

Further observations on North African and South Iberian *Bathyporeia* (Crustacea, Amphipoda), with the description of a new species

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Abstract

A new species of amphipod, *Bathyporeia watkini* sp. nov. from the Atlantic coasts of North Africa is described. This very characteristic species is abundant in some lagoons and estuaries near 28°N. New morphological information on *B. elkaimi* d'Udekem d'Acoz and Menioui, 2004 is given after specimens that were recently collected on the Atlantic coasts of southern Spain and South Portugal. The male of *B. ledoyeri* d'Udekem d'Acoz and Menioui, 2004 is described for the first time and new records of North African *B. guilliamsoniana* (Bate, 1857) and *B. chevreuxi* d'Udekem d'Acoz and Vader, 2005a are discussed.

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Introduction

The endopsammic amphipod genus *Bathyporeia* comprises over 20 species, which are remarkably similar to each other. It is distributed in the whole eastern Atlantic from the North Cape to South Africa, in the Mediterranean and Black Seas and in the temperate and subarctic parts of the West Atlantic. It is usually included in the family Pontoporeiidae Dana, 1853 (Barnard and Barnard, 1983), but Bousfield and Shih (1994) created the family Bathyporeiidae Bousfield and Shih, 1994 for the genera *Bathyporeia* Lindström, 1855 and *Amphiporeia* Shoemaker, 1929. So far, this position has received little support in

literature, although it is possibly justified. The morphology and the systematics of the genus *Bathyporeia* have been the object of several recent papers (d'Udekem d'Acoz and Berge, 2003; d'Udekem d'Acoz, 2004; d'Udekem d'Acoz and Menioui, 2004; d'Udekem d'Acoz and Vader, 2004, 2005a, 2005b). The present paper is the follow up of these papers.

B. watkini sp. nov., a highly characteristic new species from the Atlantic coasts of North Africa is described herein. This species proves to be common around 28°N in lagoons and estuaries, demonstrating once more that the North African amphipod fauna is largely unknown. The male of *B. ledoyeri* d'Udekem d'Acoz and Menioui, 2004 is illustrated for the first time. New morphological information on *B. elkaimi* is given after specimens (including one male) that were recently collected on the Atlantic coasts of southern Spain and South Portugal. A few illustrations are also given for North African *B. guilliamsoniana* (Bate, 1857) and *B. chevreuxi* d'Udekem d'Acoz and Vader, 2005a. A key to the *Bathyporeia* species known with certainty in the eastern Atlantic between 14°N and 37°N is given.

Material and methods

The material of *B. elkaimi* has been collected by the first author, the material of the other species by the two last authors. The published drawings have been made by the first author. The model of description is similar albeit not identical to that of d'Udekem d'Acoz (2004) and d'Udekem d'Acoz and Menioui (2004). After the examination of all the species of *Bathyporeia*, some ratios used in previous papers have proved to be of low informative value or re-

dundant. Such ratios are not included in the description of *B. watkini* sp. nov. The term 'pseudorostrum' designates the enlarged first article of the peduncle of the first antenna. The terminal crown of setae of the third article of the maxillipedal palp is not illustrated. The 'carpal fang' is a long single styloform spine found on the carpus of the third and fourth pereopods in all *Bathyporeia* species (and at least in some Phoxocephalidae). The following abbreviations are used for scientific institutions: IS for the Institut Scientifique, Rabat; TMU for the Tromsø Museum; ZMA for the Zoölogisch Museum, Amsterdam. All microscopical preparations have been mounted with Faure's liquid and sealed with nail polish.

Systematics

Bathyporeia elkaimi d'Udekem d'Acoz and Menioui, 2004
(Figs. 1-3)

Bathyporeia elkaimi d'Udekem d'Acoz and Menioui, 2004: 178, figs. 1-4; d'Udekem d'Acoz and Vader, 2005b: 25.

Material. 3 females (TMU 13 652), South Portugal, Ferragudo, south of town, estuary of Arade river, 37°07'N 008°31'W, sheltered shore, intertidal, fine non-muddy sand, water seepage, 30-III-2004, leg. C. d'Udekem d'Acoz; 1 female (TMU 13 653), same station, 02-IV-2004, leg. C. d'Udekem d'Acoz; 1 mature male and 18 females including ovigerous specimens (TMU 13654), 3 vials of specimens in alcohol, 1 large female dissected and mounted, southwestern Spain, Isla Cristina, Barrio Punta del Caíman, 37°12'N 007°19'W, lagoon (northwest of the pedestrian bridge across the lagoon), fine non-muddy sand, tidal channel, 0.1-0.3 m depth, 29-III-2004, leg. C. d'Udekem d'Acoz; 5 females (ZMA AMPH 204 667), southwestern Spain, Isla Cristina, Barrio Punta del Caíman, 37°12'N 007°19'W, lagoon (northwest of the pedestrian bridge across the lagoon), fine non-muddy sand, tidal channel, 0.1-0.3 m depth, 29-III-2004, leg. C. d'Udekem d'Acoz.

Descriptive notes. Eye of mature male small. Mature male with six articles on major flagellum of A1 and six articles on flagellum of A2. A2 of male considerably shorter than body, not longer than in female, with flagellum shorter than peduncle. In females ultimate article of mandibular palp much narrower than antepenultimate. Coxa 2 quite broad, with up to 14 marginal setae. Coxa 3 with up to 12 marginal

setae. Posterodistal seta of merus of P5 long in mature male. Basis of P6 with posterior border very straight and distal lobe almost indistinct. A few spines may be present on medial face of basis of P7 (in addition to pappose setae). Ischium of P7 reaching 0.41 of outer side of merus. Ep3 with ventrolateral spines loosely rowed. Peduncle of third uropod with up to seven outer spines. Second article of exopod of U3 always with setae on both sides. Small accessory spiniform setae may be present on medial side of U3, in addition to plumose setae.

Colour in life. Semi-transparent, whitish with brown viscera, eyes dark red, eggs blue (observations after specimens from Isla Cristina).

Size. Up to 5 mm (females).

Ecology. *B. elkaimi* is apparently confined to sheltered habitats such as estuaries and lagoons. Direct observations in the south of the Iberian Peninsula indicate that it is found on fine non-muddy sands remaining saturated with water at low tide: occurrence of interstitial currents through the sand or sand remaining under water. *B. elkaimi* was not found in sand not saturated with water just above the level of the sampling spots. The sand of Isla Cristina was well sorted and essentially mineral (mainly well rounded quartz grains and some well rounded feldspars grains) with only a very low percentage of shell fragments. The species has a scattered distribution in the south of the Iberian Peninsula, where it was found on only two shores despite extensive searches. It should be pointed out that no other *Bathyporeia* species were found during our intertidal field work in this area.

Distribution. Atlantic coasts of South Portugal (Ferragudo), South Spain (Isla Cristina) (present material) and North Morocco (estuary of the Bou Regreg) (d'Udekem d'Acoz and Menioui, 2004).

Discussion. The specimens of the type series were few in number, small, in rather poor condition and included no males. Furthermore both P7 were damaged in the holotype, which was by far the largest type specimen. The recently collected Iberian material consists of larger specimens, in excellent condition, and includes one mature male. It was therefore considered appropriate to give additional figures of this species. In Europe, *B. elkaimi* is only known from the extreme south of the Iberian Peninsula but it is

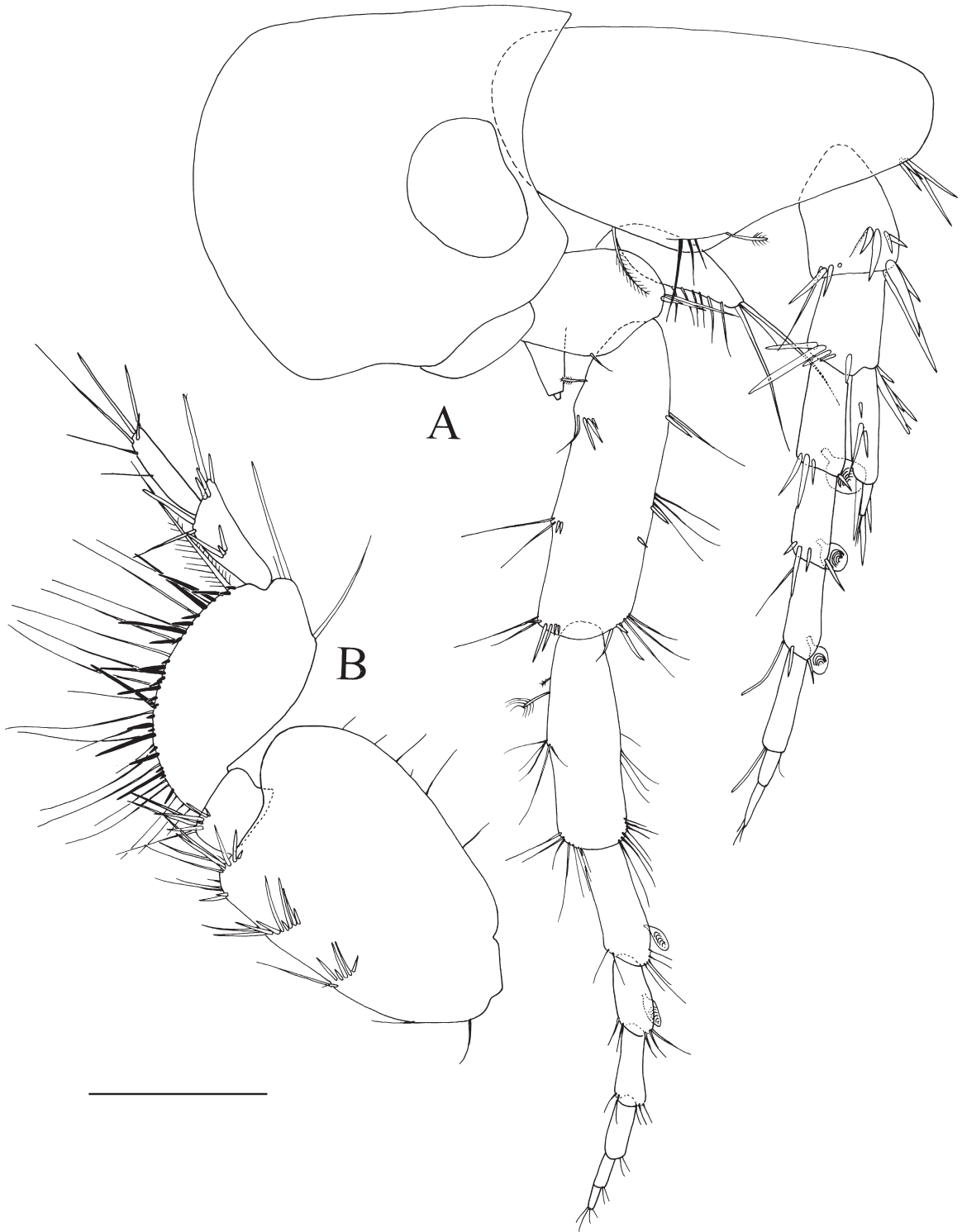


Fig. 1. *Bathyporeia elkaimi* d'Udekem d'Acoz and Menioui, 2004. Mature male, southern Spain, Atlantic coast, Isla Cristina, Barrio Punta del Caimán (TMU 13 654). (a) Head, antennae and mandibular palp. (b) Right P5. (Scale bar: a = 0.35 mm; b = 0.21 mm)

