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ON THREE SUBTERRANEAN AMPHIPODS FROM NORTH AFRICA

(AMPHIPODA: GAMMARIDEA)

Gordan S. KARAMAN & Giuseppe L. PESCE

## ABSTRACT

The discovery of representatives of the genera *Salentinella* Ruffo and *Bogidiella* Hertzog in North Africa is reported: *Salentinella angelieri* Ruffo & Delamare Deboutteville in Morocco and *Bogidiella ichmusae africana* n.ssp. from Biskra in Algeria.

Moreover, *Metacrangonyx spinicaudatus* n.sp. from subterranean waters of Morocco is described and figured.

During research on the freshwater subterranean fauna of North Africa, G.L. Pesce and other Italian scientists of the University of L'Aquila, (Pesce a.o., in press), obtained many samples of amphipods. Among these, *Salentinella angelieri* Ruffo & Delamare Deboutteville, as well as two new taxons, *Bogidiella ichmusae africana* n.ssp. and *Metacrangonyx spinicaudatus* n.sp., described below, were represented.

*Bogidiella ichmusae africana* n.ssp.  
figs. 1-2

## Material.-

1 ♀, Algeria: Bouchagroun, Biskra, freshwater well, water level on 12.5 m, water depth 0.25 m, temperature 20°C, pH 7, bottom sediments: sandstone and clay detritus. Accompanying fauna: cyclopid copepods [*Paracyclops fimbriatus* (Fischer), *Tropocyclops prasinus* (Fischer), *Eucyclops serrulatus* (Fischer)]; microparasellid

isopods [*Microcharon zibani* Pesce & Tete']; stenaseiid isopods; ostracods and some mosquito larvae; October 23, 1977; coll. P. Tete' and M. De Simone.

The holotype specimen is dissected and mounted in Faure-solution on microscope slides and deposited in the "Zoölogisch Museum", Amsterdam.

#### Description.-

Single ovigerous female 2.3 mm; lateral cephalic lobes subrounded, ventroanterior sinus present. Coxae 1-4 broader than long (= high), poorly setose, coxa 5 not shorter than coxa 4.

Antenna 1: peduncular segments 1-3 progressively shorter (fig. 2g), peduncle segment 1 with one ventral spine; main flagellum consisting of 8 segments, some of them with one long aesthetasc (aesthetasc reaching the length of segment itself).

Antenna 2: shorter than antenna 1; peduncle segment 3 short, with one ventral spine (fig. 2e); peduncle segment 4 slightly longer than segment 5, both segments poorly setose; flagellum consisting of 5 segments.

Maxilla 1: inner lobe with 2 setae, outer lobe with 7 distal spines (4 smooth, 2 with 2 lateral teeth, one with 3 lateral teeth), palp 2-segmented, with 2 distal and one sub-distal seta (fig. 11).

Maxilla 2: both lobes subequal narrow, bearing several distal strong setae each (fig. 1i).

Maxilliped: inner lobe with 3 distal spines, outer lobe with 1-2 spines and one seta, palp normal.

Mandible: molar triturative, incisor toothed, palp 3-segmented; first segment of palp smooth, short, second segment with 2 distal short setae, third segment nearly as long as the second one, with 4 setae (two of them as long as segment itself, 2 shorter) (fig. 1c).

Gnathopods 1-2 relatively large. Gnathopod 1: segment 2 (= basis) short, with one long and one short seta at posterior margin, and with one short seta at the anterior margin (fig. 1a), segments 3-4 short; segment 5 short, triangular, with produced distoposterior lobe exceeding the width of segment 6; segment 6 pyriform, longer than broad, with palm defined, inclined, exceeding half of posterior margin of segment itself; palm crenellated (= serrate finely) near the connection with dactyl and near the corner

spine, and smooth in the middle (fig. 1a). At the posterior margin of segment 6, on outer face, appears one short corner spine; on inner face there are two strong spines; dactyl exceeding half of segment 6-length, with one seta at the outer margin.

Gnathopod 2: segment 2 longer and narrower than in gnathopod 1, bearing one long and one short seta at posterior margin, as well as one short seta at the anterior margin (fig. 1b); segments 3-4 short, segment 5 short, triangular but not produced at the posterior margin, bearing 3 distal setae; the diameter of segment 5 like that of segment 6. Segment 6 ovoidal, smaller than that in gnathopod 1 (ratio 80:100), palm inclined, defined by one short corner spine on outer face and reaching halfway of posterior margin of segment 6; palm finely serrate at both ends, but smooth in the middle, like that in gnathopod 1; dactyl not exceeding half of segment 6, with one short seta at the outer margin.

Pereopods 3-4 similar to each other, but pereopod 3 slightly longer than pereopod 4 (fig. 2af). Segment 2 dilated in the middle, having one distinct Hertzog's organ ring-shaped, but with crenellated (irregularly) inferior margin; diameter of Hertzog's organ larger than diameter of segment 3-6; dactyl not reaching half of segment 6, with a short nail.

