and Meijers; well (water temperature 17.8°C; E.c. 2.23 mS/cm; O₂ 7.9 mg/l; pH 7.09; Cl⁻ 420 mg/l); 2 ♀♀ and 2 juveniles, mounted as above, in GPC collections. Beniarbeig, N. of main road Ondara-Benidoleig, 3.2 km from Benidoleig, Alicante (st. 84-3/14), YJ 600007, 40 m a.s.l., 4.3.1984, coll. Notenboom and Meijers; well (water temperature 17.0°C; E.c. 0.915 mS/cm; pH 7.34; Cl⁻ 32 mg/l); 2 ♀♀, mounted as above, in GPC collections. San Bernardo, 0.5 km NWW of Villa Lola, Corbera de Alcira, Valencia (st. 84-3/17, 84-5/57, 85-7/32),



Figs. 47-55. *Microcharon* sp., female: 47, second maxilla; 48, first antenna; 49, second pleopod; 50, maxilliped; 51, first maxilla; 52, telson; 53, third pleopod; 54, left mandible; 55, right mandible.

YJ 277385, 0-10 m a.s.l., 5.3.1984, coll. Notenboom and Meijers, well (water temperature 16.7°C; E.c. 1.114 mS/cm; pH 7.38; Cl⁻ 82 mg/l); 1 ♂, mounted as above, in GPC collections. Same locality, 15.5.1984; 1 ♀ ♀, mounted as above, in GPC collections. Carcagente, 1 km from Cogullada, S. of the road from Cogullada to cimetery Valencia (st. 84-3/20), YJ 202314, 35 m a.s.l., 5.3.1984, coll. Notenboom and Meijers; well (water temperature 15.2°C; E.c. 1.577 mS/cm; pH 8.03; Cl⁻ 145 mg/l); 1 ♀ and 1 juv., mounted as above, in GPC collections. Gestalgar, 0.3 km S of power plant near the high bridge, Valencia (st. n. 84-3/25), XJ 847855, 315 m a.s.l., 6.3.1984, coll. Notenboom and Meijers; small spring (water temperature 16.3°C; E.c. 0.497 mS/cm; pH 7.49; Cl⁻ 14 mg/l); 1 ♀, mounted as above, in GPC collections. Arnés, Algas river, Tarragona (st. 84-5/13), BF 683325, 470 m a.s.l., 5.5.1984, hyporheic habitat, SBR (water temperature 13.4°C; E.c. 0.513 mS/cm; pH 8.01; Cl⁻ 16 mg/l); 2 ♀ ♀, mounted as above, in GPC collections. Cretas, S. of main road Valderrobres-Arnés, 7.6 km from Valderrobres, Teruel (st. 84-5/14), BF 663308, 530 m a.s.l., 5.5.1984, coll. Notenboom and Meijers, well (water temperature 12.7°C; E.c. 0.578 mS/cm; pH 7.39; Cl⁻ 10 mg/l); 4 ♀ ♀, mounted as above, in GPC collections. Espadilla, Pequeño river, Castellón (st. 84-5/36), YK 259349, 260 m a.s.l., 9.5.1984, coll. Notenboom and Meijers, hyporheic habitat, SBR (water temperature 15.7°C; 0.846 S/cm; pH 7.68; Cl⁻ 16 mg/l); 3 juveniles, mounted as above, in GPC collections. La Gilo, E of N 420 Teruel-Cuenca main road Peralejos, Teruel (st. 84-5/41), XK 663817; well; 2 ♀ ♀, mounted as above, in GPC collections. El Bancalón, 0.8 km S of Deralejos, Teruel (st. 84-5/42), XK 668826; well; 1 ♀, mounted as above, in GPC collections. Tormos, E of the main road Tormos-Orba, Alicante (st. 84-5/50), YH 546988; well; 1 juv., mounted as above, in GPC collections. Fondón, Andarax river, Almería (st. A85/7-68), WF 141936 (22-43), 780 m a.s.l., 23.7.1984, coll. Van den Hurk and Leys; hyporheic habitat, SBR (water temperature 22.0°C; O₂ 8.2 mg/l; E.c. 3.50 mS/cm; pH 7.88; Cl⁻ 125 mg/l); 1 ♀, mounted as above, in GPC collections.