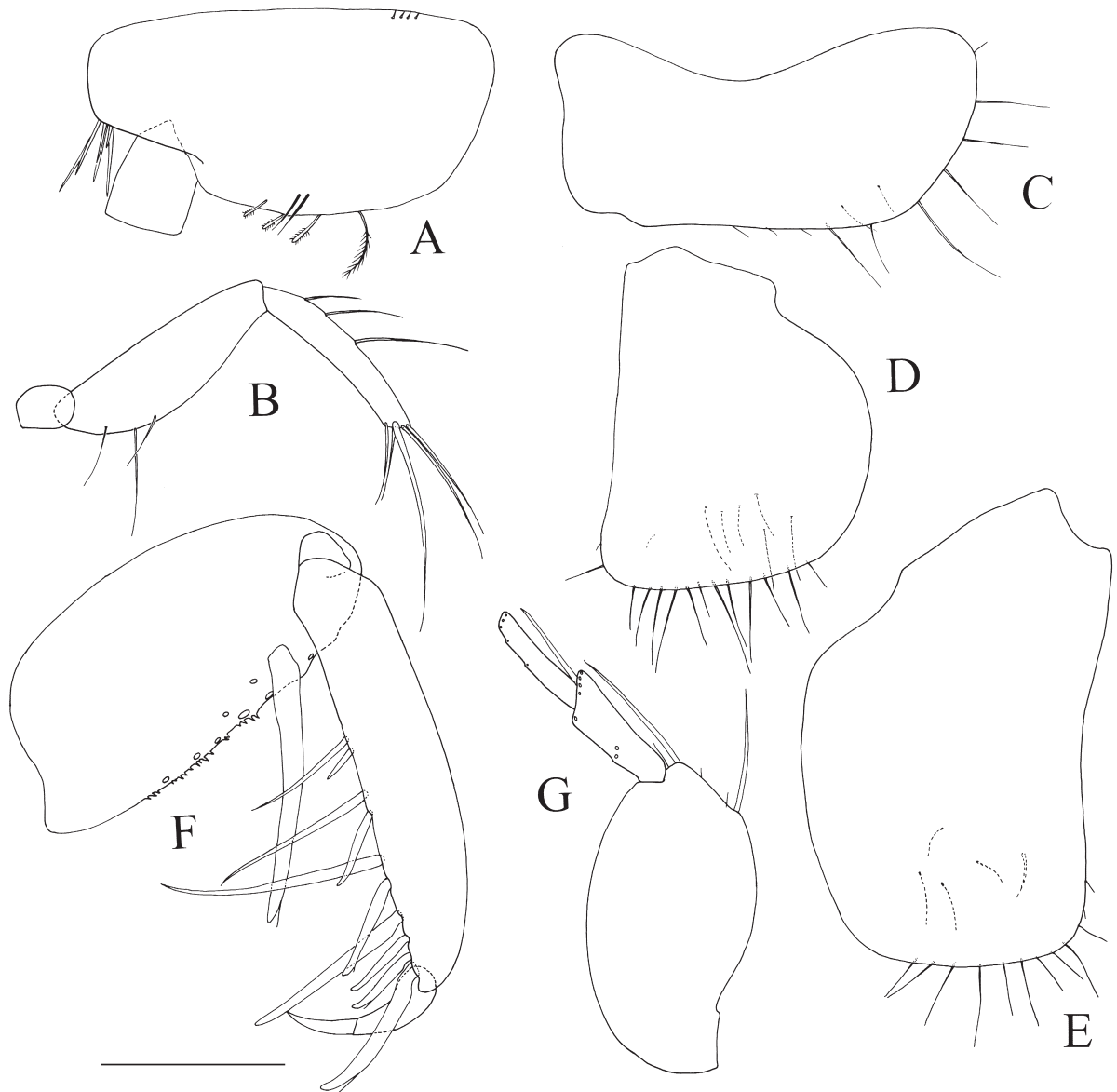


Fig. 2. *Bathyporeia elkaimi* d'Udekem d'Acoz and Menioui, 2004. Ovigerous female, southern Spain, Atlantic coast, Isla Cristina, Barrio Punta del Caimán (TMU 13 654). (a) Proximal part of left A1. (b) Mandibular palp. (c) Right coxa 1. (d) Right coxa 2. (e) Left coxa 3. (f) Anterior part of right P3 (medial spines/setae of propodus not shown). (g) Distal part of right P5. (Scale bar: g = 0.42 mm; a = 0.30 mm; d, e = 0.26 mm; b = 0.21 mm; c = 0.18 mm; f = 0.13 mm)

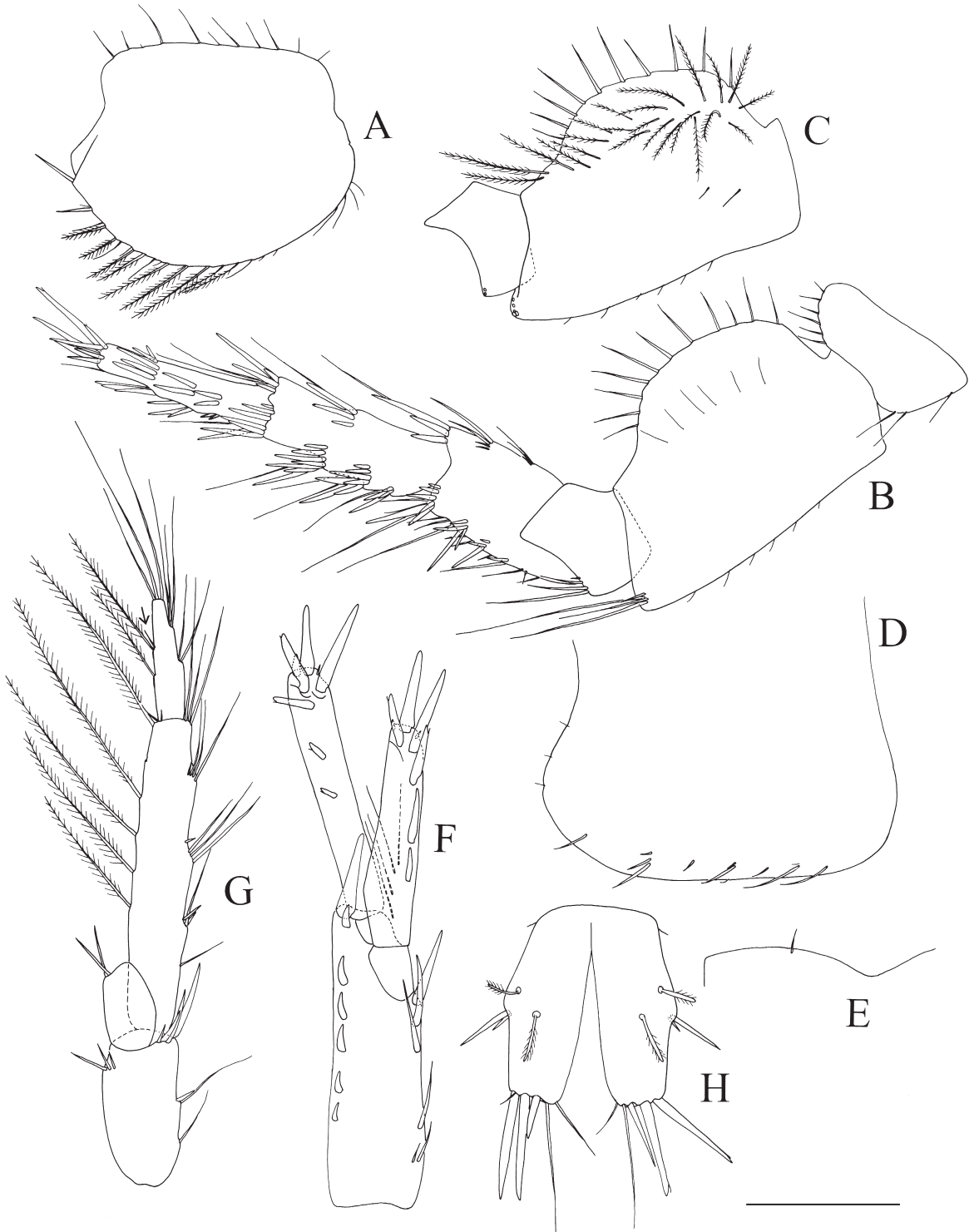


Fig. 3. *Bathyporeia elkaimi* d'Udekem d'Acoz and Menioui, 2004. Ovigerous female, southern Spain, Atlantic coast, Isla Cristina, Barrio Punta del Caimán (TMU 13 654). (a) Basis of right P6. (b) Right P7. (c) Basis and ischium of left P7 (medial view). (d) Right Ep3. (e) Dorsal part of urosomite 1 (right side). (f) Right U1. (g) Left U3. (h) Telson. (Scale bar: a = 0.53 mm; b, c = 0.42 mm; e, h = 0.21 mm; d, f, g = 0.30 mm)