Pereopods 5-6 moderately long; pereopod 6 slightly longer than pereopod 5; segment 2 of both pereopods nearly twice longer than broad, with Hertzog's organ ovoidal, ring-shaped, having crenellated inferior margin; segments 3-6 narrower than Hertzog's organ. Dactyl of pereopods 5-6 not exceeding half of segment 6, that of pereopod 6 with a long plumose seta at the outer margin (fig. 2bc).

Pereopod 7 missing.

Epimeral plates 2 and 3 with pointed distoposterior corner and with slightly excavate posterior margin (fig. 2d).

Pleopods 1-3 with 2 retinacula each. Inner ramus absent, outer ramus 3-segmented, segments with 2 long plumose setae each (fig. 1d).

Uropod 1: peduncle longer than rami, with one ventrofacial spine and with 2 short distal spines (fig. 1h). Inner ramus slightly longer than outer one, both rami without lateral spines, but with several distal spines each, the longest distal spines exceeding half of ramus-length.

Uropod 2: peduncle with one distal spine; rami unequal, without lateral spines, but

with 3 distal spines (fig. 1e).

Uropod 3 biramous, peduncle short (fig. 1g). Rami subequal, 1-segmented, bearing 2 groups of lateral spines each, and with one group of long distal spines; the longest distal spine reaching half of ramus-length.

Telson short, broader than long, with shallow distal incision (fig. 1f), each lobe with one distal spine, longer than telson itself.

Coxal gills occur on thoracal segments 2-6; oostegites occur on thoracal segments 2-5.

#### Remarks and affinities.-

The single specimen collected in Africa is very similar to *Bogidiella ichnusae* Ruffo & Vigna Taglianti, 1975, known only from Sardinia (River Liscia). But our specimen differs from the above species in several characters: segment 6 (= propodus) of gnathopods 1-2 with well defined palm (undefined in *ichnusae*), median part of palm of segment 6 of gnathopods 1-2 smooth (serrate in *ichnusae*), propodus of gnathopod 2 reaching 80% of that in gnathopod 1 (68.4% in *ichnusae*), dactyl of gnathopods 1-2 and pereopods 3-6 slightly longer than in *ichnusae*; Hertzog's organ larger and irregularly crenulated along inferior margin (smaller and smooth in *ichnusae*); outer lobe of maxilla 1 with 3 spines having 2-3 lateral teeth each (all spines with 0/1 lateral teeth in *ichnusae*), epimeral plates more pointed.

Based on all these differences we consider the specimen from Algeria as a distinct new subspecies.

Since the variability of *B. ichnusae* is poorly known and because of the lacking pereopod 7 in our specimen from Algeria, we cannot exclude the possibility of *africana* being only an extreme form of *B. ichnusae*. For the moment, it was not possible for us to identify the specimen completely with the above species and we have thought it best to treat it as a distinct subspecies. The geographical disjunction of both taxons supports our opinion.

*B. paraichnusae* G. Karaman differs from *B. ichnusae africana* by absence of Hertzog's organ on pereopods 3-6, by different shape of gnathopods 1-2, by a lower number of lateral teeth on the spines of the outer lobe of maxilla 1, etc.

#### *Metacrangonyx spinicaudatus* n.sp.

figs. 3-5

#### Material.-

Morocco, Sidi El Aydi, Casablanca, freshwater well, water level on 10.5 m, water depth 2.5 m, temperature 17.8°C, pH 7, bottom sediment: sandstone detritus; accompanying fauna: cyclopoid copepods [*Thermocyclops dybowskii* (Landé)]; asellid isopods [*Proasellus coxalis* (Dollfus)]; microparasellid isopods [*Microcharon marinus* Chappuis & Delamare Deboutteville]; ostracods; oligochates and some mosquito larvae; May 17, 1979; coll. M. De Simone; type locality: 3 specimens.

Morocco, road Casablanca-Marrakech, about 5 km from Sidi El Aydi, freshwater well, water level on 11 m, water depth 3.5 m, temperature about 18°C, pH 7.3, bottom sediment: sandstone detritus; accompanying fauna: cyclopoid copepods [*Thermocyclops dybowskii*]; asellid isopods [*Proasellus coxalis*]; ostracods and water mites; May 17, 1979; coll. M. De Simone: 1 specimen.

Morocco, road Casablanca-Marrakech, about 30 km from Casablanca, freshwater well, water level on 7 m, water depth 1.2 m, temperature 18.3°C, pH 7, bottom sediment: sandstone detritus; accompanying fauna: cyclopoid copepods [*Paracyclops fimbriatus* (Fischer)]; harpacticoid copepods [*Attheyella crassa* (Sars)]; asellid isopods [*Proasellus coxalis*] and some mosquito larvae; May 17, 1979; coll. M. De Simone: 1 specimen.

Holotype (female 2.9 mm) from Sidi El Aydi, dissected and mounted in Faure-solution, deposited at the "Zoölogisch Museum", Amsterdam; paratypes at Titograd (Karaman's collection).