Microcharon juberthiei juberthiei Coineau, 1968

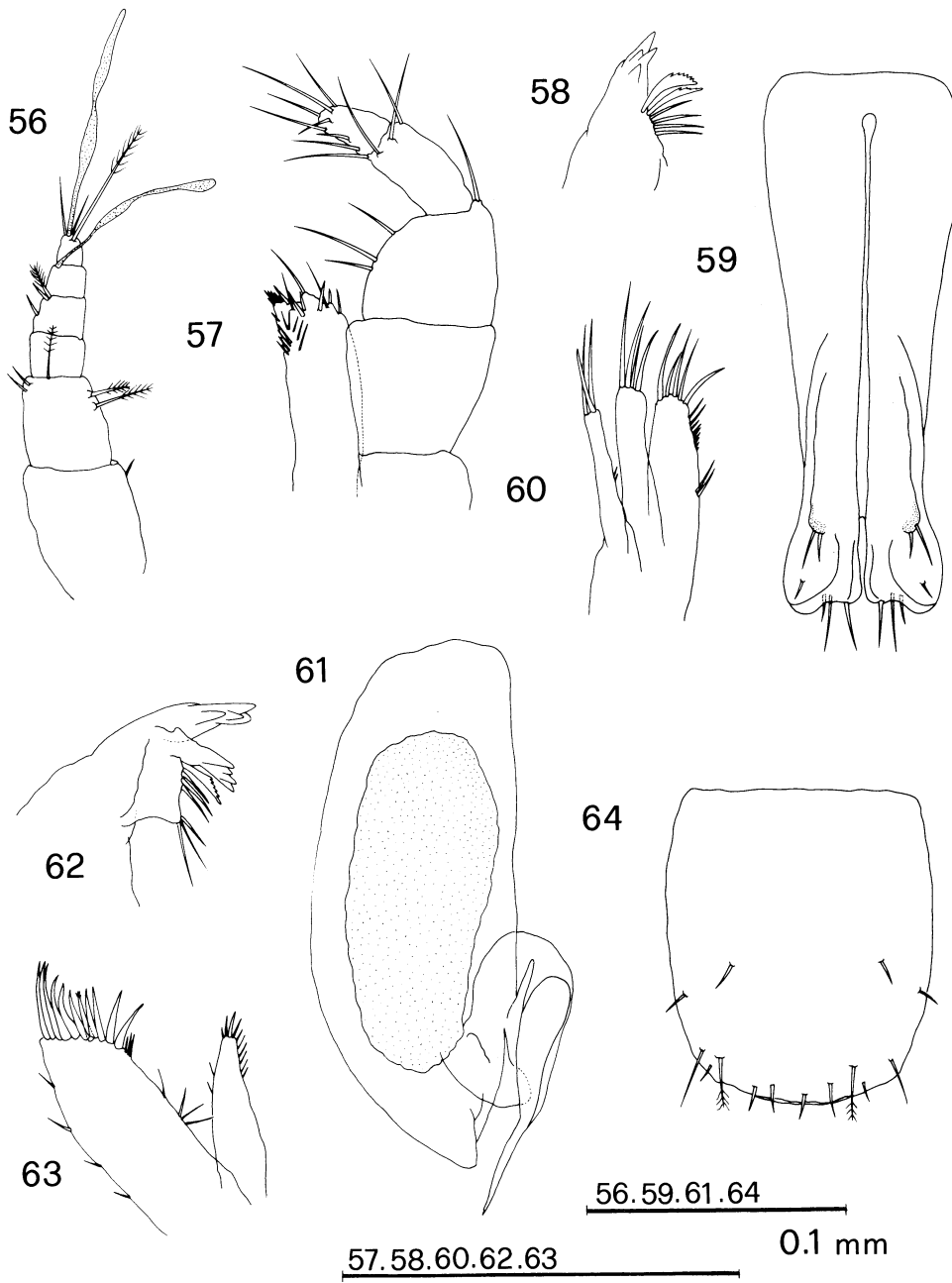
Material. — Espadilla, Pequeño river, Castellón (st. 84-5/36), YK 259349, 260 m a.s.l., 9.5.1984, coll. Notenboom and Meijers; hyporheic habitat, SBR (water temperature 15.7°C; E.c. 0.846 mS/cm; pH 7.68; Cl⁻ 16 mg/l); 1 ♀ and 1 ♂ completely dissected and mounted on slides in Faure's medium in GPC collections. Monzón, Cinca river, Huesca (st. 84-6/2), BG 6644, 250 m a.s.l., 7.6.1984, coll. Notenboom and Meijers; hyporheic habitat, SBR (water temperature: 14.0°C; E.c. 0.420 mS/cm; pH 7.98; Cl⁻ 30 mg/l); 3 ♀ ♀ and 1 ♂, mounted as above, in GPC collections.

The specimens from Spain are clearly attributable to *Microcharon juberthiei juberthiei*. Only small differences, as compared to the original description and illustrations by Coineau (1968), based on material from wells of Ardeche (France), were observed, viz. some finely pectinated spines on the inner endite of the first maxilla and a much enlarged sympodite of male second pleopod.

The actual distribution of this species includes France (*M. juberthiei juberthiei*, from phreatic waters of the Ardeche; *M. juberthiei ramosus* Coineau, 1968, from the hyporheal of the river Gard) and Spain (hyporheal of north-western region of Iberian peninsula, present data).

Microcharon notenboomi n.sp. (figs. 56-64)

Material. — Biniés, Veral river Huesca, (st. 84-6/15) (type-locality), XN 784214, 590 m a.s.l., 12.6.1984, coll. Notenboom and Meijers; hyporheic habitat, SBR (water temperature 12.2°C, E.c. 0.265 mS/cm; pH 8.00; Cl⁻ 6 mg/l). Holotype: 1 ♂, completely dissected and mounted on slide, in Faure's medium (coll. no. ZMA Is 105.399). Merindad de Sotoscueva, spring of Quintanilla de Valdebodres, Burgos (st. 84-4/11), VN 456602, 700 m a.s.l., 7.4.1984,



Figs. 56-64. *Microcharon notenboomi* n.sp., holotype: 56, first antenna; 57, maxilliped; 58, right mandible; 59, first pleopod; 60, second maxilla; 61, second pleopod; 62, left mandible; 63, first maxilla; 64, telson.

coll. Notenboom and Meijers; resurgence, SBR (water temperature 9.9°C; E.c. 0.423 mS/cm; pH 7.55; Cl⁻ 6 mg/l); 2♂♂, mounted as above, in GPC collections. Huesca, 0.5 km N. of Villareal de la Canal, Majones river (st. 84-6/16), XN 734236, 550 m a.s.l., 12.6.1984, coll. Notenboom and Meijers; hyporheic habitat, SBR (water temperature 15.2°C; E.c. 0.409 mS/cm; pH 7.77; Cl⁻ 6 mg/l); 1♂, mounted as above, in GPC collections. Ripodas, Urraül bajo, Areta river Navarra, (st. 84-6/19), XN 391274, 420 m a.s.l., 14.6.1984, coll. Notenboom and Meijers; hyporheic habitat, SBR (water temperature 16.3°C; E.c. 0.392 mS/cm; pH 7.66; Cl⁻ 6 mg/l); 2♂♂, mounted as above, in GPC collections.