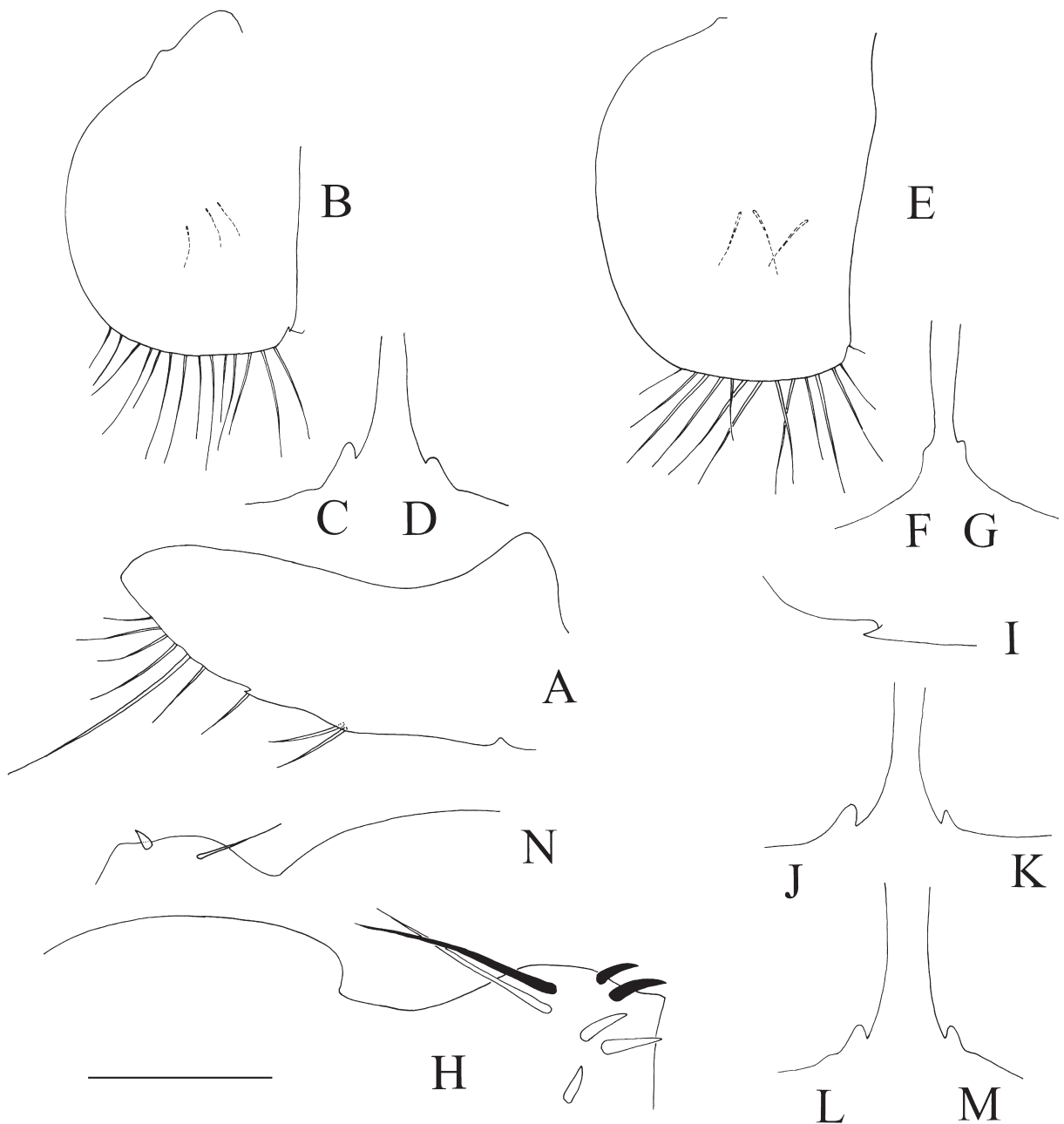


Fig. 4. *Bathyporeia guilliamsoniana* (Bate, 1857). a-h, adult male, North Africa, sample 'II 24.1'; i-n, adult female, sample 'II 21 Dakhla'. (a) Left coxa 1. (b) Left coxa 2. (c) Posteroventral angle of left coxa 2. (d) Posteroventral angle of right coxa 2. (e) Left coxa 3. (f) Posteroventral angle of left coxa 3. (g) Posteroventral angle of right coxa 3. (h) Urosomite 1 in semi-dorsal view (right spines and setae in black). (i) Ventral border of coxa 1. (j) Posteroventral angle of left coxa 3. (k) Posteroventral angle of right coxa 2. (l) Posteroventral angle of left coxa 3. (m) Posteroventral angle of right coxa 3. (n) Urosomite 1 in lateral view, right side (only right spine and seta shown). (Scale bar: b, e, n = 0.21 mm; c, d, f, g, j, k, l, m = 0.071 mm; a = 0.13 mm; h = 0.14 mm)

not ruled out that its range extends a little farther north. *B. elkaimi* is probably a warm temperate species rather than a subtropical one, since it is replaced by *B. watkini* sp. nov. around 28°N in apparently favorable habitats (lagoons and estuaries).

Bathyporeia guilliamsoniana (Bate, 1857)
(Fig. 4)

Thersites Guilliamsoniana Bate, 1857: 146

Bathyporeia guilliamsoniana; d'Udekem d'Acoz, 2004: 46, figs. 26-36; d'Udekem d'Acoz and Vader, 2005b: 13, figs. 12-20 (ubi syn.)

Material. 1 adult male (ZMA AMPH 204 672, 2 slides), sample 'II 24.1', bay of Dakhla, 23°48'N 015°48'W, sand with some organic content, 8 m depth, 22-III-2004, leg. H.M.C. Echchaoui and M. Menioui; 1 adult female (ZMA AMPH 204 671, 1 slide), sample 'II 21 Dakhla', bay of Dakhla, 23°48'N 015°48'W, sand with some organic content, 8 m depth, 22-III-2004, leg. H.M.C. Echchaoui and M. Menioui.

Descriptive notes. The adult male has three posteriorly directed spines on the dorsal part of the first urosomite on the left side and at least two on the right side (the orientation of the microscopical preparation does not allow to check if there is a third one on the right side). All these spines are large, stout and similar-sized. In the female, the right coxa 2 and the right coxa 3 have a reduced tooth, separated from the coxa by a shallow notch and the left coxa 3 has no tooth at all.

Ecology. In sand, from extreme lower shore to 75 m depth (d'Udekem d'Acoz, 2004).

Distribution. From southern Norway to North Africa (23°48'N), Mediterranean, Black Sea (d'Udekem d'Acoz and Vader, 2005b).

Discussion. Specimens from Northwest Europe have one or two (sometimes three) pairs of spines on the first urosomite (d'Udekem d'Acoz, 2004). However in this case, only one is large and the other(s) is/are very small. The situation observed in the present male (three pairs of large spines) is thus very different. In the specimens from Canary Islands recorded by d'Udekem d'Acoz and Vader (2005a), the teeth of the coxae 2-3 also exhibited a trend to reduction, albeit not so strong. Since the specimens examined exhibit no other differences with European material they are considered to be conspecific.

Bathyporeia ledoyeri d'Udekem d'Acoz and Menioui, 2004

(Figs. 5-6)

Bathyporeia ledoyeri d'Udekem d'Acoz and Menioui, 2004: 176, figs. 1-4

Material. 1 adult male (ZMA AMPH 204 680, 1 slide), Dakhla, sample 'BE1', Etoile bay (baie de l'Etoile), 250 km south of the bay of Dakhla, 0.2 to 0.5 m depth, fairly coarse sand, 14-I-2004, leg. M. Menioui; 1 adult male lost in the mail but previously dissected, mounted and illustrated by M. Menioui, Etoile bay (baie de l'Etoile), 250 km south of the bay of Dakhla, 05-I-2003, coll. M. Menioui.

Descriptive notes on illustrated male. Major flagellum of A1 narrow, extremely long, with 15 articles. Combined length of major flagellum and the two distal articles of the peduncle of A1 2.7 times as long as pseudorostrum. Anterior border of third article of peduncle of A2 with one group of spiniform setae in apical position and one single narrow seta more proximally. Flagellum of A2 with 24 articles and 3.5 times as long as peduncle (i.e. much longer than in females). Posterodistal major seta of merus of P5 very long, just as in females. Spines of the ventrolateral surface of Ep3 consisting of two single spines and two transverse rows (respectively of two and three spines). Peduncle of U1 with five outer distal spines. Second article of the outer ramus of U3 with one single plumose seta, on medial side.

Diagnosis of lost male. Pseudorostrum with rounded tip, narrow, not overhanging, with one proximoventral seta. Major flagellum of A1 narrow, with 13 articles; combined length of the major flagellum and the two distal articles of the peduncle about 2.4 times as long as pseudorostrum. Anterior border of third article of peduncle of A2 with one group of spiniform setae in apical position and one single narrow seta more proximally. Flagellum of A2 with 21 articles and 3.1 times as long as peduncle. Third article of maxillipedal palp with longitudinal row of setae on dorsal side (and with two transverse groups of anterior setae); second article of palp with four setae on dorsal surface. Coxae 1-3 without tooth. Coxa 2 with six marginal and two medial setae. Coxa 3 with six marginal and three medial setae. Carpal fang of P4 blunt-tipped with an accessory setule considerably overreaching fang. Dactyli of P3-P4 well developed, slender, with short unguis. Posterodistal major seta of the merus of P5 very long (over-

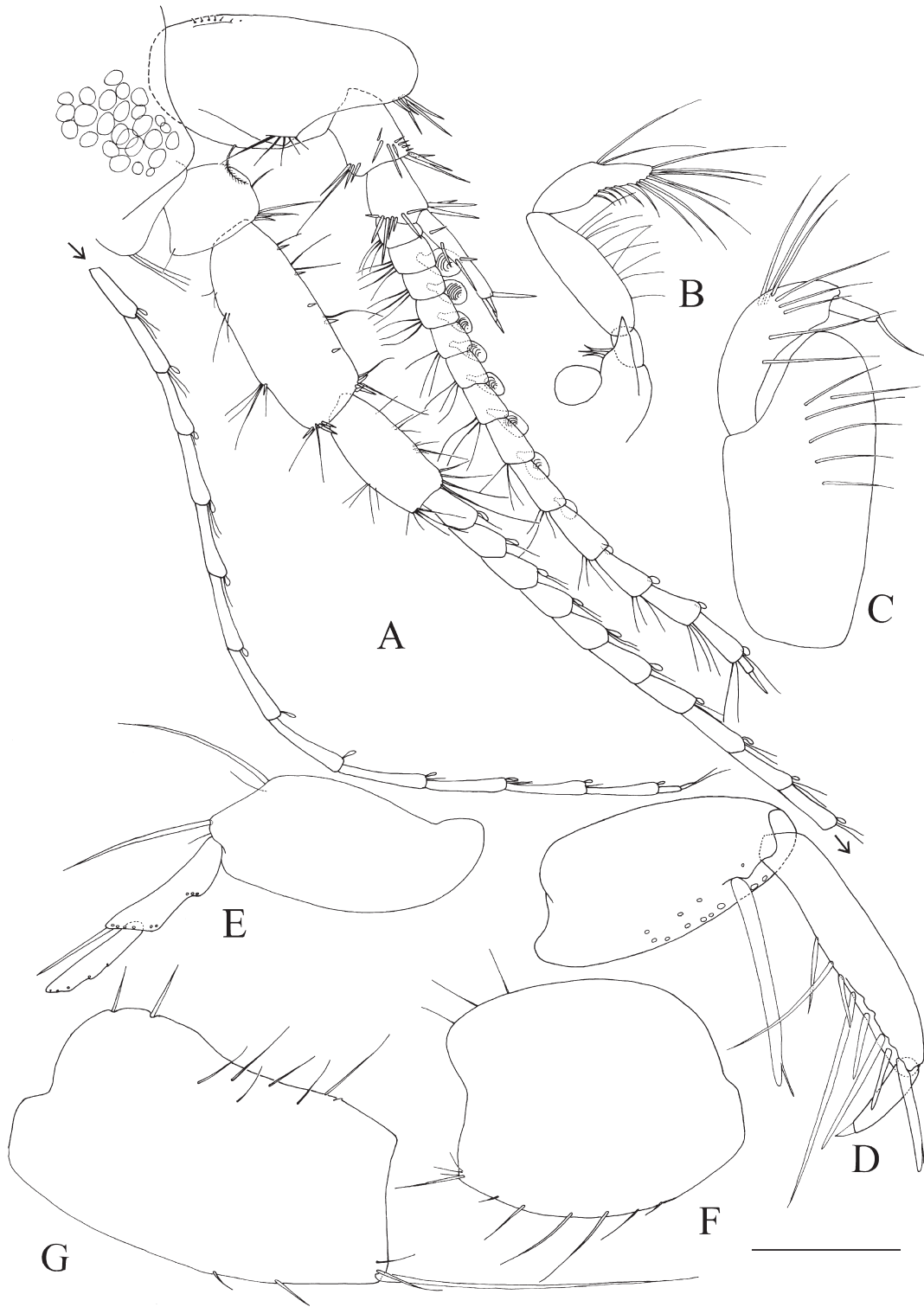


Fig. 5. Bathyporeia ledoyeri d'Udekem d'Acoz and Menioui, 2004, adult male, North Africa, sample 'BE1'. (a) Head and right antennae. (b) Left Md. (c) Palp of left Mxp. (d) Anterior part of right P4 (spines/setae of propodus not shown). (e) Distal part of right P5. (f) Basis of right P6. (g) Basis of left P7 (Scale bar: a, f = 0.21 mm; b, c, d, e = 0.18 mm; g = 0.14 mm)