#### Description.-

Female 2.9 mm: body smooth, urosomites 1-2 with one dorsolateral seta on each side, urosomite 3 with one strong spine on each side (fig. 3d). Coxae 1-4 longer than broad, with several setae at the distal margin. Coxae 1 and 3 smaller than coxae 2 and 4 (fig. 4 aeg), coxa 4 with proximoposterior excavation, coxa 3 tapering distally, coxa 2 distally dilated; coxa 5 distinctly shorter than 4, bilobe (fig. 4b), coxae 6 and 7 progressively smaller (fig. 4 cd). Head with short angular lateral cephalic lobes (fig. 3e), ventroanterior sinus present, eyes absent.

Antenna 1 long, peduncle long; peduncle segments 1-3 progressively shorter (fig. 3a), peduncle segment 1 with 2-3 ventral spines; main flagellum up to 19-segmented, many segments with one aesthetasc each; accessory flagellum 4-5 segmented.

Antenna 2 remarkably shorter than antenna 1, with peduncular segment 3 short, peduncular segment 5 poorly longer than segment 6, both

segments poorly setose; flagellum 9-12 segmented (fig. 3b) Antennal gland cone hardly exceeding the length of peduncular segment 3.

Mouthparts like those in *M. panousei* Ruffo except mandible. Labrum entire, subrounded distally; labium normal, without inner lobes. Maxilla 1: inner lobe triangular, with a row of lateral plumose setae; outer lobe with 11 spines having several lateral teeth each; palp 2-segmented, second segment of right palp slightly stronger than that in left maxilla 1, having 5 strong distal spines. Distal end of left palp of maxilla 1 with 5 slender spines.

Maxilla 2 with narrowed lobes, bearing numerous distal setae, inner lobe with a row of dorsofacial setae. Maxilliped: inner lobe reaching tip of first palp segment, bearing 3 distal obtuse spines; outer lobe not reaching tip of second palp segment, bearing at the inferior margin a row of pointed strong spines and with 3 distal spine-like setae; palp 4-segmented, second segment slightly longer than the third one, third segment without distal lobe, fourth segment as long as the third one, bearing 4 setae along the inferior margin; nail shorter than the remaining part of segment 4.

Mandible well developed, incisor toothed, molar triburative; palp poorly developed, 1-2 segmented, with 1-2 distal setae (fig. 3f).

Gnathopod 1 smaller than gnathopod 2; segment 2 with several long setae along posterior margin, segments 3-4 short; segment 5 three times longer than broad, with several bunches of setae along posterior margin, not dilated distally (fig. 5 af); segment 6 remarkably shorter than segment 5, almost twice longer than broad, with parallel lateral margins, with 2 setae at posterior margin; palm poorly inclined, short, finely crenellated, defined by 2 corner spines on outer face and 3-4 subcorner spines at inner face; dactyl with one seta at the outer margin.

Gnathopod 2: segments 2-4 like those in gnathopod 1; segment 5 as long and as broad as segment 6, dilated distally but not lobed, bearing 4-5 groups of setae along posterior margin (fig. 5 cd); segment 6 more than twice longer than broad, ovoidal, with palm reaching nearly half of posterior margin of segment 6, finely serrate and provided with a row of

strong spines at both sides; dactyl much longer than the diameter of segment 6, bearing one seta at outer margin.

Pereopods 3-4 slender, poorly setose; pereopod 3 slightly longer than pereopod 4, both with segment 4 longer than segment 6; dactyl of both pereopods shorter than half of segment 6, bearing only one plumose seta at outer margin (fig. 4 ae); nail shorter than the remaining part of dactyl.

Pereopods 5-7 with ovoid, dilated segment 2, finely crenulated at posterior margin and having distinct ventroposterior lobe not exceeding the distal tip of segment 3; segments 4-6 progressively longer, spinose at both margins (fig. 4 bl). Pereopod 5 hardly shorter than pereopods 6-7, pereopod 6 hardly longer than pereopod 7. Dactyl of pereopods 5-7 progressively shorter, the number of setae at the outer margin of dactyl decreasing towards pereopod 7; nail short.

Pleopods well developed, normal, always with two retinacula each. Epimeral plates 1 and 3 pointed, epimeral plate 3 sharply pointed and produced; all epimeral plates smooth along the ventral margin (fig. 3h).

Uropod 1: peduncle hardly longer than rami, bearing one ventrofacial spine as well as several lateral spines; inner ramus slightly longer than outer one, both rami with several bunches of lateral spines and with 3 distal spines not reaching half of rami-length (fig. 3d).

Uropod 2: peduncle shorter than rami, with lateral spines; inner ramus nearly as long as the outer one, both with lateral and distal spines (fig. 3d).

Uropod 3 not exceeding the tip of uropods 1-2, relatively small; peduncle slightly shorter than the 1-segmented outer ramus and bearing 2 lateral and 1-2 distal spines (fig. 3l); inner ramus very small, scale-like; outer ramus with 3-4 lateral spines and with 1-2 distal spines.