Description. — Body length, excluding first and second antennae, and uropods, 1.35-1.39 mm. Cephalosome slightly longer than wide. Pleotelson short (length/width ratio: 1.18-1.19), with rounded lateral margin; armature as in fig. 64.

First antenna 6-segmented, segment 2 with reduced, distal plumose seta, slightly overreaching third segment; segments 5 and 6 each bearing 1 distal aesthetasc; other armature as in fig. 56. All specimens lacking flagellum of second antenna; exopod as usual in the genus.

Left mandible with lacinia mobilis consisting of 4 subconical teeth; pars incisiva with 4 subconical, elongated teeth; pars molaris consisting of conical swelling with 3 apical setae; other armature as in fig. 62. Right mandible differs chiefly in lacking lacinia mobilis; armature as in fig. 58. Mandible palp built as usual in freshwater species of the genus, with 3 claw-like spines on distal segment. Upper lip, lower lip and maxilliped without particularities.

First maxilla consisting of 2 endites: outer endite with distal row of 11 slender spines, 1 finely pectinated apically; inner endite tapering distally and with 2 terminal spinules and setules on both inner and outer margins.

Second maxilla consisting of 3 endites of about same length; outer endite with 3 distal setae; central endite with 4 distal setae; inner endite with 4 distal setae and some setules on the inner margin.

Pereopods rather similar in shape, showing some differences in the armature of dactylus; first pereopod, dactylus bearing 2 distal unguli of different length and 1 distal and 4 subdistal setae; other pereopods, dactylus with 2 unguli, 1 distal and 1 subdistal setae.

Male first pleopod: rather elongated (length/basal width ratio: 2.76-2.78), consisting of 2 coalescent halves, deeply cleft and enlarged on distal outer corner; armature as in fig. 59.

Male second pleopod: sympodite elongated (length/width ratio: 2.71-2.73), with a pointed distal corner; endopod not recurved, small and short as compared to sympodite (endopod/sympodite length ratio: 0.51-0.52); exopod reduced to subovoid lobe.

Third and fourth pleopods without particularities as compared to those of other freshwater species.

Uropods and female unknown.

Etymology. — We have great pleasure in naming this new species in honour of Ir. Jos Notenboom, who participated in the field work and collected the new species.

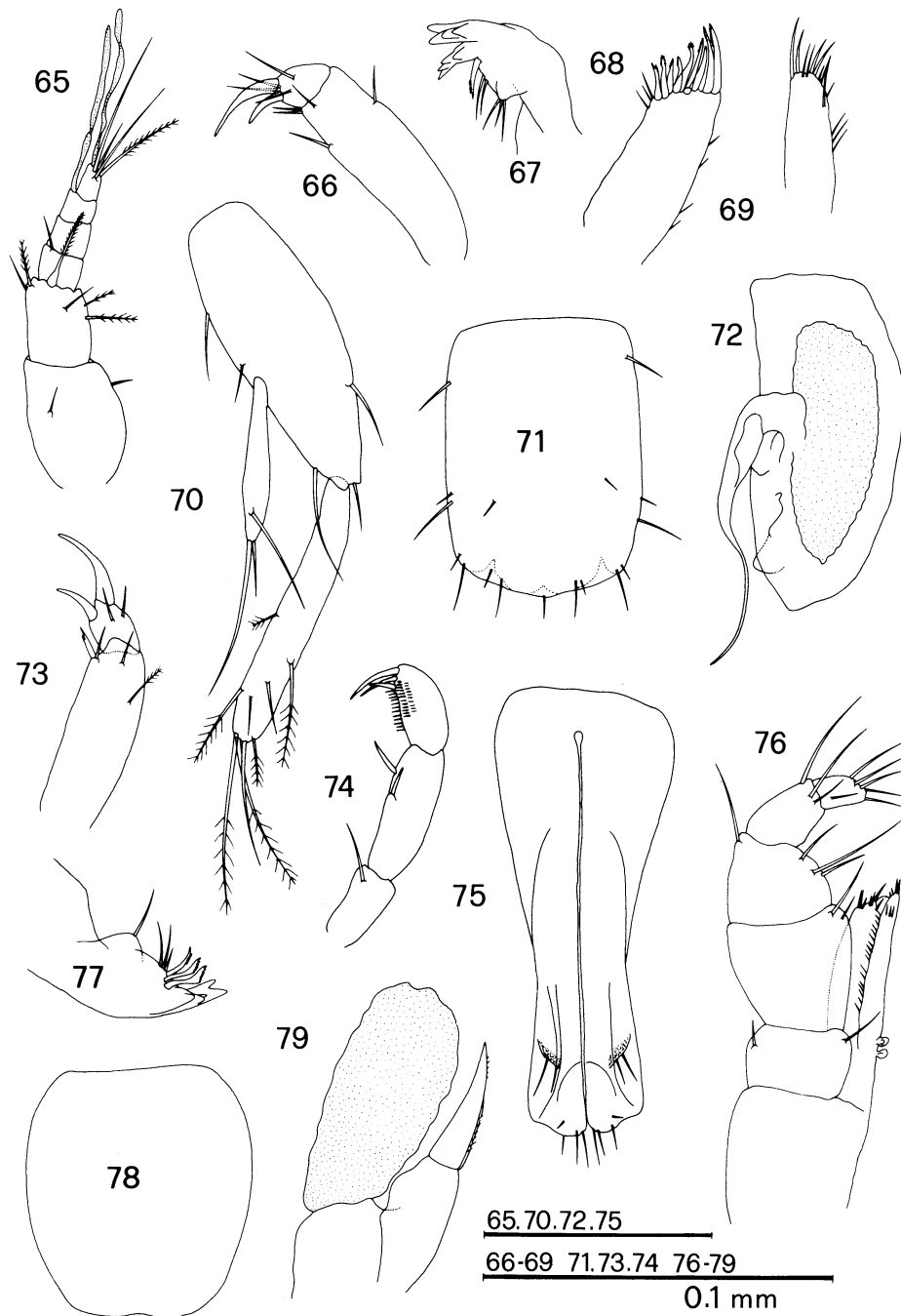
Affinities. — Among the freshwater species of the genus *Microcharon*, *M. notenboomi* n.sp. is unique in having a characteristic male first pleopod and a male second pleopod with narrow sympodite and reduced endopod, much shorter than the sympodite. These characters clearly differentiate the new species from the other freshwater species of the genus. The only species which resembles it is *M. phreaticus* Coineau & Botosaneanu, 1973, from ground waters of Cuba, in that the endopod of male second pleopod is much reduced.