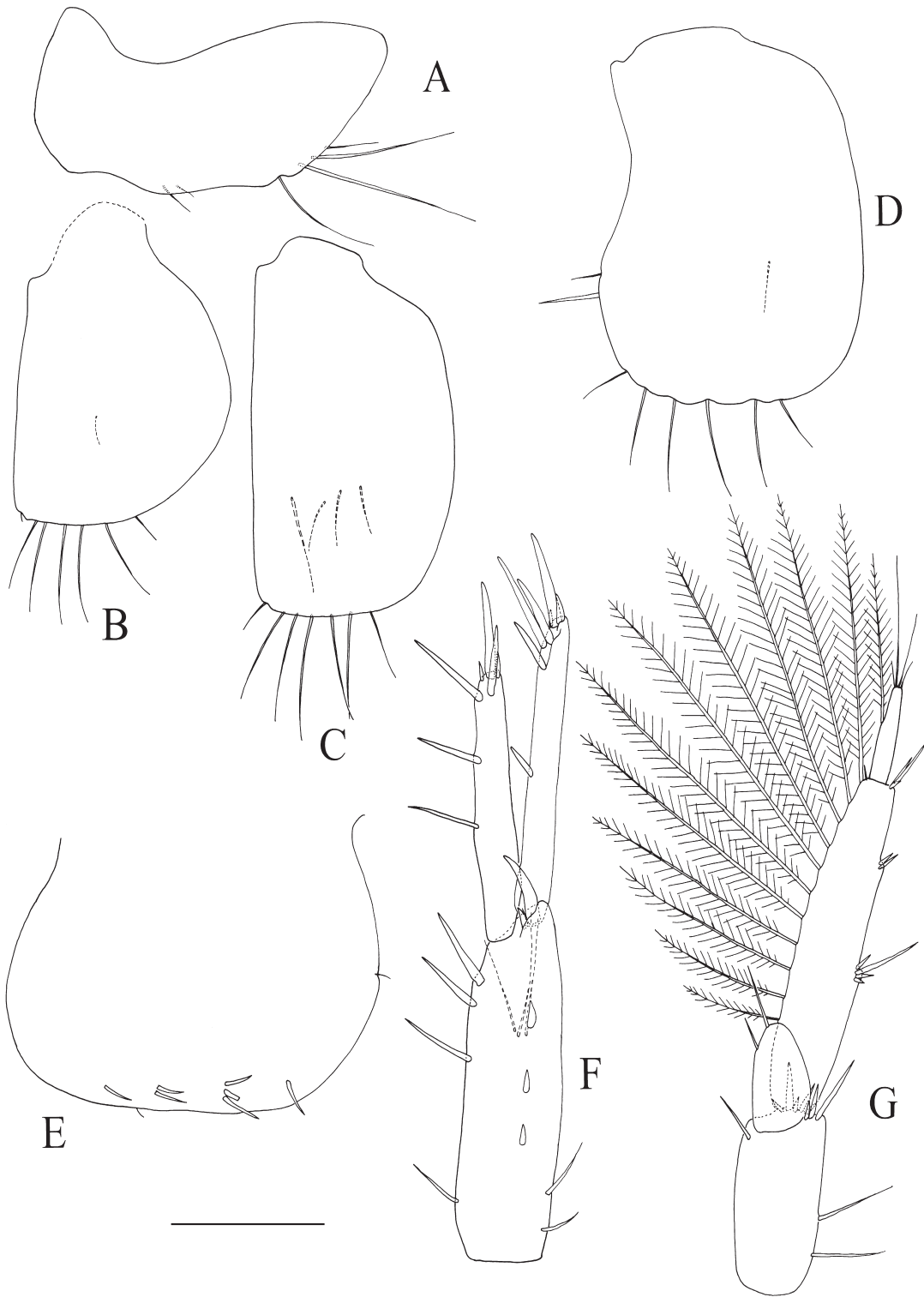


Fig. 6. *Bathyporeia ledoyeri* d'Udekem d'Acoz and Menioui, 2004, adult male, North Africa, sample 'BE1'. (a) Right coxa 1. (b) Right coxa 2. (c) Right coxa 3. (d) Right coxa 4. (e) Left Ep3. (f) Left U1. (g) Left U3. (Scale bar: g = 0.18 mm; e = 0.17 mm; d, f = 0.14 mm; b, c = 0.13 mm; a = 0.10 mm)

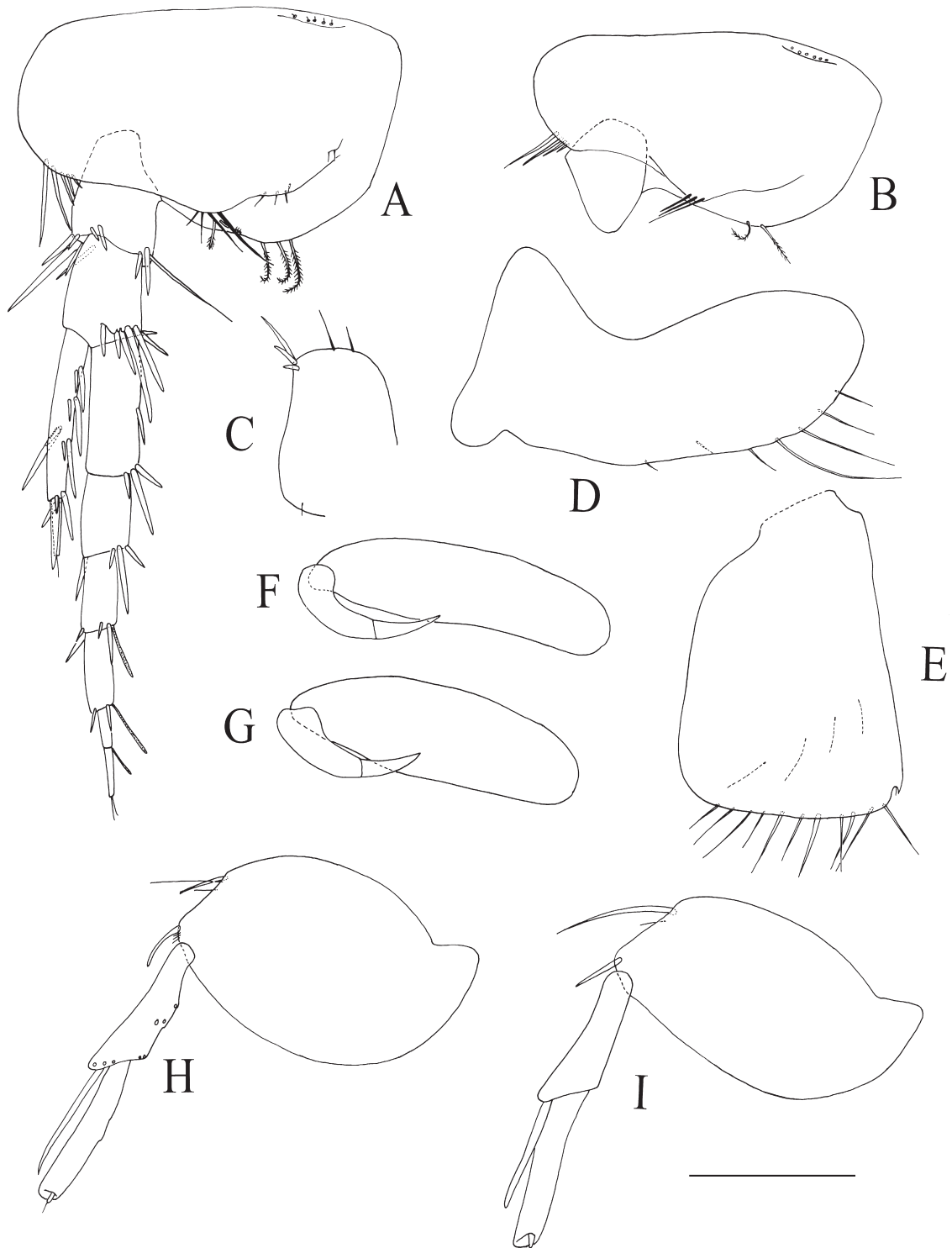


Fig. 7. Bathyporeia chevreuxi d'Udekem d'Acoz and Vader, 2005; b, d, e, f, g, i, adult male, North Africa, sample 'Bat III 2Z', a, c, h, female, sample 'Dakhla B20'. (a) Left A1. (b) Proximal part of right A1. (c) Third article of peduncle of left A2. (d) Right coxa 1. (e) Left coxa 2. (f) Propodus and dactylus of left P3 (setae not shown). (g) Propodus and dactylus of left P4 (setae not shown). (h) and (i) Distal part of right P5. (Scale bar: h = 0.35 mm; f, g = 0.30 mm; b, i, e = 0.26 mm; a, c = 0.21 mm; d = 0.13 mm)

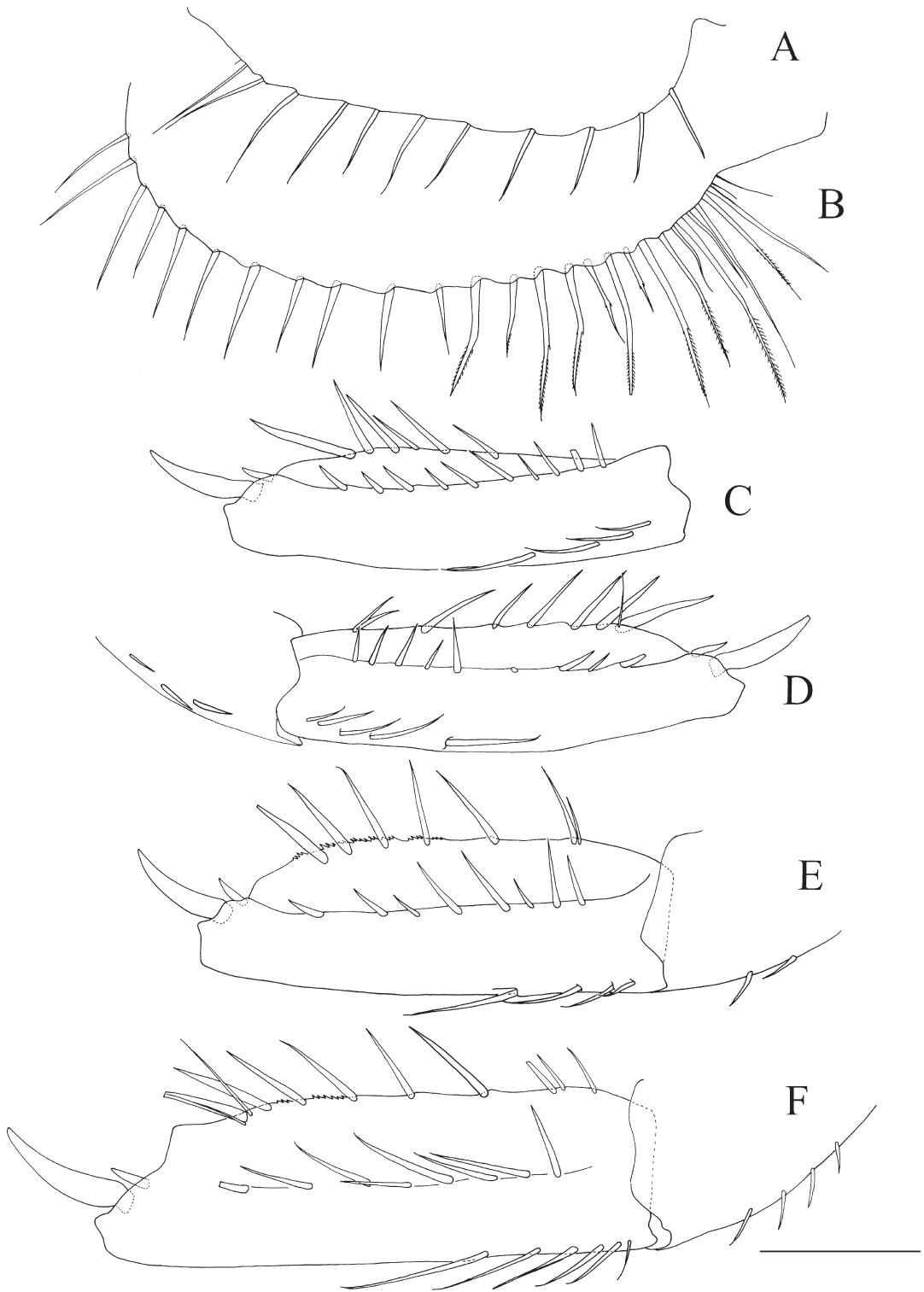


Fig. 8. *Bathyporeia chevreuxi* d'Udekem d'Acoz and Vader, 2005; a, c, d, adult male, North Africa, sample 'Bat III 2Z'; e, female, sample 'Bat 15'; b, f, female, sample 'Dakhla B20'. (a) Posterior border of basis of left P7. (b) Posterior border of basis of right P7. (c) and (e) Peduncle of right U1. (d) and (f) Peduncle of left U1. (Scale bar = 0.14 mm)

