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MEMBERS OF THE GAMMARUS PULEX-GROUP (CRUSTACEA - AMPHIPODA)
FROM NORTH AFRICA AND SPAIN, WITH DESCRIPTION OF A NEW SPECIES FROM MOROCCO

SJOUK PINKSTER

ABSTRACT

Gammarus gauthieri (Karaman) was known from North Africa only. During systematic sampling, carried out in 1969 to 1970, it became clear, that the species is also widely distributed in the Iberian peninsula. Comparative descriptions of this species and of two other members of the *Gammarus pulex*-group, *G. ibericus* Margalef (new rank) from Spain, and *G. acalceolatus* nov. spec. from Morocco, are given.

Chevreaux, 1910: 228, was the first author recording *Gammarus pulex* from Algeria and later Chevreaux & Fage, 1925: 254, mentioned it from Morocco and Algeria. Karaman, 1935, reexamined part of Chevreaux's material and some material from Algeria collected by Gauthier, coming to the conclusion that it certainly did not belong to *Gammarus pulex* (L.) but to a closely related form. He showed, that this North African form could be easily distinguished from both *Gammarus pulex* (L.) and the other European members of the *Gammarus pulex*-group (*Rivulogammarus* in the terminology of Karaman).

Until recently, *G. gauthieri* was the only known member of the *G. pulex*-group in North Africa. In the summer of 1969, however, Miss A. Zuiderwijk, a B.Sc. student at the University of Amsterdam, collected a sample of amphipods in a mountain lake in Morocco, which appeared to contain a new species of this group.

It is a well-known fact, that there exists a rather marked relationship between the freshwater fauna of the Iberian peninsula and that of North Africa, and this was a reason to look for representatives of the *G. pulex*-group in Portugal and Spain too.

The data from literature are scanty. M. Ferrer Galdiano (1921) mentions two Spanish localities of *G. pulex*. Moreover, he refers to a locality of *G. delebecqi* (= *G. fossarum*), mentioned by I. Bolivar in 1895. These data do not seem very reliable, however, since *G. gauthieri* was not yet distinguished at the time.

Margalef (1944, 1951, 1959) often refers to the data mentioned above. Moreover, he records the occurrence of *G. pulex gallicus* in the Pireneos de la Cerdaña, and the existence of a new subspecies, *G. pulex ibericus*, at a single locality in the Serrania de Cuenca. The occurrence of *G. pulex gallicus* in the Spanish part of the eastern Pyrenees is not astonishing since this

form is known from southeastern France as well.

For *G. pulex ibericus* the problems were somewhat different, since the description of Margalef is not very detailed. Fortunately, however, I was able to reexamine part of the type-material and it became clear that we had to do with a form that clearly differs from the other members of the same group. So, there were only three doubtful records left. In the summers of 1969 and 1970 systematic sampling was done in nearly the entire Iberian peninsula (see map I). It became soon evident that members of the *G. pulex*-group are not very common inhabitants of fresh waters in Spain. Generally they were found (in very dense populations though) in rather isolated areas, often in fountains and man-made water basins, widely separated from each other. The localities are plotted in map II. In all these localities the same species, *Gammarus gauthieri*, was found, once more a proof of the relationship between the freshwater fauna of North Africa and Spain.

In this paper a redescription is given of *Gammarus gauthieri* (Karaman, 1935), with notes on its variability and its ecology. A comparative description is given of *Gammarus acalceolatus* nov. spec. and of *Gammarus ibericus*, new rank.

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ABBREVIATIONS USED

MNHN = Muséum National d'Histoire Naturelle, Paris
RMNH = Rijksmuseum van Natuurlijke Historie, Leiden
ZMA = Institute of Taxonomic Zoology (Zoölogisch Museum), Amsterdam

Gammarus gauthieri (Karaman, 1935). Figs. 1, 2, 3 A - I.

Rivulogammarus gauthieri Karaman, 1935: 47.
Gammarus pulex subsp. *gauthieri*; Margalef 1951: 267.

Material.-

- Morocco: Well, called Ain Chifa, on road no. P 24, near Immouzzar, prov. Fes, 18 - VII - 1970.
Fast-running, clear water; bottom clay with gravel, Cl 8 mg/l, Ca 35 mg/l, many specimens, many of them in precopulation (ZMA).
- Cascades near Sefrou, prov. Fes, 18 - VII - 1970.
Fast-running, clear water, stony bottom, Cl 4 mg/l, Ca 40.4 mg/l, 3 specimens (ZMA).
- Well, upstream of swimming pool near Immouzzar du Kandari on road P 24, prov. Fes, 18 - VII - 1970.
Width of stream 2 - 3 m, maximum depth 1 m, bottom gravel with watercress, Cl 1 mg/l, Ca 66 mg/l, many specimens, many of them in precopulation (ZMA).
- Small brook, near Ifrane, 60 km S. of Fes, in the Moyen Atlas, alt. 1700 m, in Potamogeton-vegetation, 28 - V - 1961.
Many specimens, many of them in precopulation (ZMA).
- Ditch between Ifrane and Immouzzar du Kandari, about 20 km N. of Ifrane, alt. 1500 m, 5 - VI - 1961.
Many specimens (ZMA).

- Upstream region of Oued Moulouya, near village Boulojou, near Col du Zad and Midelt, prov. Meknes, 20 - VII - 1970.
Slowly running, slightly polluted stream of 1.5 m wide and 10 cm deep, many specimens (ZMA).
- Oued Zloul, near Tunhadite, prov. Meknes, 20 - VII - 1970.
Rather fast-running stream, slightly polluted, 4 m wide and 1 m deep, dense vegetation, many specimens (ZMA).
- Small brook N. of Kla-Aït-Oufella, 47 km N. of Midelt (near Col de Zad - Midelt), prov. Meknes, 20 - VII - 1970.
Clear fast-running stream of 1 m wide and 10 cm deep, many specimens (ZMA).
- Grotte du Chikker, prov. Taza, August 1968.
5 specimens (ZMA).
- Irrigation-ditch, near Itzer, prov. Meknes, alt. 1654 m, many specimens (ZMA).
- Grotte de la Dayo Chikker, Moyen Atlas, 29 - VIII - 1950.
3 specimens (MNHN).

Spain:

- prov. Malaga; Ronda, 28 - V - 1967, many specimens (ZMA).
- prov. Cuenca; small tributary of Río Ciguëla near Naharros, 10 - VII - 1969.
About 20 cm wide, clay bottom, Cl 35 mg/l, Ca 440 mg/l, many specimens (ZMA).
- Río Chillaron, about 6 km W. of Cuenca, wide, shallow river, stony bottom, 10 - VII - 1969.
Cl 5 mg/l, Ca 400 mg/l, many specimens (ZMA).
- Tributary of Río Valdejudios, 5 km E. of Carrascosa del Campo, on road N 400, 50 cm wide, 10 - VII - 1969.
Cl 9 mg/l, Ca 354 mg/l, many specimens, many of them in precopulation (ZMA).
- Río Valparaiso, on road N 400, 49 km W. of Cuenca, fast-running stream of about 1 m wide, 10 - VII - 1969.
Cl 8 mg/l, Ca 498 mg/l, many specimens (ZMA).
- Río Valdejudios, on road N 400 at Carrascosa del Campo, 50 cm wide, 10 VII - 1969.
Cl 6 mg/l, Ca 354 mg/l, many specimens (ZMA).
- prov. Soria; Well near Río Avion on side-road of N 122, near Colabanazor (El Burgo de Osma), 19 - VI - 1970.
Temp. 14° C, pH 5.5, Cl 1 mg/l, Ca 64 mg/l, many specimens (ZMA).
- prov. Zamora; Well on road N 122, called Fuente de la Salud, 20 km W. of Zamora, 20 - VI - 1970.
Temp. 14° C, pH 6.0, Cl 85 mg/l, Ca 107 mg/l, many specimens (ZMA).
- prov. Leon; Brook on road N 120, about 12 km E. of S. Justo de la Vega, E. of Astorga, clear, moderately running stream of 3 m wide, 40 - 50 cm deep, 5 - IX - 1970.
Temp. 22° C, pH 5.5, Cl 5 mg/l, Ca 34 mg/l, many specimens (ZMA).
- prov. Logroño; Tributary of Río Ebro, on road N 232, W. S. W. of Pancorbo, 16 - VII - 1969.
Very small stream, with only a handfull of water, Cl 8 mg/l, Ca 208 mg/l, many specimens (ZMA).
- prov. Burgos; Small brook near Barrios de Colina, N.E. of Burgos, 1 - V - 1960.
15 specimens (RMNH).
- Small brook near Burgos, 13 - IX - 1961.
6 specimens (ZMA).
- Río Cubillo, 1/2 km N. of Cubillo, 17 km S.E. of Burgos, 16 - VII - 1969.
Slightly polluted stream, 1 m wide, Cl 4 mg/l, Ca 26 mg/l, many specimens (ZMA).
- Small brooklet, N. of Hontoria de la Cantera, on road N 234, 16 - VII - 1969.
Clear, fast-running, Cl 7 mg/l, Ca 92 mg/l, many specimens (ZMA).
- Water-trough alongside road N 623, about 5 km S. of Villarcayo, 5 - VII - 1969.
Merky water with Characeae, Cl 9 mg/l, Ca 110 mg/l, many specimens, many of them in precopulation (ZMA).
- prov. Valladolid; Tributary of Río Duero, W. of Fuensaldana, near Valladolid, 5 - IX - 1970.
Clear slowly-running stream, 50 cm wide, 30 cm deep, temp. 20.8° C, pH 6.0, Cl 16 mg/l, Ca 188 mg/l, accompanying species *Echinogammarus cf. berilloni* (ZMA).
- Small brook near Trigueros del Valle, on road V.A. 901, 25 km N. of Valladolid, 6 - IX - 1970.
Clear, moderately running, temp. 13.9° C, pH 5.5 - 6.0, Cl 53 mg/l, Ca 300 mg/l, many specimens (ZMA).
- Arroyo Santa Cruz, S.E. of Cigales, on road N. 620, about 10 km N. of Valladolid, 6 - IX - 1970.
Slowly running, slightly polluted, temp. 13.8° C, pH 6.0, Cl 49 mg/l, Ca 190 mg/l, many specimens (ZMA).
- Small tributary of Río Pisuerga, near Corcos on road VA 901, 6 - IX - 1970.
Moderately running, temp. 13.8° C, pH 6.0, Cl 43 mg/l, Ca 105 mg/l, many specimens (ZMA).
- Small tributary of Río Duero, about 2 km S.W. of Seria, on road N 620 (E 3) near Valladolid, 6 - V - 1970.
Very small brook of 30 cm wide and 2 - 5 cm deep, temp. 16° C, pH 6.0 - 6.5, Cl 34 mg/l, Ca 118 mg/l, many specimens (ZMA).
- Small tributary of Río Pisuerga, about 2 km N. of Cigales, on road V.A. 901, 17 km N. of Valladolid, 6 - IX - 1970.
Slowly running, slightly polluted, 1.5 m wide and 20 cm deep, temp. 14.9° C, pH 5.5, Cl 112 mg/l, Ca 320 mg/l, many specimens (ZMA).
- Small tributary of Río Pisuerga, near Mucientes, on road V.A. 901, 11 km N. of Valladolid, 6 - IX - 1970.

- Clear, slowly running, 1 m wide and 30 cm deep, temp. 15.2° C, Cl 34 mg/l, Ca 260 mg/l, many specimens, many of them in precopulation (ZMA).
- Rio Pirón, 3 km N.E. of Iscar, near Valladolid, 20 - IV - 1971.
Clear, moderately fast-running stream, 5 to 10 m wide, more than 1 m deep, temp. 17.4° C, pH 5.5, Cl 21 mg/l, Ca 155 mg/l, 6 specimens, one pair of them in precopulation (ZMA).
- Rio Trabancos, 5 km W. of Nava del Rey, S.W. of Valladolid, 20 - IV - 1971.
Slightly polluted, moderately fast-running stream, 2 to 5 m wide, 50 cm deep, temp. 20.3° C, pH 6.0, Ca 210 mg/l, Cl 48 mg/l, many specimens, many of them in precopulation (ZMA).
- prov. Segovia; Cemented water-trough, 500 m N.E. of Cuellar, N.N.W. of Segovia, 20 - IV - 1971.
Rather polluted, almost stagnant water, temp. 13.4° C, pH 6.0, Ca 300 mg/l, Cl 41 mg/l, 22 specimens, 12 of them in precopulation (ZMA).

Description.- A large species: the largest male out of a sample of about 100 specimens was 17 mm (without antennae). In general appearance, the species resembles *Gammarus pulex* (L.) from western Europe, which, however, has a different second antenna, see Pinkster, 1970, fig. 1a.

Male: The lateral lobes to the head (fig. 1A) are rounded; the eyes are rather small, in general almost rounded, but sometimes 1.75 times as long as wide, the maximum distance between the upper margin of the eyes and the middorsal line being always longer than the length of the eye.

The first antenna (fig. 1B) is almost half as long as the total body length of the animal, peduncle segments rather short; segment 2 is about as long as peduncle segment 1 and about twice as long as peduncle segment 3. The accessory flagellum is 3- to 4- segmented, the main flagellum, distinctly longer than that of A2, is 23- to 30- segmented.

The second antenna (fig. 1C) is only sparsely armed with setae, most of them being rather short; peduncle segments 4 and 5 are about equal in length. The flagellum is not very characteristic, armed with short setae only, implanted near the distal end of each segment. Calceoli are always present in males.

The mandible palp (figs. 1D and E) has an unarmed first segment; the inferior margin of the third segment is armed with a regular comb-like row of spinules (fig. 1E); the spinules on the proximal end of that row are somewhat shorter in young specimens (fig. 1D). One or two lateral groups of setae can be found on the outer surface. The other mouth-parts of this species do not show obvious differences from other species within the family Gammaridae.

The first gnathopod closely resembles that of *G. pulex* in having a more or less pyriform hand with a strong medial palmar spine which is clearly separated from the strong angle spine. On the posterior margin of the hand a number of spines ("Stiftstacheln") can be found. The number of these spines increases with age. The hand of the second gnathopod (fig. 2B) is less pyriform, more elongate than in the first, having a strong medial palmar spine and an angle group of 3 spines; 3 smaller spines are implanted near the base of this angle group. Much more than in gnathopod 1, the hand is set with large groups of long slightly curved setae.

The merus and carpus of the third leg (fig. 3A) bear long setae, sometimes curled in very old specimens. The number of spines along the anterior margin of the merus is somewhat variable (2 to 4 groups). The setation of the 4th leg closely resembles that of the third.

The distal end of the basal segment of legs 5 to 7 are always wider than the proximal end of the ischium (figs. 2A, D; 3C, D), forming a protruding lobe, sometimes set with a short setule. The length/width ratio of these basal segments, especially in leg 7, increases with age (figs. 3C, D). In the other features legs 5, 6, and 7 resemble those of *G. pulex*.

In adult specimens, the inner ramus of the third uropod (fig. 2G) attains almost 3/4 of the length of the outer ramus. The greater part of the setae on the inner and outer margins of both exopod and endopod are plumose. The number of spines, implanted along the margins is largely variable.

The telson is slightly larger than the basal segment of the 3rd uropod (fig. 2E). The number of spines implanted near the distal end varies from 1 to 3. In between those spines and on the dorsal surface of the telson lobes one can find a variable number of setae, the length of which is

about twice that of the spines. A subbasal spine could never be found.