***Microcharon longistylus* n.sp. (figs. 65-79)**

Material. — Ripodas, Urraul Bajo, Areta river Navarra, (st. 84-6/19) (type-locality), XN 391274, 420 m a.s.l. 14.6.1984, coll. Notenboom and Meijers. Holotype: 1♂, completely dissected and mounted on slide in Faure's medium (coll. no. ZMA Is 105400); allotype: 1♀, mounted as above (coll. no. ZMA Is 105.401). Paratypes: 14♀♀, 9♂♂, 7 juveniles, mounted as above, in GPC collections. Merindad de Sotoscueva, spring of Quintanilla de Valdebodres Burgos, (st. 84-4/11), VN456602, 700 m a.s.l., 7.4.1984, coll. Notenboom and Meijers; resurgence, SBR; 1♀, mounted as above, in GPC collections. Merinda de Río Ubierna, spring N. of San Martín de Ubierna, Burgos, (st. 84-3/32, 84-4/38), VN 417067, 900 m a.s.l., 28.4.1984, coll. Notenboom and Meijers; resurgence SBR (water temperature 12.9°C; E.c. 0.421 mS/cm; pH 7.45; Cl⁻ 6 mg/l); 2♀♀, mounted as above, in GPC collections. Same locality, 30.3.1984 (water temperature 12.0°C; E.c. 0.401 mS/cm; pH 7.56; Cl⁻ 6 mg/l); 1♀, mounted as above, in GPC collections. Castellón, Villos bridge, Bergantes river (st. 84-5/15), YL 374062, 660 m a.s.l., 6.5.1984, coll. Notenboom and Meijers; hyporheic habitat, SBR (water temperature 13.6°C; E.c. 0.695 mS/cm; pH 7.40; Cl⁻ 36 mg/l); 1♂, 1♀ and 1 juv., mounted as above, in GPC collections. Sipán, Guatizalema river Huesca, (st. 84-6/4, YM 255743, 530 m a.s.l., 8.6.1984, coll. Notenboom and Meijers, hyporheic habitat, SKC (water temperature 12.7°C; E.c. 0.375 mS/cm; pH 8.16; Cl⁻ 14 mg/l); 10♀♀ and 7♂♂, mounted as above, in GPC collections. Huesca, Gesera bridge, Guarga river (st. 84-6/7), YM 211968, 740 m a.s.l., 8.6.1984, coll. Notenboom and Meijers; hyporheic habitat, SBR/SKC (water temperature 17.5°C; E.c. 0.349 mS/cm; pH 7.85; Cl⁻ 8 mg/l); 2♀♀, 3♂♂ and 4 juveniles, mounted as above, in GPC collections. Villobas, S. of Lanave-Boltaña main road Huesca, (st. 84-6/8), YM 231973, 750 m a.s.l., 8.6.1984, coll. Notenboom and Meijers; well (water temperature 10.9°C; E.c. 0.458 mS/cm; pH 7.33; Cl⁻ 6 mg/l); 1♀, mounted as above, in GPC collections. Huesca, 0.5 km N. of Villareal de la Canal, Majones river (st. 84-6/16), XN 734236, 550 m a.s.l., 12.6.1984, coll. Notenboom and Meijers; 3♀♀, 3♂♂ and 3 juv., mounted as above, in GPC collections.

Description. — Body length 1.41-1.49 mm (♀♀), 1.35-1.38 mm (♂♂), 1.38 mm (holotype) (first and second antennae and uropods not included). Cephalosome longer than wide. Pleotelson much longer than wide (length/width ratio: 1.43-1.45), with subparallel margins; armature as in fig. 71. First antenna 6-segmented; segment 2 bearing 1 distal, short plumose seta; segments 5 and 6 each with 1 long, distal aesthetasc; remaining armature as in fig. 65. Second antenna lacking flagellum, exopod as usual in the genus.