reaching carpus). Posterior border of basis of P7 slightly concave. Spines of the ventrolateral surface of Ep3 consisting of four single spines and one pair of rowed spines. Ep3 without posteroventral tooth. Urosomite 1 with an anteriorly directed pair of setae and a posteriorly directed pair of well developed stout conical spines. Peduncle of U1 with seven spines on outer dorsal border. Second article of the outer ramus of U3 with one single plumose seta, on medial side.

Ecology. On sand between 0.5 and 12 m (d'Udekem d'Acoz and Menioui, 2004).

Distribution. Atlantic coasts of North Africa between 23°N and 24°N.

Discussion. The male specimens agree quite well with the original description of the species (based on females only). However, there is an important sexual dimorphism on the antennae (which was not unexpected). *B. ledoyeri* is apparently uncommon, but this may result from the lack of knowledge about its ecological preferences.

Bathyporeia chevreuxi d'Udekem d'Acoz and Vader, 2005
(Figs. 7-8)

Bathyporeia chevreuxi d'Udekem d'Acoz and Vader, 2005a: 2763, figs. 1-4 (type locality: Dakar, Senegal)

Material. 1 adult male (ZMA AMPH 204 668, 2 slides), sample 'Bath III 2Z', bay of Dakhla, 23°37'N 015°52'W, sand with some mud content, 2 m depth, 23-III-2004, leg. H.M.C. Echchaoui and M. Menioui; 1 adult female (ZMA AMPH 204 669, 1 slide), sample 'Bath II 15', bay of Dakhla, 23°49'N 015°48'W, sand with some organic content, 8 m depth, 24-III-2004; 1 large adult female (ZMA AMPH 204 670, 1 slide), sample 'Bath II 20', bay of Dakhla, 23°49'N 015°48'W, sand with some organic content, 8 m depth, 24-III-2004; 1 ovigerous female (TMU 13 839, 10 slides), Etoile bay (baie de l'Etoile), 250 km south of the bay of Dakhla, intertidal, sandy pools, 0-0.5 m depth, 05-I-2003, leg. M. Menioui; 1 adult female (ZMA AMPH 108 290, in alcohol), Mauritania, Banc d'Arguin, Jwile beach, south of Nouadhibou (position of Nouadhibou = 20°55'N 16°56'W), 15-II-1986, leg. W.J. Wolff.

Ecology. On sand and mud between 2 and 9 m depth (present data; d'Udekem d'Acoz and Vader, 2005a).

Distribution. Atlantic African coast from Dakhla to Dakar (present data; d'Udekem d'Acoz and Vader, 2005a).

Discussion. The *Bathyporeia* of the complex *tenuipes* are distributed throughout the whole eastern Atlantic, from Denmark to South Africa, as well as in the Mediterranean Sea. Small differences have been detected between the groups populations and four species are assumed, albeit with some reservations, by d'Udekem d'Acoz and Vader (2005a): *B. tenuipes* Meinert, 1877 from northwestern Europe, *B. lindstromi* Stebbing, 1906 from the Mediterranean, *B. chevreuxi* d'Udekem d'Acoz and Vader, 2005 from the Atlantic coasts of North Africa and Senegal, and *B. cunctator* d'Udekem d'Acoz and Vader, 2005 from the Atlantic coasts of South Africa. The specimens listed above are considered conspecific with the material from Senegal, although they exhibit some variation in the ornamentation of the peduncle of the first uropod.

Bathyporeia watkini sp. nov.
(Figs. 9-14)

Material. 1 adult female holotype [no extra spine on P5 merus] (ZMA AMPH 204 673, 1 slide), sample 'St B', estuary of Oued Louaer, 28°10'37"N 011°52'24"W, 0-1 m depth, *Donax* sand, 22-V-2004, leg. H.M.C. Echchaoui and M. Menioui; 1 adult female paratype (ZMA AMPH 204 674, 1 slide), sample 'KST ME', lagoon of Khnifiss, 28°00'21"N 012°14'66"W, about 1 m depth, tidal channel of the lagoon, muddy sand, 09-III-2004, leg. H.M.C. Echchaoui and M. Menioui; 1 adult female paratype (ZMA AMPH 204 675, 1 slide), sample 'Aguig3', estuary of Oued El Aguig, 28°43'06"N 011°33'13"W, intertidal, coarse sand, 25-V-2004, leg. H.M.C. Echchaoui and M. Menioui; 1 adult male paratype (ZMA AMPH 204 676, 1 slide), sample 'O. Fatma 5', estuary of Oued Oum Fatma, 28°12'54"N 011°48'82"W, intertidal, 0-0.5 m depth, 05-III-2004, leg. H.M.C. Echchaoui and M. Menioui; 1 adult female paratype (TMU 13 656, 1 slide), sample 'St M09', lagoon of Khnifiss, 28°00'21"N 012°14'66"W, about 1 m depth, tidal channel of the lagoon, muddy sand, 09-III-2004, leg. H.M.C. Echchaoui and M. Menioui; 1 adult male paratype (TMU 13 657, 1 slide), sample 'St B male 1', estuary of Oued Louaer, 28°10'37"N 011°52'24"W, 0-1 m depth, *Donax* sand, 22-V-2004, leg. H.M.C. Echchaoui and M. Menioui; 1 adult male paratype (ZMA AMPH 204 677, 1 slide), sample 'St B male 2', estuary of Oued Louaer, 28°10'37"N 011°52'24"W, 0-1 m depth, *Donax* sand, 22-V-2004, leg. H.M.C. Echchaoui and M. Menioui; 1 adult male paratype (ZMA AMPH 204 678, 1 slide), sample 'St B male 3', estuary of Oued Louaer, 28°10'37"N 011°52'24"W, 0-1 m depth, *Donax* sand, 22-V-2004, leg. H.M.C. Echchaoui and M. Menioui; 1 adult male (ZMA AMPH 204 679, 1 slide), sample 'KstB', 30 km north of Tarfaya, 27°57'12"N 012°39'18"W, intertidal, coarse sand, 05-III-2004, leg. H.M.C. Echchaoui and M. Menioui; 53 specimens (IS Bat011), estuary of Oued Louaer, 28°10'37"N 011°52'24"W, 0-1 m depth, *Donax* sand, 22-V-2004, leg. H.M.C. Echchaoui and M. Menioui; 37 specimens (IS BatAg1), estuary of Oued El Aguig, 28°43'06"N 011°33'13"W,

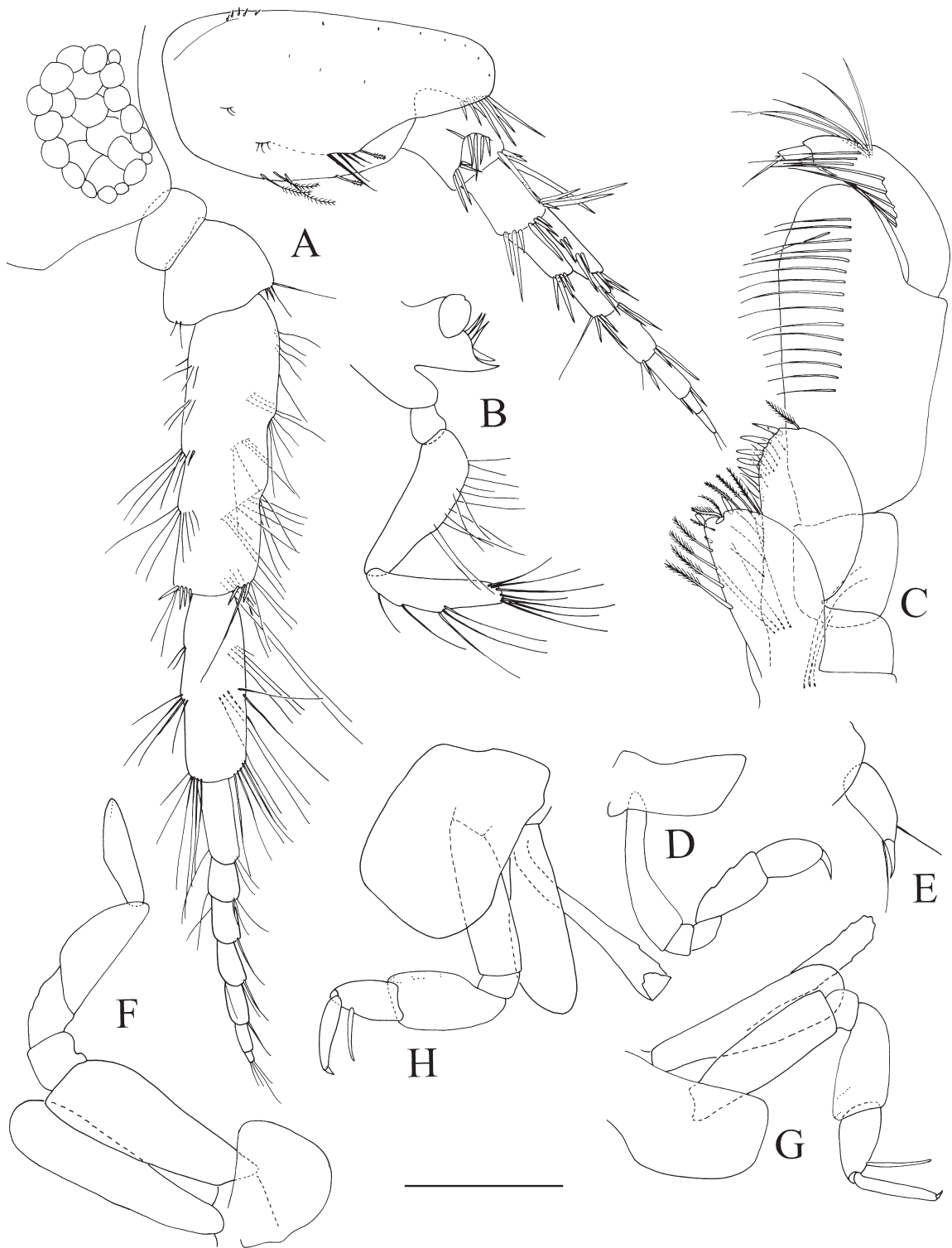


Fig. 9. *Bathyporeia watkini* sp. nov., North Africa, sample 'St. B', female holotype. (a) Head and right antennae. (b) Right Md. (c) Right Mxp. (d) Right P1 (setae not shown). (e) Dactylus of right P1. (f) Left P2 (setae not shown). (g) Left P3 (setae not shown). (h) Left P4 (setae not shown). (Scale bar: d, f, g, h = 0.42 mm; a, b = 0.21 mm; c = 0.13 mm; e = 0.10 mm)