The dorsum of the pleosome is not keeled. The urosome segments do not show dorsal excavations or elevations. The dorsal armature is largely variable. In general, each segment bears a middorsal group of spines, with one group of spines on each side; all groups are accompanied by a varying number of setules, which are little longer than the spines (fig. 2 F). The postero-inferior corners of the second and third epimeral plates vary from almost rectangular to slightly pointed (fig. 1 H). They only bear some few setules along their posterior borders and a few spinules at the lower margins.

Female: Smaller than the male, just as in all other species of the family Gammaridae. There is a marked sexual dimorphism in this species. The differences found between the sexes are almost the same as in *G. pulex* (see Pinkster, 1970). In some populations the setae found on the peduncle of the second antenna of the females are longer than those in the males.

Variability.- As in most other groups of gammarids, the morphological diversity within this species is enormous, not only between populations from different localities, but also between individuals from the same locality.

More or less stable characters are: (1) the shape of the eyes; (2) the structure of the mandible palp (this holds true for adult specimens only); (3) the setation of A 2 in male; (4) the shape of the hands in gnathopods 1 and 2 and the arrangement of the spines on the palm; (5) the relative length of the endopod in Ur 3, always being at least 65% of the exopod; (6) the presence of plumose setae on the outer margin of Ur 3 in male.

Extremely variable characters are: (1) the number of segments in the flagellum of A 1 and A 2; (2) the shape and setation of the epimeral plates; (3) the setation of the telson (in some specimens a group of setae can be found on the surface of the telson lobes, in others only some terminal setae occur); (4) the armature of the urosome (within one sample of about 100 specimens from Ifrane, Morocco, all spinule-formulas, used by Margalef (1951: 266) as a key-character for the members of the *G. pulex*-group in Spain, could be found); (5) the number of setae and spines on the legs (in general this number increases with age); (6) the shape and setation of the basal segments of P 5 to P 7 (see figs. 3 E-H; in adult males the length/width ratio of the basal segment of P 7 can vary from 1.2 to about 2; in some specimens the posterior margin is almost unarmed, in others it carries many setules; the backward protruding lobe is sometimes sharp and unarmed, sometimes rounded and provided with one or two setules).

Due to this intraspecific variation, it is possible to find specimens, in populations from Spain and Morocco, which are completely identical with specimens of *G. wautieri* A.L. Roux, 1967, from the Lower Alps in France (cf. fig. 3 K). This suggests a very close relationship between these two forms. I hope, that hybridization experiments, which will be carried out in near future by the present author and Dr. A.L. Roux, will clarify the taxonomic status of *G. wautieri*.

Ecology.- During the present survey the species was always found in waters with a raised calcium ion content (see "material"). It seems to prefer wells and upper reaches of rivers. The presence or absence of a vegetation does not seem to affect the occurrence, since dense populations have been found, both in vegetation and in bare, cimented water-troughs.

Gammarus a calceolatus nov. spec.

Material.- Many specimens, including precopulae and ovigerous females, from Aquehmane de St. Ali, a lake between Midelt and Azrou, prov. Meknes, Morocco, 30 July 1969. The ♂ holotype, ♀ allotype and many paratypes have been deposited in the collections of the Zoological Museum Amsterdam, cat. no. Z.M.A. Amph. 102.739.

Description.- Although the new species is of considerable size, it looks less robust than other species in the *G. pulex*-group. The maximum body length observed in a male is 17 mm.

Male: The lateral lobes of the head (fig. 5 A) are somewhat rounded. The eyes are small, always less than twice as long as wide, rather far removed from the middorsal line.

The first antenna (fig. 4 A) is more than half as long as the total body length of the animal; peduncle segments 1 and 2 are about equal in length, the third is half as long as the second; peduncle segments 2 and 3 bear some groups of rather long setae; the flagellum is very long, having 36 to 41 segments: the accessory flagellum is 4 - to 5 - segmented.

The second antenna is very characteristic (fig. 4 B). It is invariably much more hairy than in *G. gauthieri*. Peduncle segments 4 and 5 bear numerous tufts of long, sometimes curled, setae along their inferior margin. Groups of some shorter setae are implanted on the inner and upper surface of these peduncle segments. The setae on the flagellum are also very long, whereas these are short in *G. gauthieri*. These setae never form a brush as in *G. pulex*.

A very peculiar feature within the *G. pulex*-group is the complete absence of calceoli. Therefore the name *a calceolatus* is proposed for the new species.

The third segment of the mandible palp (fig. 4 C) has a regular comb-like row of spinules along the inferior margin. The spinules in the middle of this comb are generally a little longer than these near the proximal and distal ends.

The hand of the first gnathopod (fig. 5 B) is slightly different from those in other members of the *pulex*-group. In this species the 4 spines near the palmar angle form a kind of transverse row. The spines along the posterior margin, the so-called "Stiftstacheln", are stronger and more numerous than in *gauthieri*.

The hand of the second gnathopod (fig. 5 C) also shows some differences from that in *gauthieri*. The latter possesses 3 strong spines near its palmar angle, accompanied by 3 smaller spines near their implantation. In the new species we only find 2 strong palmar angle spines with 3 smaller spines near their implantation. Legs 3 and 4 (figs. 5 D, 6 A) are more or less similar to all other members of the *G. pulex*-group. The setation is little longer than in *G. gauthieri*. The basal segments of legs 5 to 7 (figs. 6 B, 6 C, 6 D) are rather wide with a protruding lobe; the setae along the posterior margin are longer than in *gauthieri*. As in *gauthieri* and *pulex*, a variable number of spines is found along the margins of the merus, carpus and propodus of these legs. These legs are different from those in *G. pulex* and *G. gauthieri* in having setae intermixed with the spines, setae which are more than twice as long as the spines. The third uropod (fig. 6 E) does not show differences from *G. gauthieri*. The telson is largely variable (fig. 5 E). So the number of spines near the distal end varies from 1 to 3. The subbasal spine is not always present. The setae near the distal end and on the dorsal surface of the telson lobes are much longer than in *G. gauthieri*.

The armature of the urosome (fig. 6 F) is variable and like the epimeral plates (fig. 6 G), it does not show fundamental differences from *G. gauthieri*.

Remarks.- The absence of calceoli on the second antenna of the male, distinguishes the new species from almost all other described species in the *Gammarus pulex*-group, but *Gammarus syriacus* Chevreux, 1895. The latter species differs from the newly described one in the following characters: (1) the very elongate epimeral plates, produced into a very sharp ventro-posterior corner and with an almost comma-like posterior margin; (2) the presence of well-developed dorsal elevations on all three urosome segments; (3) the armature of P 5 to P 7 consisting of spines only; (4) the armature of both peduncle and flagellum segments of A 2, consisting of a few groups of setae only.

Variability.- Although we had only one sample at our disposition, it seems probable that the variability pattern is comparable to that of *G. pulex*.

Data on the ecology are not available.

Gammarus ibericus Margalef, 1951, new rank. Fig. 7.

Gammarus pulex ibericus Margalef, 1951: 263; 1953: 198.

Material.- Spain, Fuentes de la laguna "El Tobar" in the Serrania de Cuenca, prov. Cuenca; alt. 1100 m (2 ♂ paratypes). The types are preserved in the collection of Dr. Margalef.

Description.- The description is based on material from the type locality, kindly put at our disposal by Dr. R. Margalef. It is a small species in comparison with the other members of the *Gammarus pulex*-group. The maximum length observed (♂) is 11 mm.

Male: Margalef, 1951, gave a rather good description and some very good illustrations of the species. Since not all characteristic features were mentioned or illustrated, a supplementary description is given.

The first antenna (fig. 7A) is slightly different from that in *G. gauthieri*. Its 3rd peduncle segment is relatively longer, being almost as long as the second. The flagellum is 26- to 28-segmented.