Left mandible with lacinia mobilis consisting of 4 pointed teeth; pars incisiva with 4 rounded teeth; pars molaris consisting of a conical lobe with 3 distal setae; between lacinia mobilis and pars molaris there are 2 setae and 1 den-



Figs. 65-79. *Microcharon longistylus* n.sp., holotype (65-77), allotype (78, 79): 65, first antenna; 66, first pereopod, detail of dactylus; 67, left mandible; 68, first maxilla, inner endite; 69, second maxilla, inner endite; 70, uropod; 71, telson; 72, second pleopod; 73, 7th pereopod, detail of dactylus; 74, mandibular palp; 75, first pleopod; 76, maxilliped; 77, right mandible; 78, second pleopod; 79, third pleopod.

ticulate spine. Right mandible differs in lacking lacinia mobilis, in having 1 seta (versus 3) on the conical swelling of pars molaris and 3 setae (versus 2) and 3 (versus 1) denticulate spines between pars molaris and pars incisiva. Mandible palp as usual in freshwater species of the genus. Upper and lower lips without particularities.

First maxilla with 2 endites; outer endite bearing 9-10 distal spines, some finely denticulate or pectinated; inner endite bearing 2 subterminal spinules and setules on both margins.

Second maxilla with 3 endites of about same length; outer and central endites each with 4 distal setae and some lateral setules; inner endite with 4 apical spiniform setae and some subdistal and inner setae.

Maxilliped without particular characteristics.

Pereopods rather similar in shape, showing small differences in armature of dactylus; dactylus of first pereopod with 2 unguli (the longer about twice as long as dactylus), 2 distal and 2 subdistal setae; dactylus of pereopods 2-7 differing in having 2 instead of 4 setae.

Male first pleopod bilobed, elongated (length/width ratio: 2.50-2.52), with rounded distal inner corners; armature as in fig. 75.

Male second pleopod: sympodite long and slender (length/width ratio: 2.42-2.44), with subparallel margins and slightly pointed mediodistal corner; endopod long (endopod/sympodite length ratio: 0.86-0.87), recurved and distally filiform; exopod reduced to subovoidal lobe.

Female second pleopod longer than wide (length/width ratio: 1.10-1.11), with faint distal convexity.

Third and fourth pleopods not sexually dimorphic. Third pleopod: exopod not recurved, slender, without apical setulae and with row of thin setules on outer margin; endopod ovoid, without armature. Fourth pleopod consisting of 1-segmented, naked ovoid rudiment.

Uropods elongated and slender; sympodite much longer than wide (length/width ratio: 3.45-3.47); exopod long, half as long as sympodite and endopod; endopod about as long as the sympodite; armature as in fig. 70.

Etymology. — The specific epithet “*longistylus*” refers to the elongated and filiform endopod of male second pleopod.

Affinities. — The present new species resembles *M. angelieri* in the length of the endopod of the second male pleopod and in the morphology of the second female pleopod; moreover, it shares the presence of setules on the exopod of pleopod 3 with the following species: *M. rouchi*, *M. meijersae* n.sp. and *M. thracicus*.

M. longistylus n.sp. differs from these species, as well as from the other freshwater species of the genus, in several characters, especially in the slender body, armature of the first maxilla, morphology of male first and second

pleopods, absence of a distal setula on the exopod of pleopod 3 and the elongated exopod of the uropods.

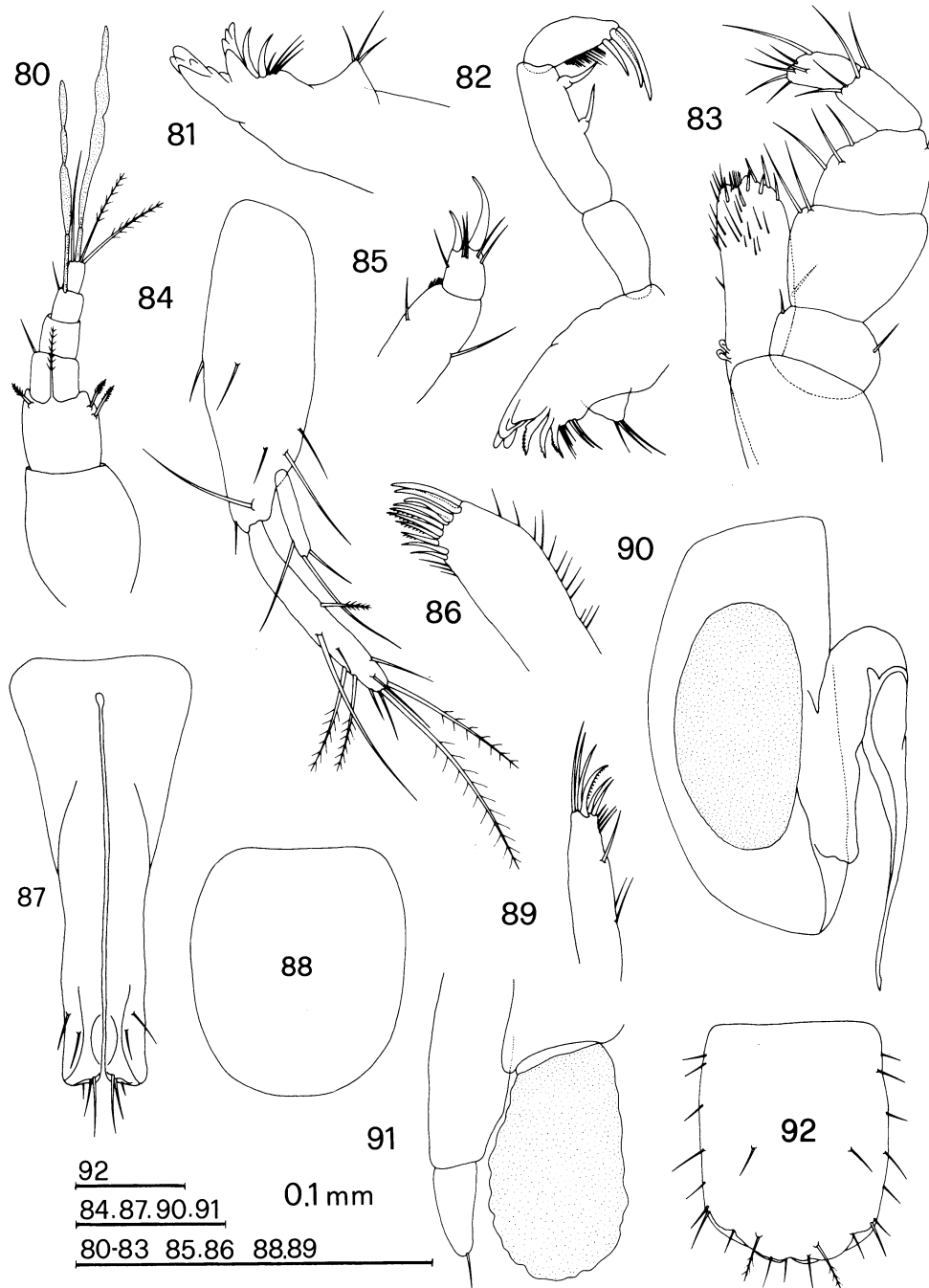
Microcharon letiziae n.sp. (figs. 80-92)