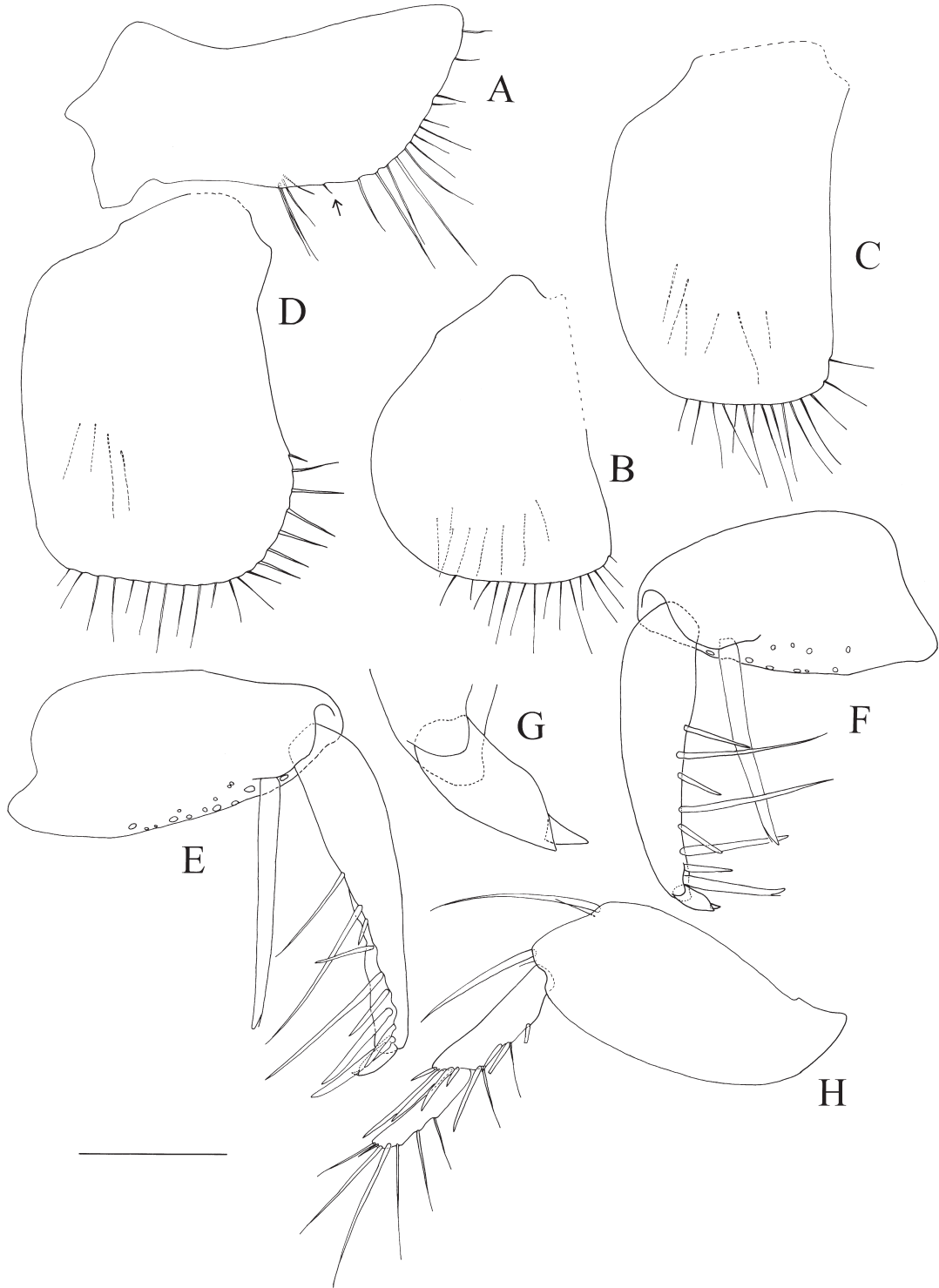


Fig. 10. Bathyporeia watkini sp. nov.; a-g, female holotype, North Africa, sample 'St. B'; h, adult male paratype, North Africa, sample 'St B male 2'. (a) Right coxa 1 (the short seta indicated by an arrow is characteristic of the species). (b) Left coxa 2. (c) Left coxa 3. (d) Left coxa 4. (e) Anterior part of right P3 (medial spines/setae of propodus not shown). (f) Anterior part of left P4 (medial spines/setae of propodus not shown). (g) Dactylus of left P4. (h) Right P5 (distal part and merus: most common disposition, without extra seta group). (Scale bar: d = 0.21 mm; b, c = 0.18 mm; a = 0.14 mm; e, f = 0.10 mm; g = 0.025 mm)

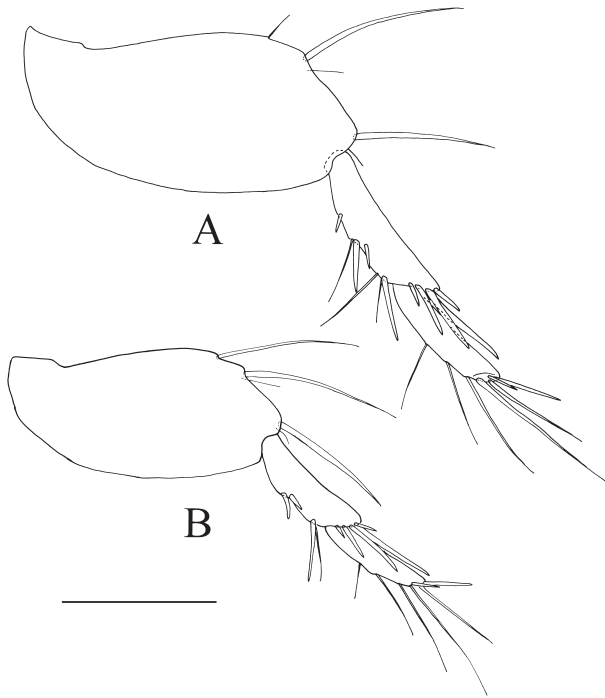


Fig. 11. *Bathyporeia watkini* sp. nov., paratypes, North Africa; a, sample 'O Fatma'; b, 'St M09'. (a) Adult male. (b) Adult female, P5 with an extra seta group. (Scale bar = 0.21 mm)

beach, intertidal, 24-V-2004, leg. H.M.C. Echchaoui and M. Menioui; 82 specimens (IS BatOf), estuary of Oued Oum Fatma, 28°12'54"N 011°48'82"W, beach, intertidal, 0-0.5 m depth, 05-III-2004, leg. H.M.C. Echchaoui and M. Menioui; 25 specimens (IS BatTarl), shore 30 km north of Tarfaya, 27°57'12"N 012°39'18"W, intertidal, coarse sand, 11-III-2004, leg. H.M.C. Echchaoui and M. Menioui; 6 specimens (IS BatKh1), lagoon of Khnifiss, 28°00'21"N 012°14'66"W, 1 m depth, 08-III-2004, leg. H.M.C. Echchaoui and M. Menioui; 4 specimens (IS BatBe), Etoile bay (baie de l'Etoile), 250 km south of Dakhla, 0.2-0.5 m depth, 29-III-2004, leg. H.M.C. Echchaoui and M. Menioui.

Etymology. The species is dedicated to the Welsh biologist Emrys Watkin who added so much to the knowledge of systematics and ecology of the genus *Bathyporeia* (Watkin, 1938, 1939a, 1939b, 1941, 1942). The name is a genitive.

Description. Species rather stout. Eye with well-developed ommatidia in adults. Pseudoscorpium with rounded tip, narrow, not overhanging, with two or three (sometimes four) proximoventral setae in adults; development and number of apical spines normal. Major flagellum of A1 with five or six articles in females,

12-15 in male; first article of accessory flagellum with two or three non-apical groups of spines. Flagellum of A1 in males very long (combined length of major flagellum and distal two articles of peduncle 2.3-2.5 times as long as pseudoscorpium). Anterior border of third article of peduncle of A2 with one group of spinules and setae in apical position only or with one single seta more proximally (rarely with three groups of spines); flagellum with six or seven articles in female, 16-22 in male. A2 of adult male 0.65-0.70 times as long as body length, with flagellum 2.5 times as long as peduncle (i.e. longer than in female).

Penultimate article of mandibular palp elongate.

Third article of maxillipedal palp with longitudinal row of setae on dorsal side (two transverse groups of anterior setae are also present); second article of palp with an unusually high number of setae on dorsal side (13-17); outer plate with 4 [1 specimen examined] or 5 [5 specimens examined] nodular spines (narrower than in other species).

Coxa 1 anterodorsally angular, without ventral tooth, usually with anteroventral angular discontinuity, with well developed ventral setae, without apical setule; characteristic very short seta always present on anterior 0.25 of ventral border (behind anteroventral long setae), normally associated with a very shallow notch (indicated by an arrow on drawings).

Coxa 2 without posterior tooth; transition between anterior and ventral border without angular discontinuity; anterior border convex; anterior and posterior border not parallel; ventral border with 15-19 narrow and fairly regular-sized setae of normal length in adult females; five to nine medial setae.

Coxa 3 without posterior tooth; anterior and posterior border almost parallel (faintly converging downwards); ventral border with 15-21 narrow and fairly regular-sized setae of normal length in adult females, six or seven medial setae.

Coxa 4 with 19-23 narrow and fairly regular-sized setae, of normal length; posterior setae not setulose; three or four medial setae.

P3 with carpal fang usually not reaching tip of propodus, distally blunt, with accessory setule; accessory setule not reaching or just overreaching tip of carpal fang; propodus rather stout; outer spines/ setae of propodus in normal number (seven or eight), strong and rather long; dactylus very short, stout, with short unguis, with posterior border convex. Propodus of P3 longer than propodus of P4.