Telson very short, twice broader than long, fleshy, entire, pentagonal, bearing distally 2 long spines and one short plumose seta; one pair of plumose setae appears at the margin of each side on telson (fig. 5e).

Oostegites occur on thoracal segments 2-5; coxal gills occur on thoracal segments 2-6,

ovoid, simple.

Males: like females, but segment 5 of gnathopod 2 shorter than segment 6 (fig. 5d); segment 6 like that in females but slightly stronger.

#### Variability.-

Accessory flagellum 3 to 5-segmented. Mandible palp consisting of 1 or 2 articles bearing 1 or 2 distal setae. Main flagellum of antenna 1 consisting of 19-34 segments, flagellum of antenna 2 consisting of 9-12 segments.

#### Remarks and affinities.-

*M. spinicaudatus* n.sp. is close to *M. longicaudatus* Ruffo, known also from Morocco (Oued Gheris), mainly by the long accessory flagellum and the shape of uropods 1-3.

*M. longicaudatus* differs from *M. spinicaudatus* by its very long antennal gland cone reaching the half of peduncle segment 4 of antenna 2 and by the absence of spines on the telson. Unfortunately, the description of *M. longicaudatus* was based on only one specimen, partially damaged (dactyls of pereopods 5-7 unknown).

The other two known *Metacrangonyx* species from Morocco, *M. panousei* and *M. remyi* Balazuc & Ruffo, differ distinctly from *M. spinicaudatus* by the absence of spines on the telson and uropod 3 (*panousei*) and by the short ramus of uropod 3 and pereopods 5-7 (*remyi*).

*Salentinella angelieri* Ruffo &

Delamare Debutteville, 1952

Fig. 5 g, i

#### Material.-

1 ♀, Morocco, Derdara freshwater well, water level on 12.5 m, water depth 2.5 m, temperature 18.1°C, pH 7.5 bottom sediment: sandstone detritus; accompanying fauna: cyclopid copepods [*Thermocyclops oblongatus* (Sars), *Eucyclops serrulatus*]; asellid isopods [*Proasellus coxalis*]; ostracods and water mites; May 12, 1979; coll. M. De Simone.

#### Distribution.-

Coasts of Italy, Yugoslavia, Greece, Corsica, Sardinia, Balearic Islands, Morocco.

#### Remarks and affinities.-

G. Karaman (in press) showed a very large variability of this species, reducing several

taxons as synonyms of this species (viz. *pisana* Ruffo, 1953, *denticulata* Baschieri, 1952, *balcanica* S. Karaman, 1953, *franciscoi* Ruffo, 1953).

The single specimen in hand from Morocco agrees completely with the diagnosis of *S. angelieri* given by G. Karaman: Accessory flagellum 1-segmented; segment 2 of gnathopod 1 with 2 long setae along anterior margin and with one long and one short seta along the posterior margin; segment 2 of gnathopod 2 without setae at the anterior margin and with two long and one short seta at posterior margin.

Dactyl of pereopods 5 and 7 exceeding half of segment 6. Pleopods with two retinacula each. Inner ramus of uropod III reaching half of first segment of outer ramus (fig. 5i); lobes of telson with one distal seta and with one pair of dorsal long plumose setae (fig. 5g). All other characters like those of *S. angelieri*.

The finding of *S. angelieri* so far from the coast (about 50 km) showed that this species can penetrate deeply in inland waters, like in Italy.

At present, *S. angelieri* is not known from the eastern coasts of the Mediterranean.

#### ACKNOWLEDGEMENTS

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Dr. G.S. Karaman  
Biological Institute,  
Titograd,  
Yugoslavia.

Prof. G.L. Pesce  
Zoological Institute  
University of l'Aquila  
Italy.