The second antenna is as in *G. gauthieri*. Calceoli are always present. The third segment of the mandible palp is relatively short in the material studied and has only 4 terminal setae (fig. 7B).

The first and second gnathopods do not show any differences from those in *Gammarus gauthieri*, except for the setae, which are relatively longer; the same holds true for the third and fourth legs.

The last three pereopods are characteristic for the species (see figs. 7C, D, E). The basal segments are rather slender, tapering towards the distal end, forming a more (P 5) or less (P 7) protruding lobe. The setae along the posterior margin of the basal segments are relatively long. The armature of the next four segments of these legs not only consists of spines, as in *G. gauthieri* and *G. pulex*, but also of setae, intermixed with the spines, and being much longer than the spines. Within the *Gammarus pulex*-group this feature is found in *Gammarus acalceolatus*.

The setae on the third uropod are generally less densely implanted than in *Gammarus gauthieri*. The telson lobes, almost twice as long as wide, distally have 2 or 3 spines and some long setae; subbasal spines or setae have not been found.

The shape of the epimeral plates (Margalef 1951: 264, fig. 2a) is identical to that found in *G. gauthieri*. The spines and setae along the margin of the epimeres are somewhat stronger and more numerous than in *G. gauthieri*. The first segment of the urosome is devoid of spines. This was a reason for Margalef to consider this form distinct from *G. pulex*. Since we know that the number and the arrangement of both spines and setae on the urosome are extremely variable in nearly all members of this group, we do no longer attach much value to this characteristic. Nevertheless this form can be easily distinguished from other species in the same group, since it is the only one having the following combination of features: presence of calceoli and presence of long setae on pereopods 5 to 7.

The structure of the second antenna, which is almost identical to that found in *Gammarus gauthieri*, points to a very close relationship to this species, a relationship that certainly is much closer than to the western European species *Gammarus pulex* (L.). Since both forms coexist in the same area in Spain, the province of Cuenca, and no obvious geographical or other barriers can be indicated, we believe that this form, like *Gammarus gauthieri*, must be

considered a good species: *Gammarus ibericus*.

Distribution and ecology.- Up to now the species is only known from the type locality. Ecological data are not available.

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Drs. S. PINKSTER
Institute of Taxonomic Zoology (Zoölogisch Museum)
University of Amsterdam
Plantage Middenlaan 53
Amsterdam - C. - The Netherlands

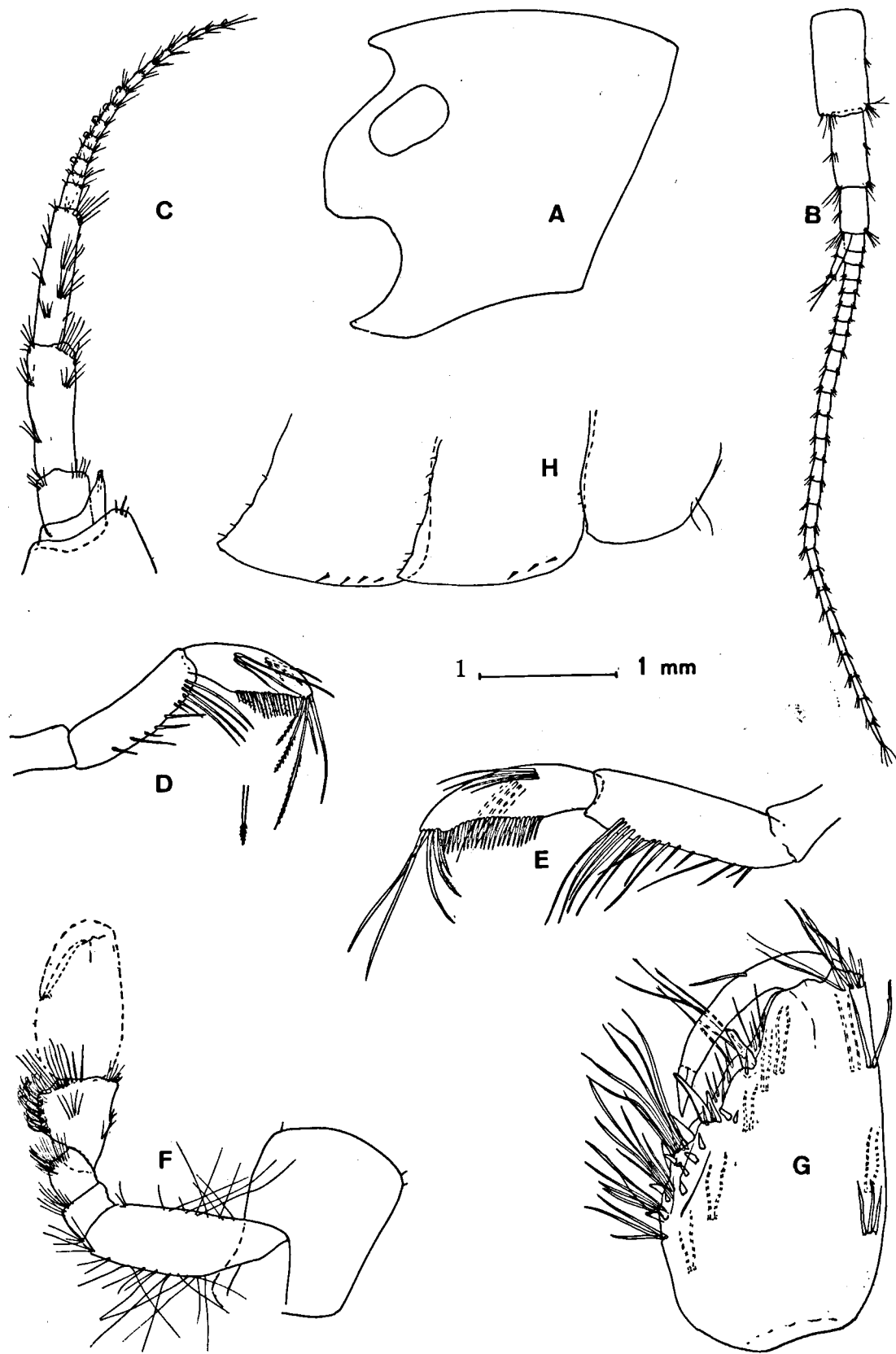


Fig. 1. *Gammarus gauthieri* Karaman, 1935, ♂ from Ifrane, Morocco. A, head (scale 2); B, first antenna (1); C, second antenna (1); D, mandible palp of young specimen (2); E, mandible palp of adult (2); F, first leg (1); G, hand of first leg (2); H, epimeral plates (4).