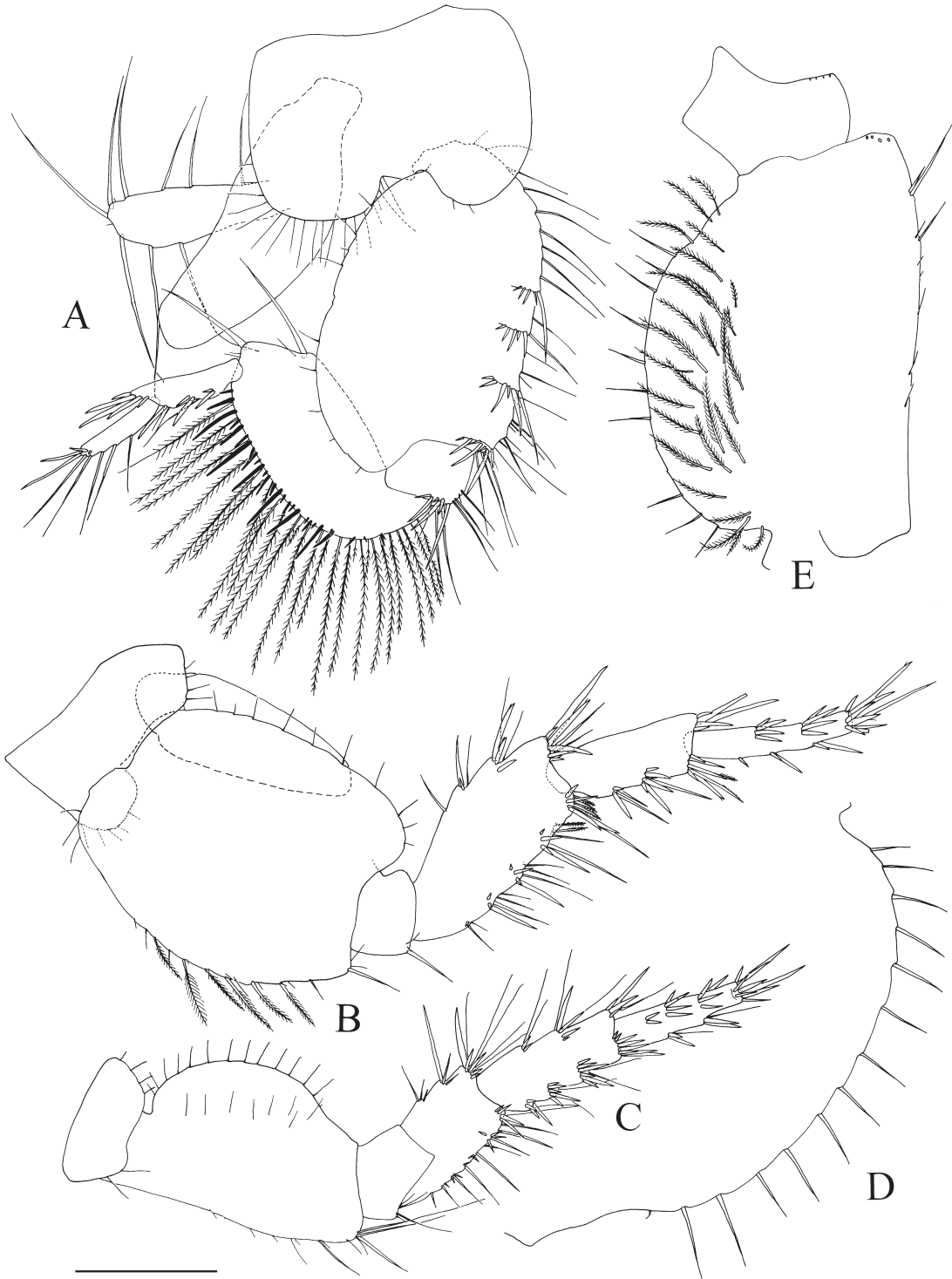


Fig. 12. Bathyporeia watkini sp. nov., North Africa, sample 'St. B', female holotype. (a) Right P5. (b) Left P6. (c) Left P7. (d) Posterior border of basis of left P7. (e) Basis and ischium of right P7 (medial side). (Scale bar: c = 0.35 mm; a, b = 0.30 mm; e = 0.21 mm; d = 0.14 mm)

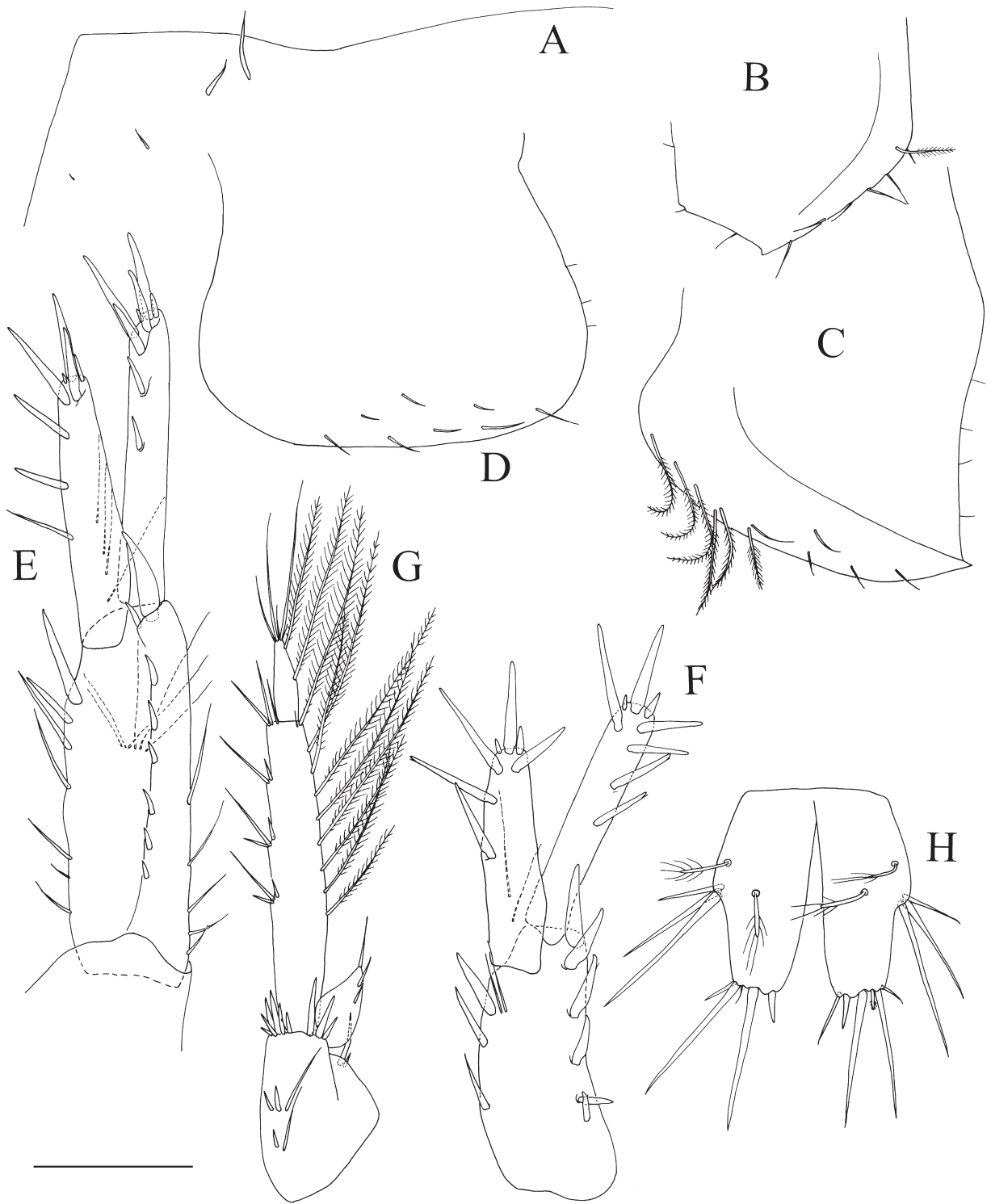


Fig. 13. *Bathyporeia watkini* sp. nov., North Africa, sample 'St. B', female holotype. (a) Right side of dorsal part of first urosomite (only right spines/setae illustrated). (b) Right Ep1 (broken in two parts and re-assembled on the drawing). (c) Left Ep2. (d) Left Ep3. (e) Right U1. (f) Left U2. (g) Right U3. (h) Telson. (Scale bar: b, c, d, g = 0.21 mm; e = 0.18 mm; f, h = 0.14 mm; a = 0.10 mm)

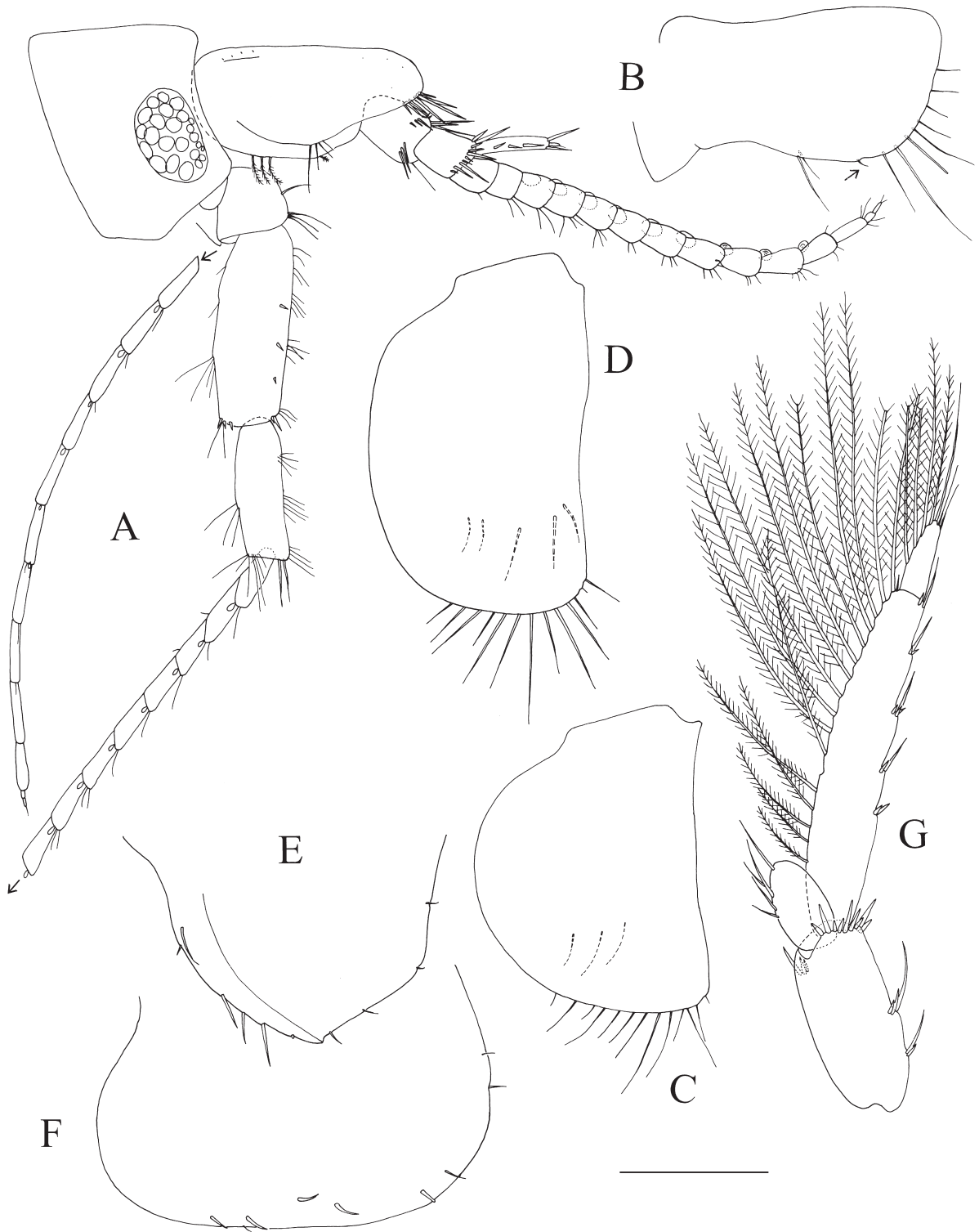


Fig. 14. Bathyporeia watkini sp. nov., North Africa, adult male paratypes; a, c-g, sample 'KStB'; b, sample 'B male 2'. (a) Head and right antennae. (b) Right coxa 1 (the short seta indicated by an arrow is characteristic of the species). (c) Left coxa 2. (d) Left coxa 3. (e) Left Ep1. (f) Left Ep3. (g) Left U3. (Scale bar: a = 0.30 mm; f, g = 0.21 mm; c, d = 0.15 mm; e = 0.20 mm)

Ratio between propodus length and merus length of P3 in adult female: 0.71-0.74.