Material. — Javéa field, Alicante (st. 84-2/19) (type-locality), BC 547956, 15 m a.s.l., 5.2.1984, coll. Notenboom and Meijers; well (water temperature 16.3°C; E.c. 6.24 mS/cm; O₂ 6.7 mg/l; pH 7.01; Cl⁻ 1850 mg/l). Holotype: 1 ♂, completely dissected and mounted on slide in Faure's medium (coll. n. ZMA IS 105402); allotype: 1 ♀, mounted as above (coll. n. ZMA IS 105403). Paratypes: 3 ♀ ♀, 3 ♂ ♂ and 2 juveniles, mounted as above, in GPC collections. Monsensol, Jávea, Alicante (st. n. 84-2/17), BC 568941, 10 m a.s.l., 4.2.1984, coll. Notenboom and Meijers; well (water temperature 17.5°C; E.c. 2.36 mS/cm; O₂ 4.0 mg/l; pH 6.98; Cl⁻ 550 mg/l); 2 ♂ ♂, 1 ♀ and 1 juv., mounted as above, in GPC collections. Teulada, NE. of Moraire, Alicante (st. 84-2/10), BC 507866; 5 m a.s.l., 4.2.1984, coll. Notenboom and Meijers; well (water temperature 17.5°C; E.c. 6.55 mS/cm; O₂ 4.1 mg/l; pH 7.34; Cl⁻ 1850 mg/l); 1 ♀, 1 ♂ and 1 juv., mounted as above, in GPC collections. Jávea, Prime Montanar 3, Alicante (st. 84-2/20), BC 552976, 0 m a.s.l., 5.2.1984, coll. Notenboom and Meijers; well (water temperature 16.7°C; E.c. 6.65 mS/cm; O₂ 8.6 mg/l; pH 7.46; Cl⁻ 1860 mg/l); 1 ♂ and 2 ♀ ♀, mounted as above, in GPC collections. La Moya, Denia, Alicante (st. 84-2/32), BD 445040, 5-10 m a.s.l., 7.2.1984, coll. Notenboom and Meijers; well (water temperature 16.7°C; E.c. 2.28 mS/cm; O₂ 5.4 mg/l; pH 7.67; Cl⁻ 370 mg/l); 1 ♀, mounted as above, in GPC collections. Benidoleig, Sandra house, N. of Benidoleig — Orba main road, Alicante (st. 84-3/11), YH 572981, 105 m a.s.l., 4.3.1984, coll. Notenboom and Meijers; well (water temperature 13.8°C; E.c. 1.275 mS/cm; pH 7.94; Cl⁻ 66 mg/l); 1 ♀, mounted as above, in GPC collections. La Gila, Peralejos, E. of N 420 Teruel-Cuenca main road, Teruel (st. 84-5/41), XK 663817, 10.5.1984, coll. Notenboom and Meijers; well (water temperature 11.5°C; E.c. 1.037 mS/cm; pH 7.14; Cl⁻ 32 mg/l); 1 ♀ mounted as above, in GPC collections. El Bancalón, 0.8 km S. of Peralejos, Teruel (st. 84-5/42), XK 668826, 990 m a.s.l., 10.5.1984, coll. Notenboom and Meijers; well (water temperature 12.0°C; E.c. 1.062 mS/cm; pH 7.15, Cl⁻ 30 mg/l); 1 ♂, mounted as above, in GPC collections. Alicante, E. of the road C 3318 Tormos-Olba S. of Tormos (st. 84-5/50), YH 546988, 120 m a.s.l., 12.5.1984, coll. Notenboom and Meijers; well (water temperature 12.0°C; E.c. 1.062 mS/cm; pH 7.15; Cl⁻ 30 mg/l); 1 ♂, mounted as above, in GPC collections. San Bernardo, 0.5 km NWW of Villa Lola, Corbera de Alcira, Valencia (st. 84-3/17), YJ 277385, 0-10 m a.s.l., 15.5.1984, coll. Notenboom and Meijers; well (water temperature 17.8°C; E.c. 1.109 mS/cm; pH 7.28; Cl⁻ 88mg/l); 2 ♀ ♀, mounted as above, in GPC collections. Carcagente, 0.8 km N of cemetery, Valencia (st. 84-5/63), YJ 207321, 35 m a.s.l., 15.5.1984, coll. Notenboom and Meijers; well (water temperature 16.2°C; E.c. 1.104 mS/cm; pH 7.74; Cl⁻ 98 mg/l); 1 ♀, mounted as above, in GPC collections.