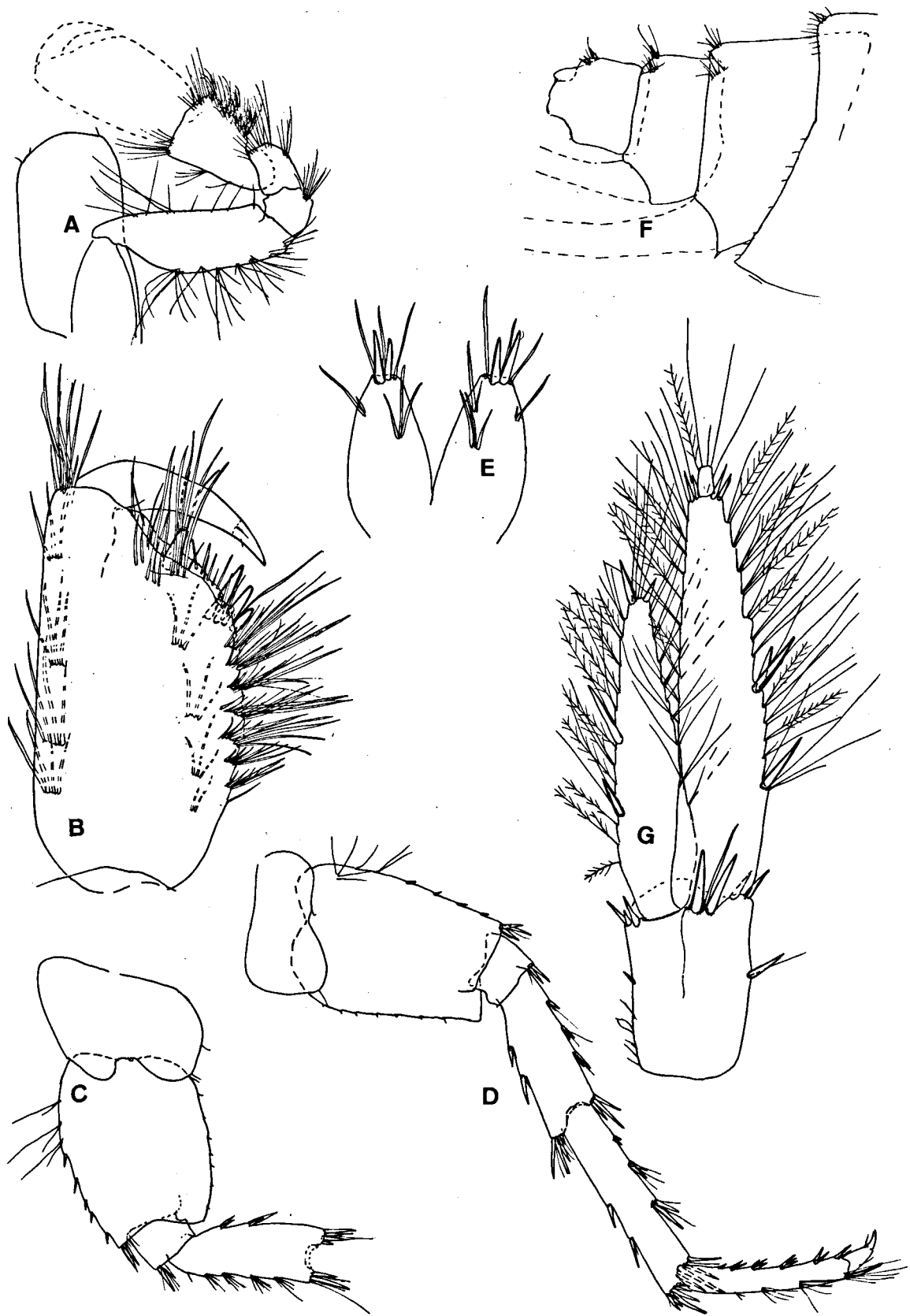


Fig. 2. *Gammarus gauthieri* Karaman, 1935, ♂, from Ifrane, Morocco. A, second leg (scale 1); B, hand of second leg (2); C, fifth leg (1); D, sixth leg (1); E, telson (2); F, urosome (4); G, third uropod (2).

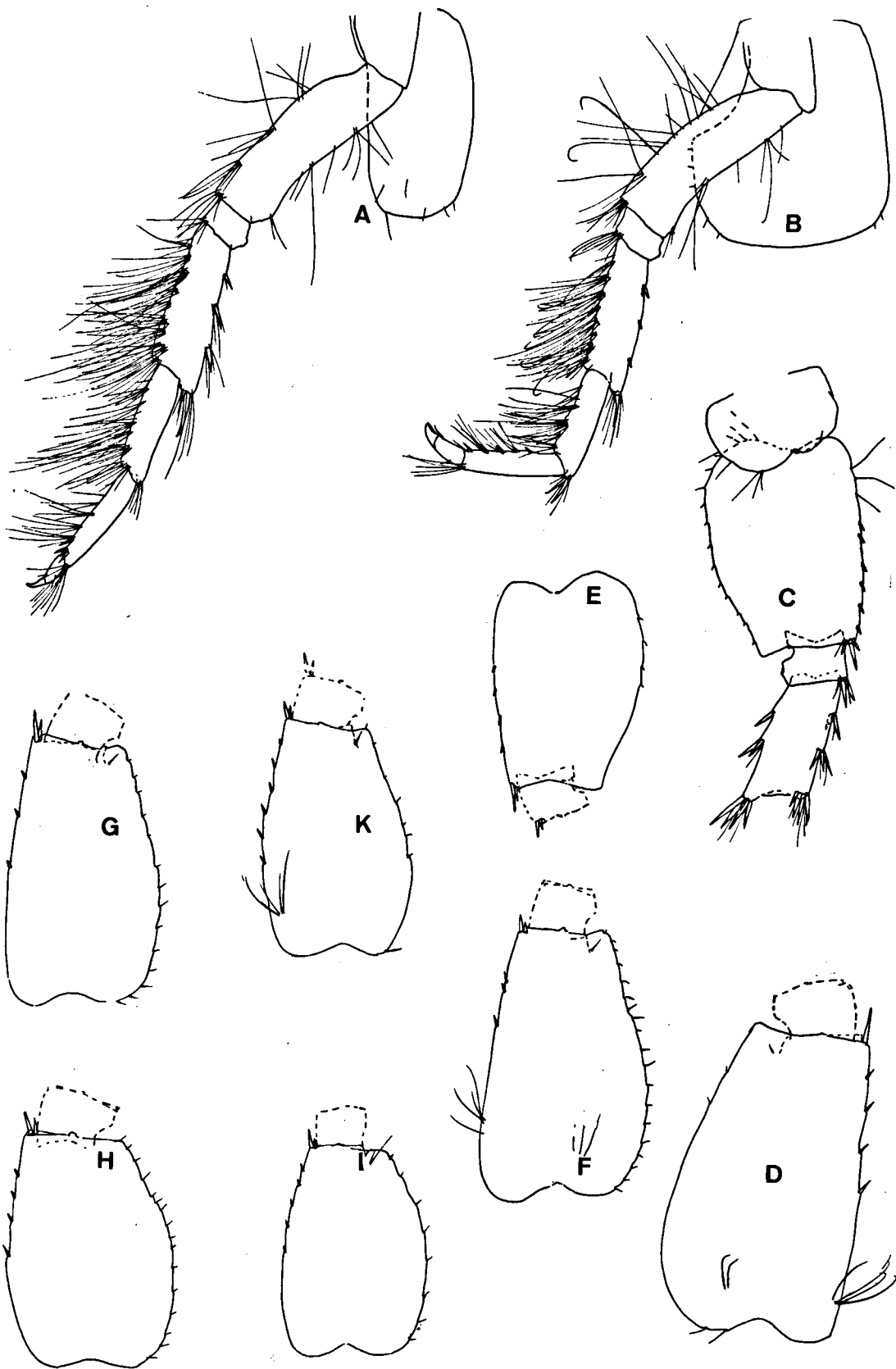


Fig. 3, A - I. *Gammarus gauthieri* Karaman, 1935, ♂, from Ifrane, Morocco. A, third leg (scale 1); B, fourth leg (1); C, seventh leg (1); D - I, basal segments of P 7 of various specimens within the same sample.

Fig. 3, K. *Gammarus wautieri* A.L. Roux, 1967, from Val d' Amby, France: basal segment of P 7.