Ratio between dactylus length and propodus length of P3 in adult female: 0.15-0.17.

Ratio between length and width of dactylus of P3 in adult female: 2.9.

Ratio between unguis length and total length of dactylus of P3 in adult female: 0.22.

Ratio between unguis length and dactylus width in P3 of adult female: 0.64.

P4 with carpal fang not reaching tip of propodus, distally blunt, with accessory setule; accessory setule not reaching or just overreaching tip of carpal fang; propodus rather stout; outer spines/setae of propodus in normal number (six to eight), strong and rather long; dactylus very short, stout, with short unguis, with posterior border convex.

Median part of anterior border of basis of P5 straight; merus elliptic, not unusually broad; posteromedian seta group of merus with one long and strong major seta and one 0.18-0.26 times as long as non-setulose accessory seta; a second posteromedian seta group sometimes present behind the normal one; posterodistal seta group with one long and strong straight seta (nearly reaching or just overreaching tip of carpus), and one well developed accessory seta (no sexual dimorphism); longest posterior spine of carpus not reaching or just overreaching tip of propodus. Posterodistal lobe of basis of P6 protruding or not; anterior border regularly convex; posterior border distinctly but not strongly convex. Merus of P6 with three or four posterior groups of spines/setae and four or five anterior groups; longest seta of each anterior seta group of significantly increasing size towards distal part of merus; carpus without posterior spines (distal group not considered); propodus with two posterolateral, and three anteromedial groups of spines (terminal crown of spines not considered). Spines of carpus and merus long and of normal robustness.

P7 with anterior border of basis straight and posterior border convex; posterior border of basis with slender ornamentation (9-14 very regular-sized short setae); medial side without spines in females. Ischium short, reaching 0.40-0.41 of outer side of merus; anterodistal border barely concave on outer side, distinctly concave on medial side; posterodistal border nearly straight on outer side, weakly concave on medial side. Spines of carpus and merus

of normal length and robustness. Middle of posterior border of Ep1 angular, not produced in a tooth.

Middle of posterior border of Ep2 angular barely protruding, not angular, not produced in a tooth. Ventrolateral surface of Ep2 with long plumose setae anteriorly, with glabrous spiniform setae posteriorly, similar to those of Ep3.

Ep3 with posteroventral border regularly rounded, without posteroventral tooth, with five to nine single spines (none in transverse rows), with zero to one setule on ventral border, with one to four setules on posterior border.

Urosomite 1 with one pair of anteriorly directed setae, three (sometimes one) pairs of posteriorly directed minute spiniform setae (much narrower than in any other species); ventrolateral border without strong setae arising from outer side.

Peduncle of uropod 1: outer dorsal border with six to eight spines consisting of following succession: 1) four to six short robust spines, 2) the usual penultimate short robust spine, 3) very short space followed by very strong distal spine; dorsomedial border with five to seven single styliiform spines or spiniform setae. Rami of normal length and rather slender; inner ramus with border facing outer ramus, with only one long spine in subdistal position. Spines on rami of normal robustness.

Peduncle of uropod 2 of normal proportions, outer dorsal border with four to seven short and robust spines; dorsomedial border with three strong spines, one may be associated with one to three narrow setae. Rami of normal length and robustness; inner ramus with border facing outer ramus with only one long spine in subdistal position. Spines on rami of normal robustness.

Peduncle of uropod 3 with longest distal spine not reaching tip of inner ramus (spines of inner ramus excluded); outer border of peduncle of uropod 3 with one or two groups of two to three spiniform setae. Inner ramus elliptic, with two to five spines. Outer ramus with first article narrow, second article of normal length and width. Second article of outer ramus with two to four medial setae, without outer setae. Medial side of outer ramus (first and second articles together) with 9-21 long, plumose setae (highest numbers in males); distal plumose seta of the first article and sometimes other plumose setae associated with an accessory non-setulose spiniform

seta; all plumose setae much longer than longest setae on outer side. Outer side of outer ramus (first and second article together) with four to six groups of two or three spiniform setae, which can be longer than width of outer ramus. Ratio between length of second article and length of first article: 0.24–0.28. Ratio between length of second article and width of first article: 1.2–1.5.

Telson of typical morphology; lobes without medial setae.

Size. Usually between 6.0 and 6.5 mm, sometimes up to 8 mm.

Colour in life. More or less translucent, yellowish white with a few red dots. Eyes black, sometimes brown.

Ecology. Lagoons and estuaries, sand, coarse sand, muddy sand, from lower shore to 1 m depth. Very common species. It seems to be an important part of the diet of some species of seabirds, especially the herring gull *Larus argentatus* Pontoppidan, 1763. The genus *Bathyporeia* (*B. pelagica*) has already been recorded in the diet of seabirds, in northwestern Europe (Pienkowski, 1983).

Distribution. Atlantic coasts of North Africa, around 28°N.

Discussion. *B. watkini* sp. nov. is a highly characteristic species. The males have a very long flagellum on A1. The second article of the palp of the maxilliped has an unusually high number of long and strong setae on the dorsal surface; the nodular spines of the outer plate are more slender than in other species. The coxa 1 is unusually massive and always exhibits a characteristic short seta on the anterior part of the ventral border behind the long anteroventral setae. The dactyli of P3–P4 are remarkably short. The ventrolateral surface of the second epimeral plate exhibits long plumose setae (as in other *Bathyporeia* species) on the anterior half, but spines similar to those of the third epimeral plate on the posterior half (which is a unique disposition for the genus). The spines of the ventrolateral surface of the third epimeral plate do not form transverse rows (although they are not in low number). The reduced size and the setiform structure of the posteriorly directed dorsal spines of the first urosomite are unique in the genus *Bathyporeia*. However, one of the most remarkable characteristics of the species is

the occurrence in some specimens of a second group of posteromedian group of setae on the merus of the fifth pereopod. This disposition has never been observed before in the genus *Bathyporeia*. Such specimens are, however, rather uncommon. This disposition is reminiscent of that observed in *Amphiporeia lawrenciana* Shoemaker, 1929 as illustrated by Shoemaker (1930: 36, fig. 14b), in which there is often a single short seta behind the posteromedian seta group of the fifth pereopod.

Key to the East Atlantic *Bathyporeia* species known to occur in the eastern Atlantic between 14°N and 37°N

Southern records of *B. pilosa* Lindström, 1855 (see Elkaïm, 1974; Bayed, 1991), *B. pelagica* (Bate, 1857) (see Elkaïm, 1974; Marques, 1981; Marques and Bellan Santini, 1985; Dexter, 1988; Bayed, 1991; Cruz et al., 2003), *B. elegans* Watkin, 1938 (see Elkaïm, 1976), and *B. nana* Toulmond, 1966 (see Conradi and López-González, 1999) are considered either as unreliable or erroneous and these species have therefore been omitted from the key. *Bathyporeia* sp. is known from a single mutilated female from Dakar. This possibly undescribed species has been briefly described but not named by d'Udekem d'Acoz and Vader (2005a). Other species not known with certainty from the area such as *B. elegans*, *B. nana* and *B. phaiophthalma* Bellan-Santini, 1973 should also key out as *Bathyporeia* sp. A key to all known *Bathyporeia* species is given by d'Udekem d'Acoz and Vader (2005a).

1. Posterodistal seta group of merus of P5 with a short spiniform seta, shorter than half of carpus length 2
- Posterior seta group of merus of P5 with a long slender seta, longer than half of carpus length 3
2. Coxa 2 with anterior and posterior borders strongly diverging downwards. Carpus of P6 with one or two groups of spines on posterior border (in addition to distal group). Ventrolateral border of urosomite 1 with spiniform setae. Proximal dorsal setae of outer border of peduncle of U1 slender and rather long *Bathyporeia chevreuxi*
d'Udekem d'Acoz and Vader, 2005
- Coxa 2 with anterior and posterior borders parallel or nearly so. Carpus of P6 without groups of spines on posterior border (besides distal group). Ventrolateral border of urosomite 1 without spiniform setae. Dorsal setae of outer border of peduncle of U1 all stout and short Adult males of
B. guilliamsoniana (Bate, 1857)

3. Carpal fang of P3-P4 blunt-tipped with accessory setule. [Coxa 1 without tooth. Ep3 without posteroventral tooth] 4
- Carpal fang of P3-P4 with tip slender, without accessory setule 6
4. Dactylus of P3-P4 slender or robust, not curved and with short unguis. Second article of exopod of U3 with seta(e) on medial side only. Urosomite 1 with pair of anteriorly directed setae and one to three pairs of posteriorly directed spines (may be setiform and quite short) 5
- Dactylus of P3-P4 slender, curved and with long unguis. Second article of exopod of U3 with setae on both sides. Urosomite 1 with pair of anteriorly directed setae but without pair of posteriorly directed spines *B. elkaimi* d'Udekem d'Acoz and Menioui, 2004
5. Dorsal surface of second article of Mxp palp with four to six strong long setae in adults. Coxa 1 anteriorly not especially broad, without ventral angular discontinuity, without very short seta behind the anteroventral long setae. Dactylus of P3-P4 normally developed and fairly slender. Posterior border of basis of P7 straight or slightly concave. Ventrolateral surface of Ep3 with one or two transverse rows of spines in addition to two to four single spines. Urosomite 1 with pair of well developed and stout posteriorly directed dorsal conical spines (besides pair of anteriorly directed setae) *B. ledoyeri* d'Udekem d'Acoz and Menioui, 2004
- Dorsal surface of second article of Mxp palp with 13-17 strong long setae in adults. Coxa 1 usually anteriorly very broad, usually with ventral angular discontinuity, with characteristic very short seta behind the anteroventral long setae. Dactylus of P3-P4 very short and stout. Posterior border of basis of P7 convex. Ventrolateral surface of Ep3 with spines scattered and not forming transverse rows. Urosomite 1 with at least one pair of short and slender posteriorly directed dorsal setiform spines (besides pair of anteriorly directed setae) *B. watkini* sp. nov.
6. Ep3 with tooth 7
- Ep3 without tooth *Bathyporeia* sp.
7. Coxa 1 acute, with ventral tooth. Basis of P5-P7 with many setae on posterior border. Ep3 with many ventrolateral spines, most spines forming transverse rows. Second article of U3 with several setae on both sides. Up to 7 mm long Females and immature males of *B. guilliamsoniana* (Bate, 1857)
- Coxa 1 blunt, without ventral tooth. Basis of P5-P7 with one to three spines/setae on posterior border. Ep3 with one single spine. Second article of U3 with a seta on medial side and none on outer side. About 3 mm long *B. microceras* d'Udekem d'Acoz and Menioui, 2004

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