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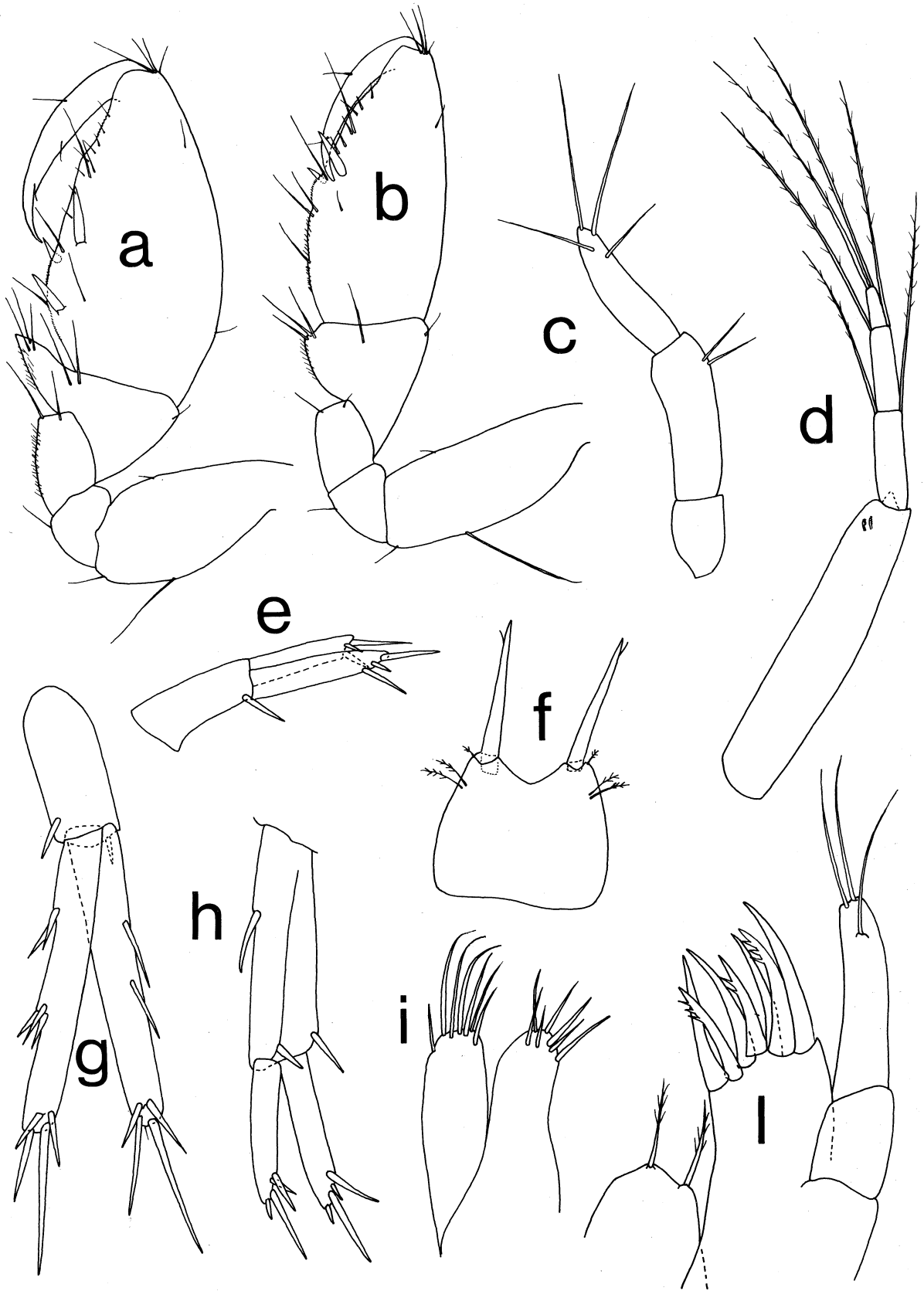


Fig. 1. *Bogidiella ichnusae africana* n.ssp., Algeria, Bouchagroun, Biskra, female 2.3 mm: a, gnathopod 1; b, gnathopod 2; c, mandible, palp; d, pleopod 1; e, uropod II; f, telson; g, uropod III; h, uropod I; i, maxilla 2; l, maxilla 1.