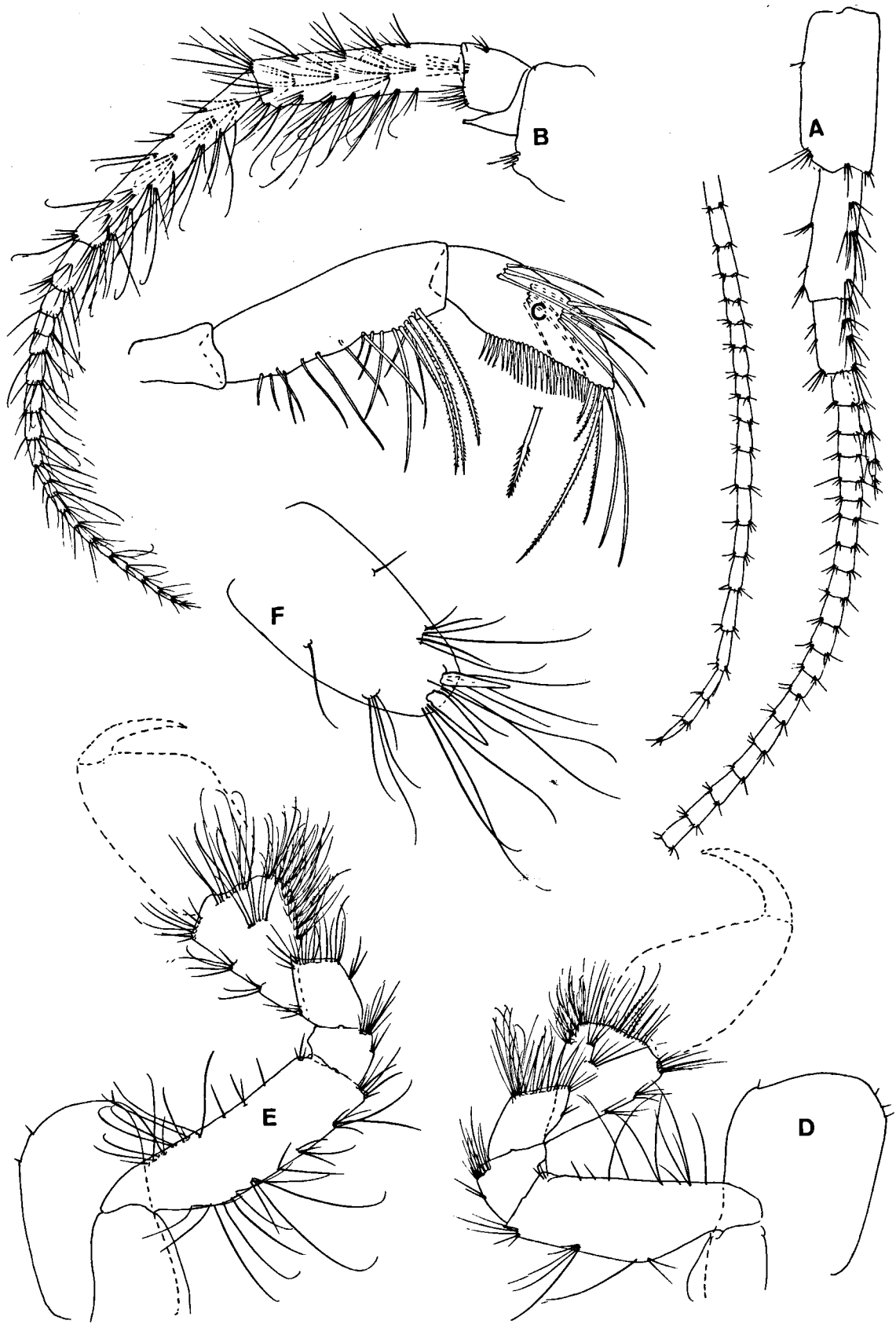


Fig. 4. *Gammarus acalceolatus* nov. spec., ♂, paratype. A, first antenna (scale 1); B, second antenna (1); G, mandible palp (3); D, first leg (1); E, second leg (2); F, telson (2).

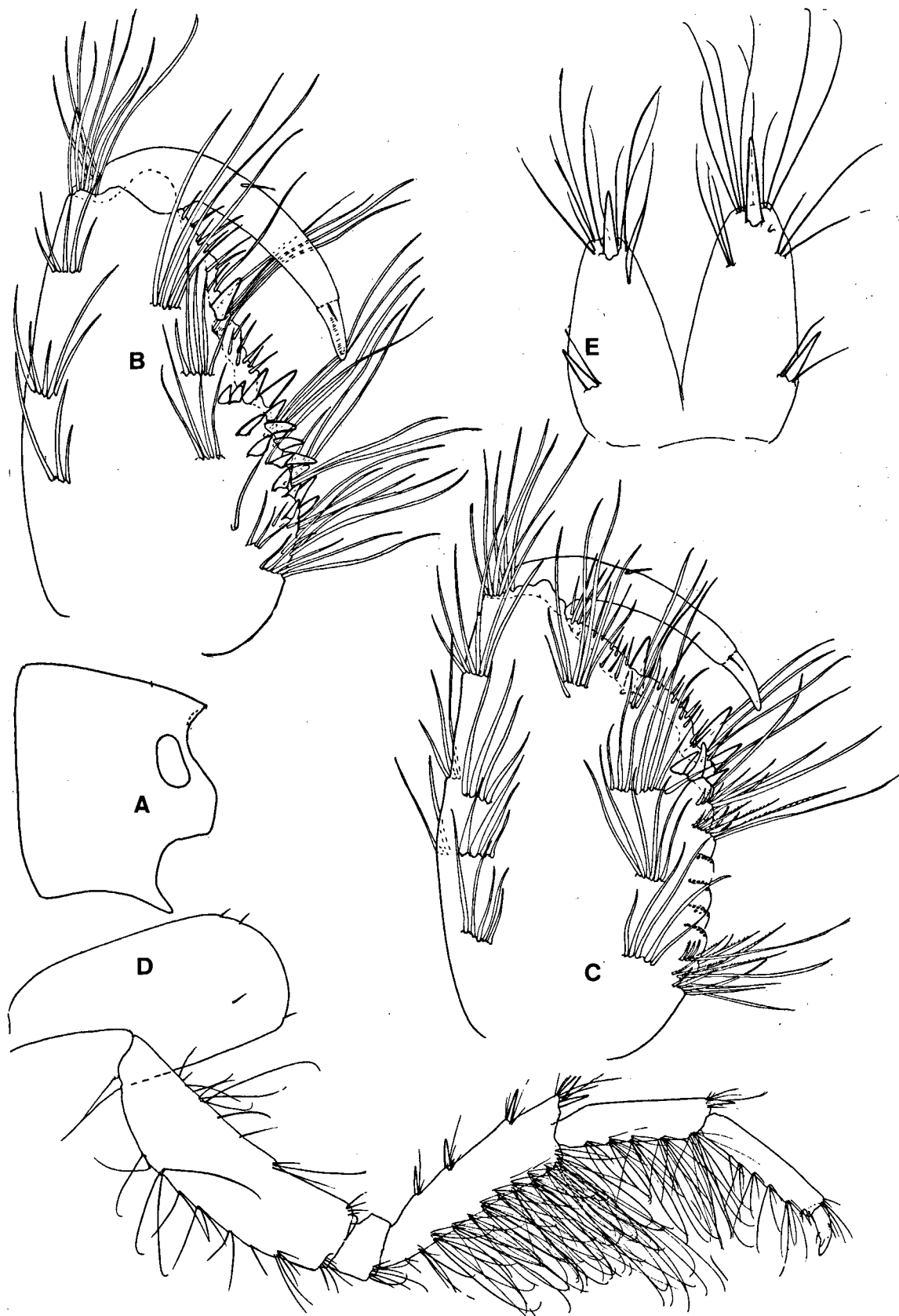


Fig. 5. *Gammarus acalceolatus* nov. spec., ♂, paratype. A, head (scale 1); B, hand of first leg (2); C, hand of second leg (2); D, third leg (1); E, telson (2).

