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## On two new or interesting species of the family Niphargidae from Greece and Croatia (Contribution to the knowledge of the Amphipoda 286)

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Received 24 December 2015 | Accepted 27 December 2015 | Published online 2 January 2016.

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### Abstract

New species of the family Niphargidae (Amphipoda Gammaridea), *Niphargus impexus*, sp. n. is described and figured from the well in Iraklion on Crete Island, Greece, and its taxonomical position within the genus *Niphargus* is discussed.

The species *Niphargus salonitanus* S. Karaman, 1950 is discovered at the first time on the Lastovo Island (spring Lokanj in Uble village) in the Adriatic Sea, and distribution of this species is mentioned.

**Key words:** taxonomy, new species, distribution, *Niphargus*, *impexus*, *salonitanus*, Greece, Croatia.

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### Introduction

The numerous discoveries of members of the family Niphargidae (Amphipoda: Gammaridea) in the subterranean waters over central and southern Europe during last 50 years indicated the presence of much higher number of species of this family in these waters as we supposed previously. The recognition of various species remains difficult because of the high morphological similarity of distinct taxa at one side, and high variability of some external morphological characters, at other side. Recently we described a new species *Niphargus spasenijae* G. Kar., 2015 from brackish waters of Tasos Island (Greece), a taxon similar to *Niphargus rhodi* S. Kar., 1950b known from Rhodes Island and close to *Niphargus longicaudatus*-Complex of taxa, where various species differs to each other by very small, distinct morphological characters.

During our recent study of material in hands from the subterranean waters of Croatia and Greece, one new species of the family Niphargidae, *Niphargus impexus*, sp. n. is discovered and new locality of *Niphargus salonitanus* S. Kar., 1950a is cited. This is the first citation of genus *Niphargus* on Crete Island.

### Material and Methods

The material of amphipods has been collected by hand-net in the wells and springs. Collected material was preserved in the 70% ethanol. The specimens were dissected using a WILD M20 microscope and drawn using camera lucida attachment. All appendages were temporarily submersed in the mixture of glycerine and

water for study and drawing. The body-length of examined specimens was measured from tip of head to end of telson using camera lucida. All illustrations were inked manually. After the end of the study, the dissected body-parts were submerged in Liquid of Faure and covered by cover glass for final preservation. Some morphological terminology and seta formulae follows Karaman's terminology (G. Karaman, 1969, 1993) for the last mandibular palpus [A= setae on outer face; B = setae on inner face; C = additional setae on outer face; D = lateral marginal setae; E = distal long setae] and for propodus of gnathopods 1 and 2 (G. Karaman, 2012) [S = corner spine; L = lateral slender serrate spines; M = facial setae; R = subcorner spine on inner face]. Terms "setae" and "spines" are used based on shape, not origin.

The advantage of use of Liquid of Faure is the possibility to remove the dissected body-parts from Liquid of Faure by water, and study it again in the various positions under the microscope. The new species is established based on provided morphological and ecological investigations and data.

## Taxonomical part

Family Niphargidae

*Niphargus impexus* sp. n.

Figures 1-9

## Material examined:

S-6186= Greece: Crete Island, Iraklion (=Irakleio), well 1 km after Panagio-Nigaditos, 4.5.1995, 5 adult spec. and numerous very small juv. spec. (leg. R. Agrano).

## Diagnosis

Maxilla 1 with 2-3 setae, 6 spines of outer plate with 1 lateral tooth each. Mandible palpus on inner face with several bunches of B-setae.

Coxa 1 shallow, with subrounded ventroanterior corner, coxa 4 without posterior lobe. Coxa 5 with subrounded anterior lobe. Epimeral plates 1-2 subangular, epimeral plate 3 angular. Gnathopods 1-2 with trapezoid propodus bearing moderately inclined palm and dactylus with several setae along outer margin. Pereopods 5-7 with article 2 dilated, but without distinct ventroposterior lobe. Dactylus of pereopods 3-7 moderately strong, with one spine and short seta at inner margin near basis of the nail.

Pleopods with 2 retinacula, peduncle of pleopods scarcely setose or naked. Urosomal segment 1 in male and female with 1 seta on each dorsolateral side, 1-2 spines on each dorsolateral side of urosomal segment 2.