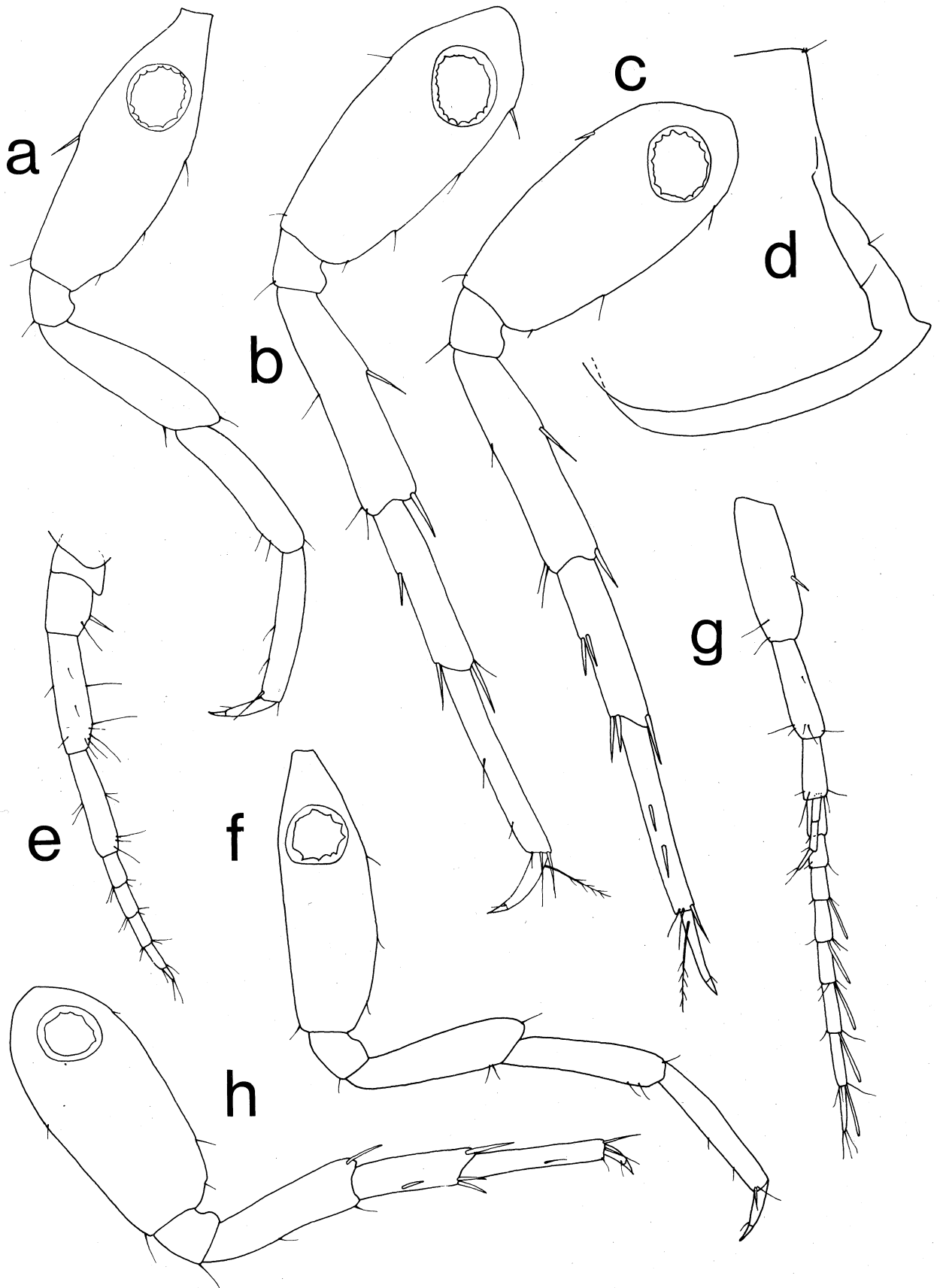


Fig. 2. *Bogidiella ichnusae africana* n.ssp., Algeria, Bouchagroun, Biskra, female 2.3 mm: a, pereopod 3; b-c, pereopod 6; d, epimeral plates 2-3; e, antenna 2; f, pereopod 4; g, antenna 1; h, pereopod 5.