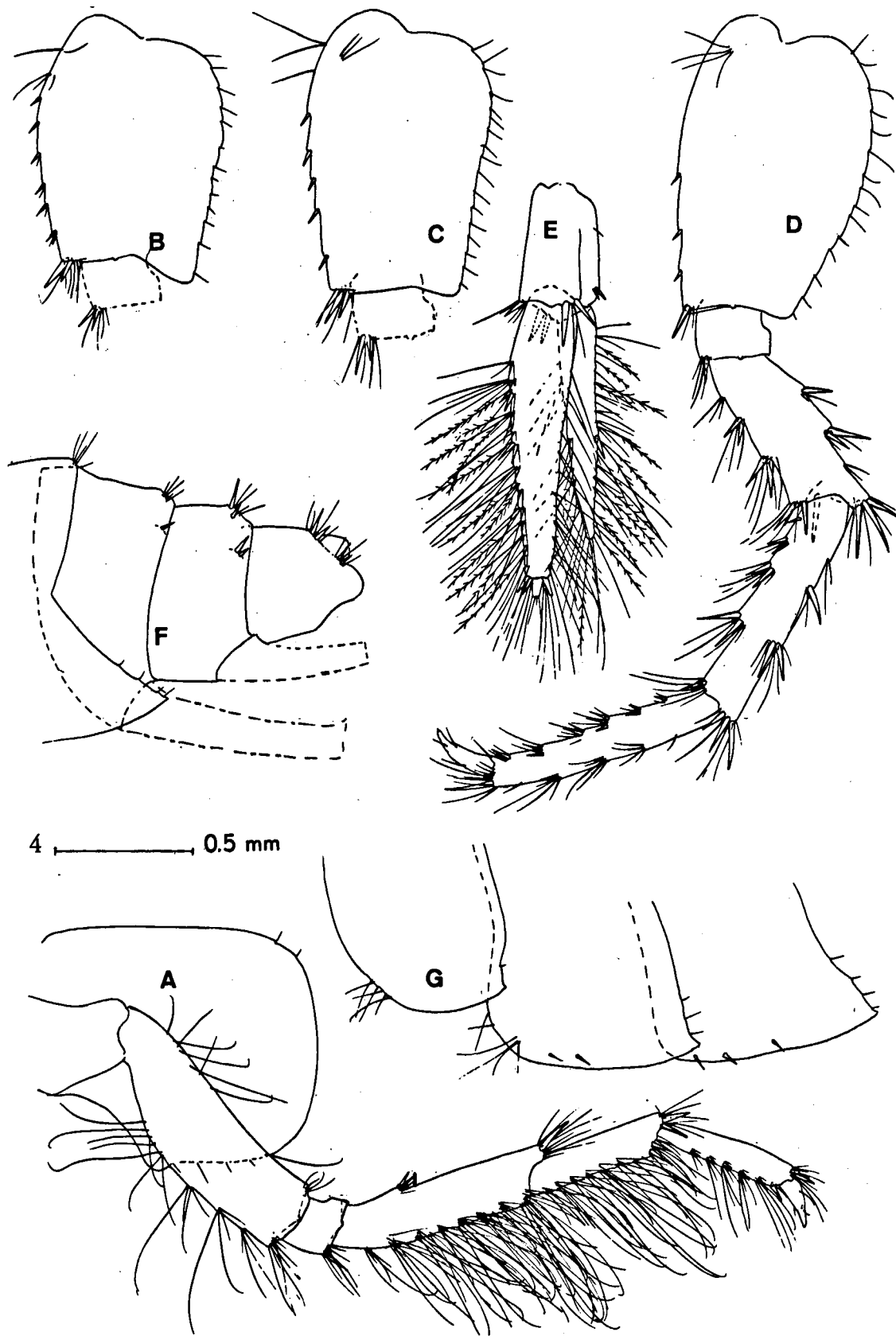


Fig.6. *Gammarus acalceolatus* nov. spec., ♂, paratype. A, fourth leg (scale 1); B, basis of fifth leg (1); C, basis of sixth leg (1); D, seventh leg (1); E, third uropod (1); F, urosome (4); G, epimeral plates (4).