Description. — Body length of adults, excluding first and second antennae and uropods, 1.32-1.33 mm; no marked size difference between the sexes. Cephalosome much longer than wide. Pleotelson longer than wide (length/width ratio: 1.28-1.30), with subparallel margins; armature as in fig. 92.

First antenna, 6-segmented; segment 2 with short and slender plumose seta; segments 5 and 6 each with long, heavy aesthete; other armature as in fig. 80. All specimens without antennular flagellum; exopod as usual in the genus.

Left mandible: lacinia mobilis with 4 conical teeth; pars incisiva with 4 rounded teeth; pars molaris consisting of a conical protuberance, with 3 distal setae; between "lacinia mobilis" and pars molaris there are 2 naked spines and 4 setae. Right mandible lacking lacinia mobilis; pars incisiva consisting of 5



Figs. 80-92. *Microcharon letiziae* n.sp., holotype (80-87, 90), allotype (88, 89; 90-92): 80, first antenna; 81, left mandible; 82, right mandible; 83, maxilliped; 84, uropod; 85, first pereopod, dactylus; 86, first maxilla; 87, first pleopod; 88, second pleopod; 89, second maxilla, inner endite; 90, second pleopod; 91, third pleopod; 92, telson.

teeth; between pars incisiva and pars molaris there are 3 denticulate spines and 5-6 setae. Mandibular palp 3-segmented; basal segment naked, second segment with 2 inner spines, distal segment with 3 claw-like spines and row of long setules on inner margin.

Upper and lower lips without particularities.

First maxilla consisting of 2 endites; outer with row of 10-11 spines (4 finely pectinated); inner endite tapering apically, with 2 terminal spines and some setules on both inner and outer margins.

Second maxilla consisting of 3 endites of about same length; outer and central endites each with 4 setae of different length; inner endite with 5 apical setae, 1 pectinated spine and some setae on inner margin.

Maxilliped (fig. 83) without particular characteristics.

Pereopods rather similar in shape, but showing small differences in armature; dactylus of first pereopod with 2 ungui (the outer much longer than dactylus), 4 subdistal and 1 inner setae; dactylus of other pereopods with 2 ungui and 2 subterminal setae.

Male first pleopod bilobed, elongated (length/basal width ratio: 2.44-2.46), distal part parallel-margined, and deeply cleft; ornamentation consisting of 3 distal and 2 subdistal setae on each half (fig. 87).

Male second pleopod: sympodite elongated (length/width ratio: 2.19-2.23), with rounded medio-distal corner; endopod not recurved, slightly shorter than sympodite (endopod/sympodite length ratio: 0.87-0.88), and with filiform distal part, overreaching sympodite tip; exopod reduced to subovoid lobe.

Female second pleopod longer than wide (length/width ratio: 1.16-1.17) with regularly rounded margins and without distal setules.

Third and fourth pleopods not sexually dimorphic. Third pleopod, exopod 2-segmented; distal segment very short, 37-38% of endopod, with a terminal setule; endopod subovoidal, naked.

Fourth pleopod 1-segmented, rudimentary.

Uropods: sympodite slender and elongated (length/width ratio: 3.01-3.03); exopod short (exopod/sympodite length ratio: 0.64-0.66); armature as in fig. 84.

Etymology. — Specific epithet after Miss Letizia Patanè who cooperated with us in the description of the new species.

Affinities. — The only species related to *M. letiziae* n.sp. appears to be *M. meijersae* n.sp., herein described; with this species, it shares the presence of a pectinate seta on the second maxilla, the armature of the first maxilla, and a similar morphology of the male first and second pleopods. *M. letiziae* n.sp. differs in numerous characteristics, viz. the female second pleopod, the morphology and armature of the third pleopod, the armature of the pleotelson and the construction of the uropods.

CONCLUSIONS

The inadequate descriptions and illustrations of some species and subspecies of the genus *Microcharon* induced several difficulties and mistakes throughout the literature of the microparasellid isopods.

In recent years, however, this interesting group of crustaceans has received careful attention from Coineau (1968, 1971), who provided a useful comprehensive treatment of the species and subspecies described in the genus *Microcharon*, grouping them into two convenient groups, easily separable by their ecology, viz: (1) marine species, which are characterized by a 5-segmented first antenna (except *M. monnioti* Bocquet, 1979, which has a 6-segmented plesiomorphic first antenna), presence of a pectinate seta on the second maxilla, short unguli on the pereopods, and a third pleopodal endopod armed with 3 plumose setae; (2) inland-water species, with a 6-segmented first antenna (except in *M. kirghisicus* Jankowskaya, 1964, *M. phreaticus* Coineau & Botosaneanu, 1973, *M. raffaellae* Pesce, 1979, *M. herrerae* Stock, 1977, *M. galapagoensis* Coineau & Schmidt, 1979, all with a 5-segmented first antenna), a second maxilla without pectinated seta, long unguli on the pereopods, and a naked third pleopodal endopod.