Uropod 1 in male and female with equally long rami, peduncle with dorsointernal row of setae (only 1 median seta). Uropod 2 with inner ramus slightly longer than outer one. Uropod 3 elongated in males, with long second article of outer ramus. Uropod 3 in females narrowed, with second article of outer ramus exceeding  $\frac{1}{4}$  of first article. Telson short, with marginal and distal spines.

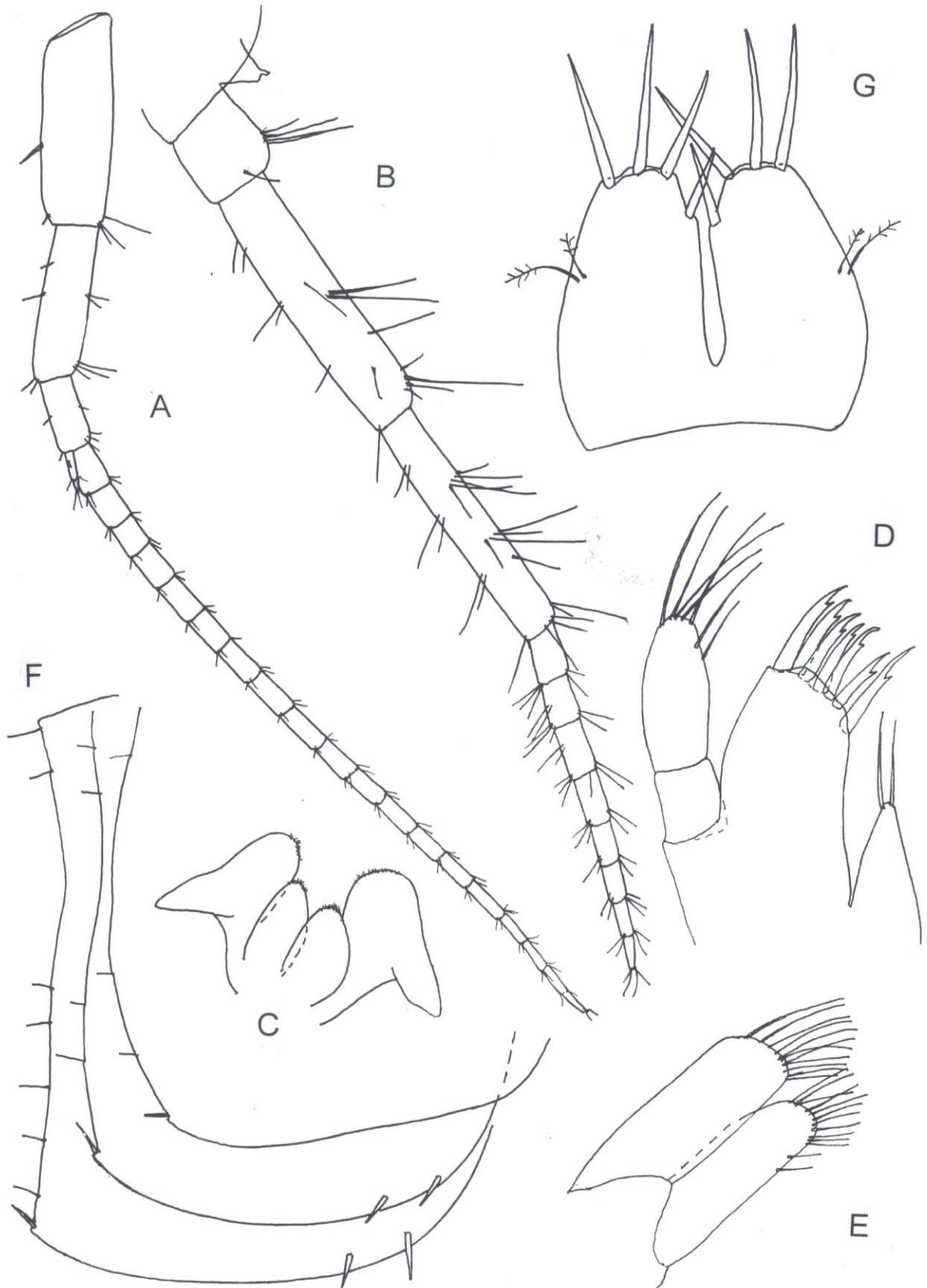
## Description

**Male 9.8 mm (holotype):** Body moderately slender, metasomal segments 1-3 with 4-6 dorsoposterior marginal setae each (fig. 1F). Epimeral plate 1 subrounded, with marked ventroposterior corner defined by 1 strong seta; along posterior convex margin appear 3 setae. Epimeral plate 2 poorly angular, with defined ventroposterior corner and convex posterior margin bearing 2-3 setae; epimeral plate 3 distinctly angular, with straight and poorly inclined posterior margin bearing 5-6 setae; epimeral plates 2 and 3 with 2 subventral spines each (fig. 1F).