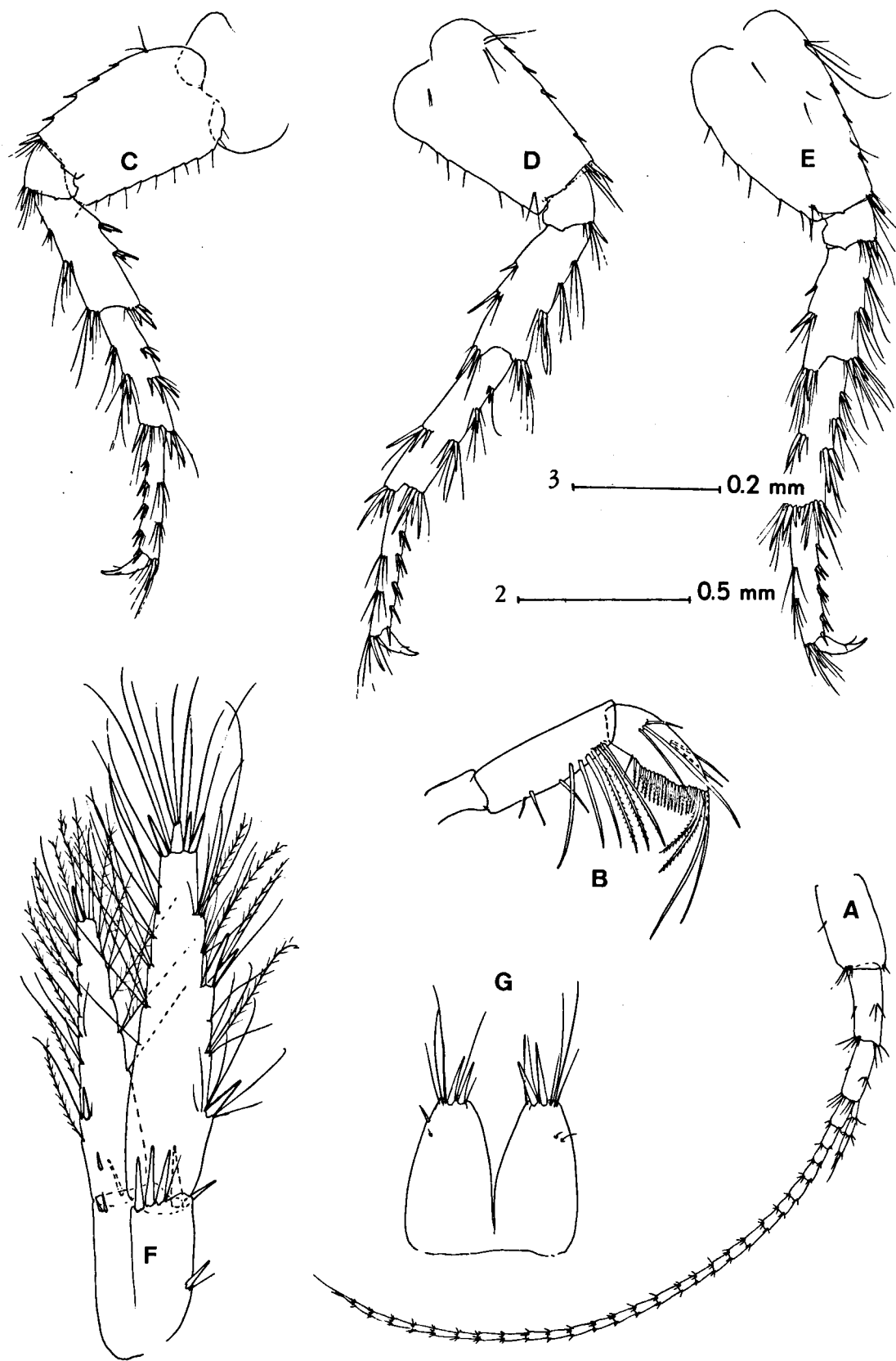
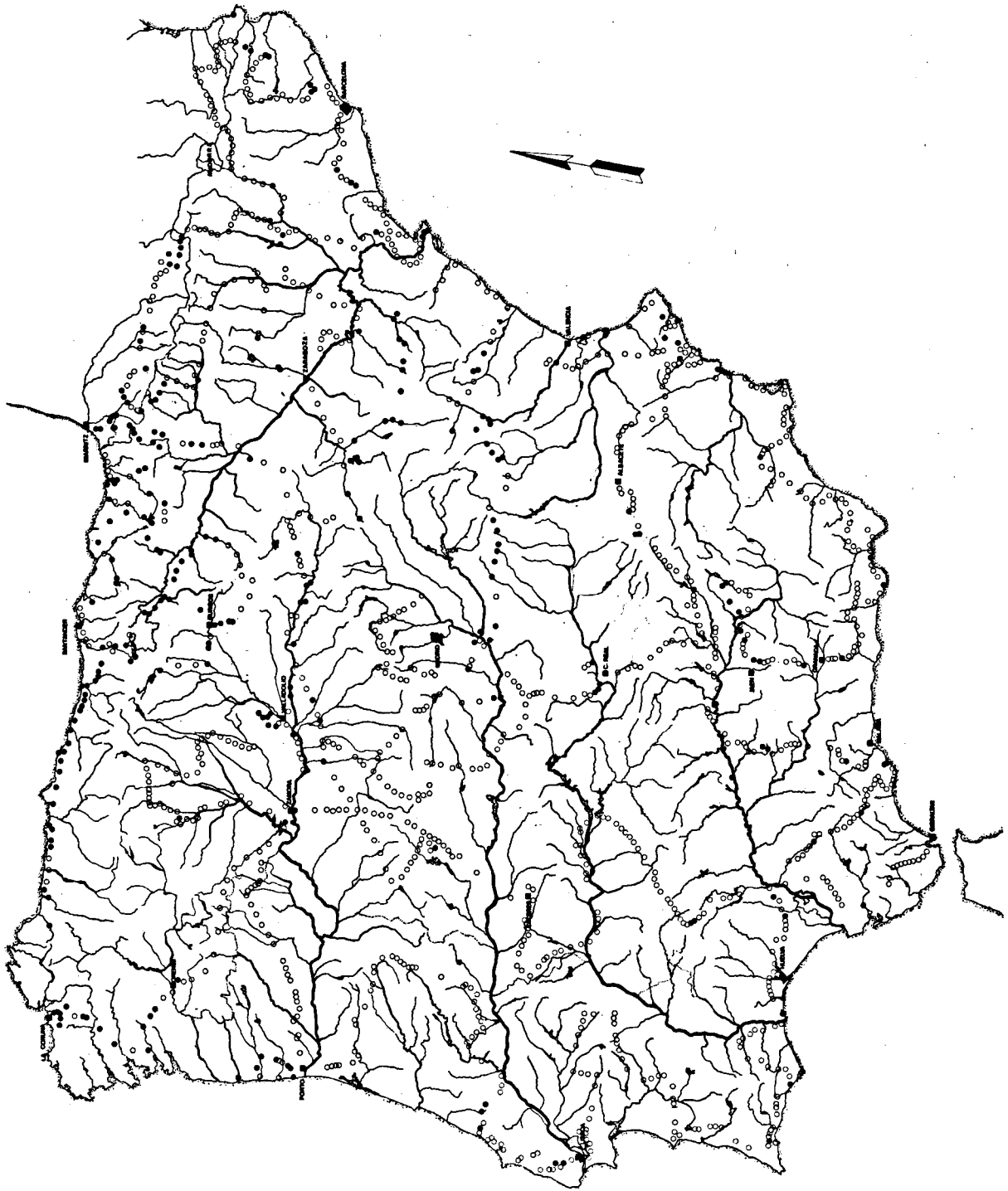
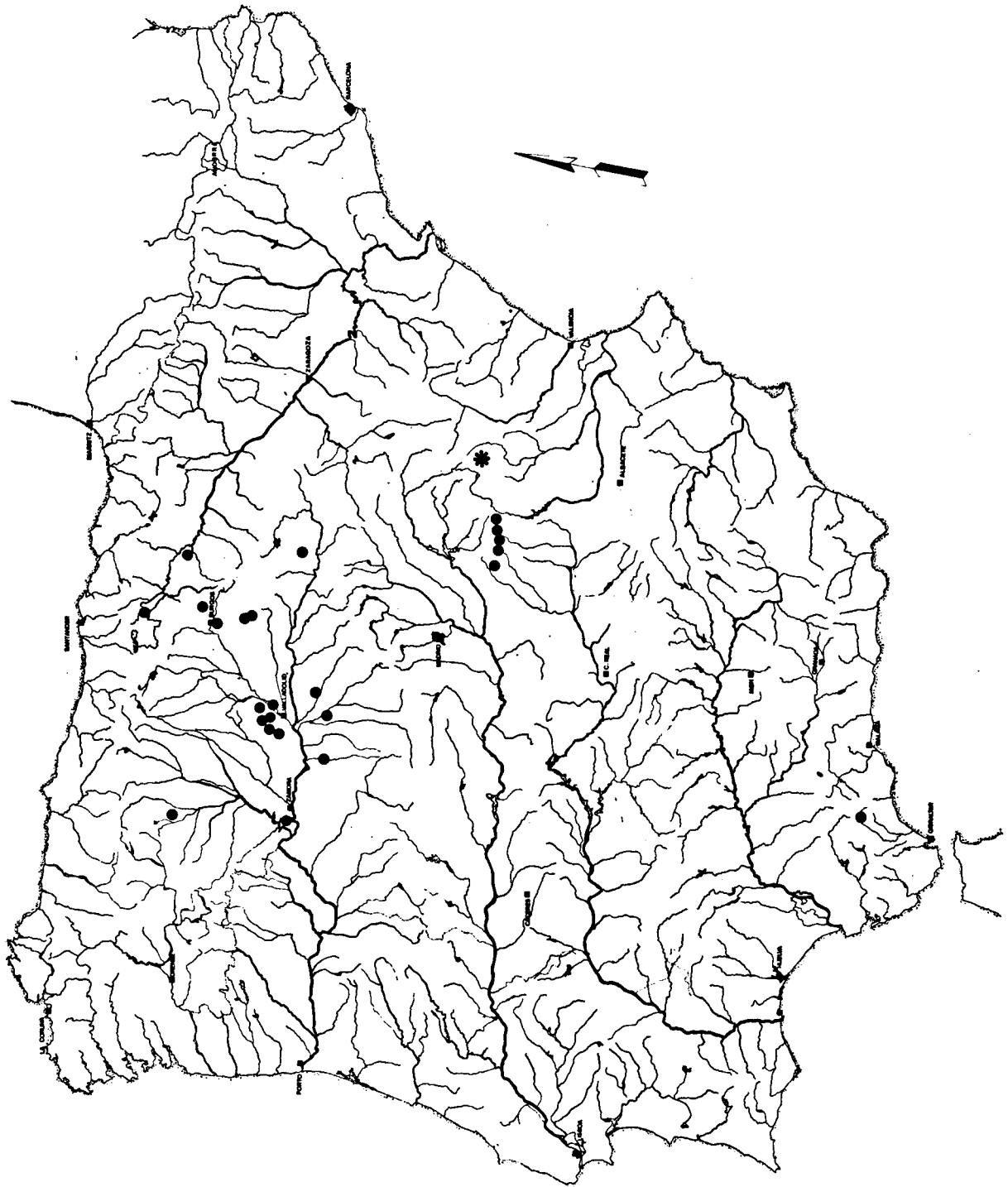


Fig. 7. *Gammarus ibericus* Margalef, 1951, ♂, paratype. A, first antenna (scale 1); B, mandible palp (2); C, fifth leg (1); D, sixth leg (1); E, seventh leg (1); F, third uropod (2); G, telson (2).



Map I. Sampling network in the Iberian peninsula.

Closed symbol: positive sample.
Open symbol: negative sample.



Map II. Distribution of *Gammarus gauthieri* (dots) and *Gammarus ibericus* (asterisks) in the Iberian peninsula.