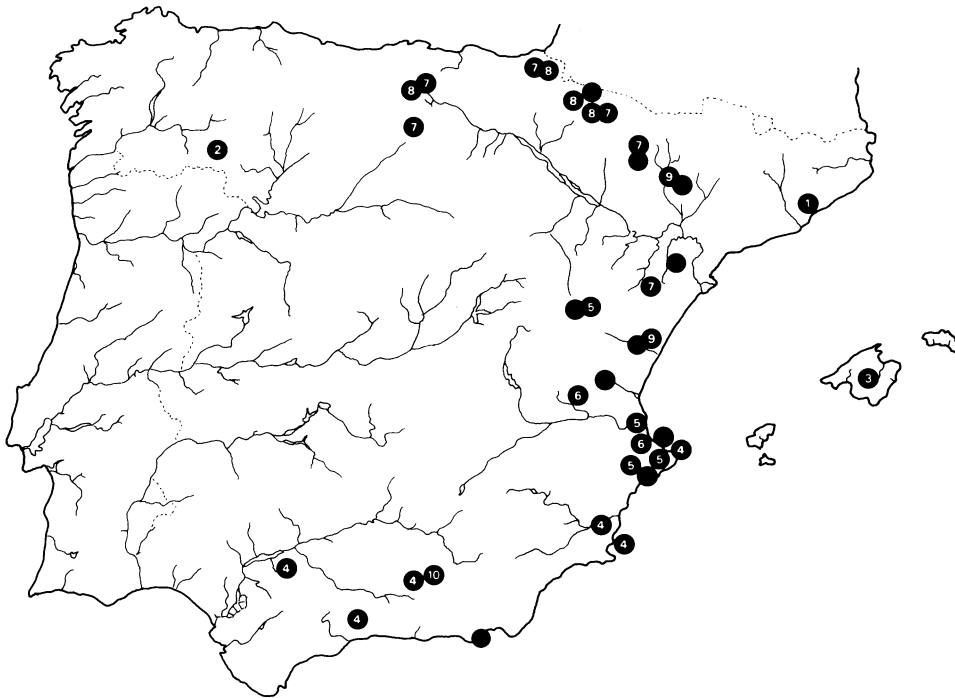


Fig. 93. Map of distribution of the genus *Microcharon* in Spain: 1, *M. marinus*; 2, *M. angelieri*; 3, *M. comasi*; 4, *M. cf. marinus*; 5, *M. letiziae* n.sp.; 6, *M. meijersae* n.sp.; 7, *M. longistylus* n.sp.; 8, *M. notenboomi* n.sp.; 9, *M. juberthiei juberthiei*; 10, *M. hispanicus* n.sp.; black dots, *M. sp.*

Later on Coineau (1986, 1988) recognized two morphological groups within the really freshwater species of the genus, viz.: (1) species with an apomorphic round and naked female second pleopod and a sympodite of the male second pleopod with a rounded distal corner; (2) species characterized by a female second pleopod with distal setules and a more or less pointed sympodite of the male second pleopod. Some species (*M. halophilus* Birstein & Ljovuschkin, 1965, *M. kirghisicus*, *M. tantalus* Birstein & Ljovuschkin, 1965, *M. latus* Karaman, 1933) may form another, intermediate group, in having an armed female second pleopod and a rounded distal corner of the sympodite of the male second pleopod.

Stock (1977), in describing *M. herrerae* from brackish ground waters of Bonaire (Netherlands Antilles), discussed the origin and the status of the marine, brackish and freshwater species of the genus, with particular regard to the first antenna segmentation, suggesting as well as generic distinction within the genus *Microcharon*.

Meanwhile, Pesce & Tetè (1978), mentioned some morphological features of marine species (pectinated seta on the inner endite of the second maxilla, conspicuously denticulate spines on the first maxilla) in *M. karamani* and *M. zibani*, both from continental ground waters of Algeria. Moreover, they hypothesized the existence of an intermediate group between marine and freshwater species, combining the following morphological characteristics: first antenna 6-segmented; first maxilla with denticulate or pectinate spines; inner endite of second maxilla with a strongly pectinated element; pereopods with rather elongated unguili; female second pleopod with distal setules; third pleopod unarmed.

Some of the species, herein described, viz. *M. hispanicus* n.sp., *M. meijersae* n.sp., *M. letiziae* n.sp. and *M. cf. marinus*, exhibit the same combination of characteristics as the mentioned intermediate grouping.

The above observations tend to corroborate the hypothesis that all these species may form a separate group, incorporating species and subspecies which are characterized by both "marine" and "freshwater" morphological features, and to be regarded as an intermediate evolutionary stage in the colonization of underground continental freshwaters by the genus *Microcharon*.

In this new evolutionary lineage are likely to be included some other inadequately described fresh- or brackish water species as well, which we recently examined again, such as *M. latus prespensis* Karaman, 1954, *M. othrys* Argano & Pesce, 1979, *M. raffaellae* Pesce, 1979 and *M. ullae* Pesce, 1981. After a closer analysis, these revealed to possess a pectinate element on the inner endite of the second maxilla (feature hardly visible, however, in preserved specimens!), as well as strongly denticulate spines on the inner endite of the first maxilla, long unguili on the pereopods and a third pleopod with naked endopod.

Within the same group a possible separation is seen between primitive (thalassoid) and more derived species, the first ones (*karamani*, *zibani*,

hispanicus, *ullae*, *othrys*, *raffaellae*, *latus prespensis*) characterized by a mandibular palp with more than 3 spines on the distal segment, and a female second pleopod with 2-4 distal setules; the others (*meijersae*, *letiziae*) with 3 spines on the mandibular palp and an apomorphic, naked female second pleopod.

On the basis of the above evidence it seems now desirable to describe, or revise, every species and subspecies of the genus *Microcharon* in a way as detailed and careful as possible, particularly the mouthparts, as well as to construct an up-to-date key to the genus.

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