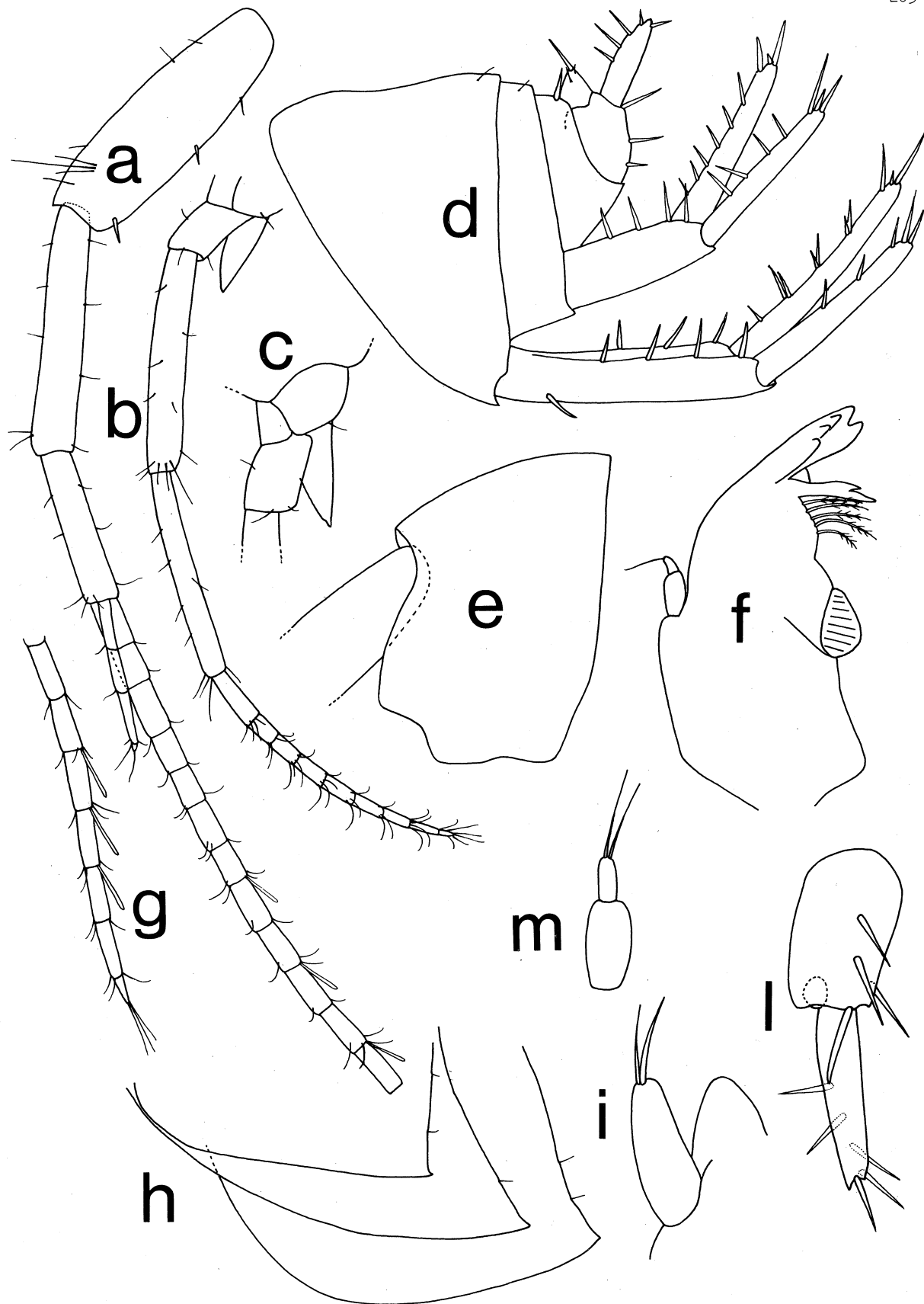


Fig. 3. *Metacrangonyx spinicaudatus* n.sp., Morocco, Sidi El Aydi, Casablanca, female 2.9 mm; a, antenna 1; b, antenna 2; c, antenna 2, detail; d, urosome with uropods 1-2; e, head; f, mandible; g, antenna 1; h, epimeral plates 1-3; i, mandible, palp (other specimen); l, uropod III; m, mandible, palp (other specimen).

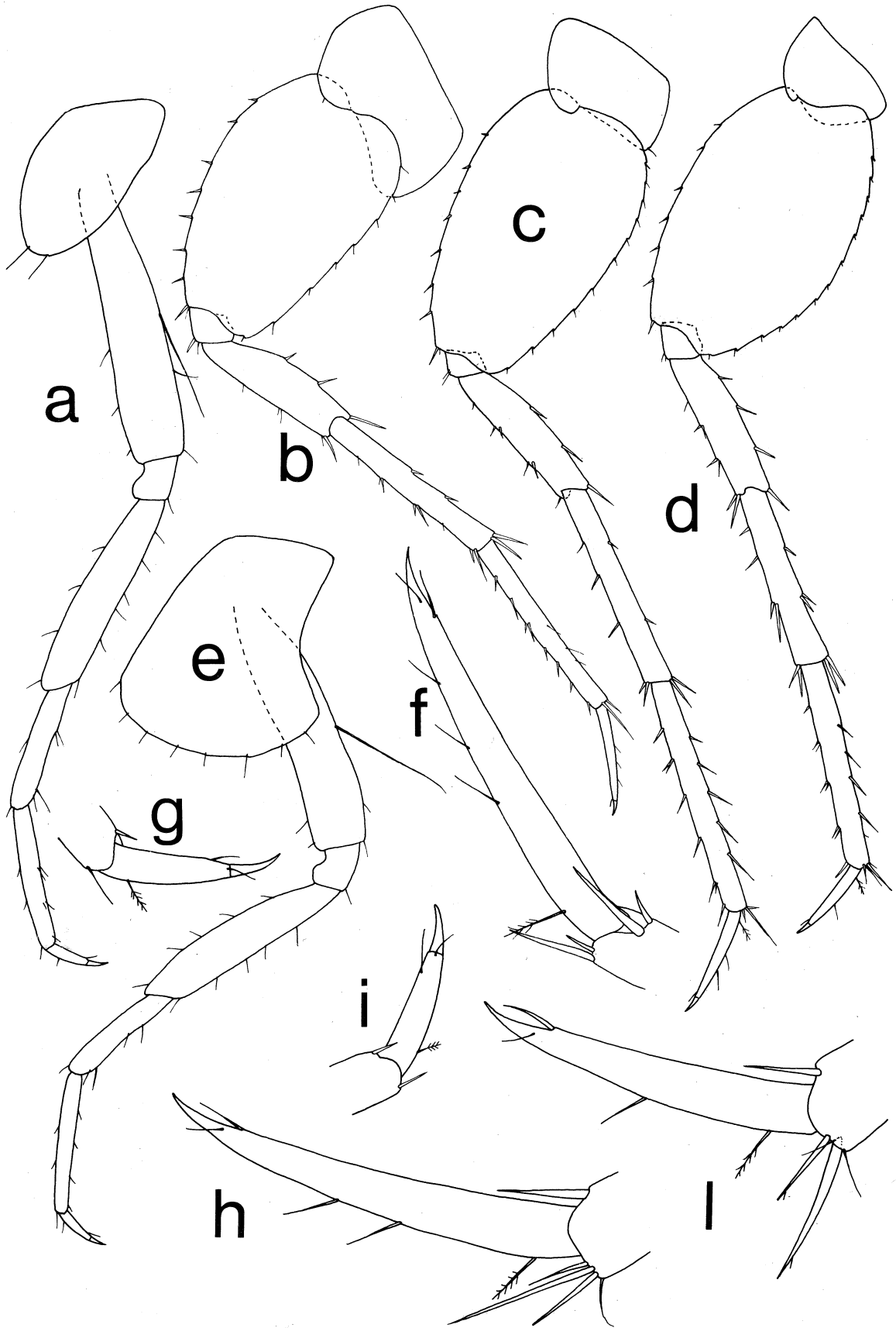


Fig. 4. *Metacrangonyx spinicaudatus* n.sp., Morocco, Sidi El Aydi, Casablanca, female 2.9 mm: a, pereopod 3; b, pereopod 5; c, pereopod 6; d, pereopod 7; e, pereopod 4; f, pereopod 5; g, pereopod 3; h, pereopod 6; i, pereopod 4; l, pereopod 7.

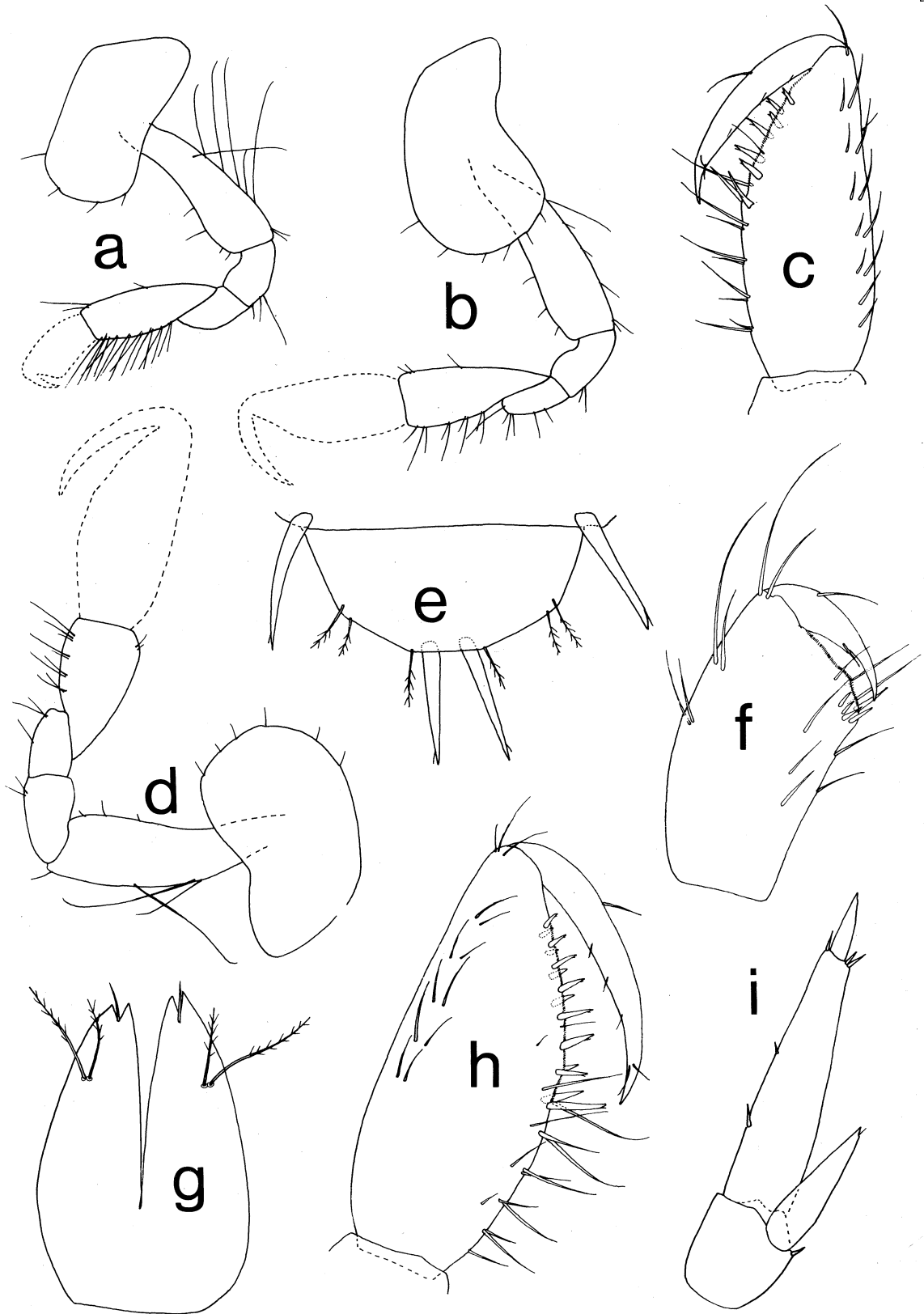


Fig. 5. *Metacrangonyx spinicaudatus* n.sp., Morocco, Sidi El Aydi, Casablanca, female 2.9 mm: a, gnathopod 1; b, gnathopod 2; c, gnathopod 2, detail; e, telson; f, gnathopod 1, detail.

Male 3.2 mm: d, gnathopod 2; h, gnathopod 2, detail.

*Salentinella angelieri* Ruffo & Delamare Deboutville, Morocco, Derdara, female (size unknown): g, telson; i, uropod III.