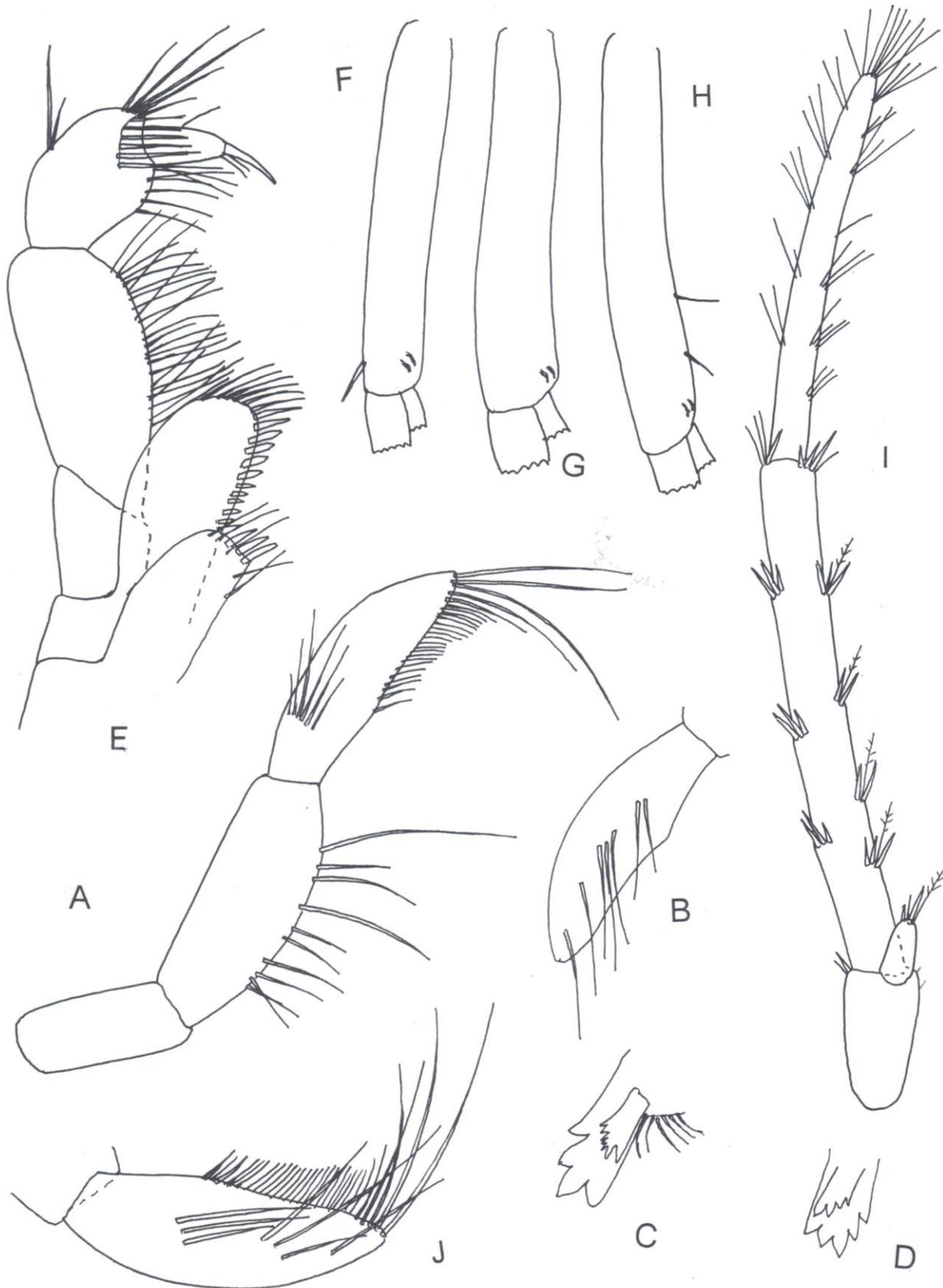
Urosomal segment 1 on each dorsolateral side with 1 seta (fig. 4G); urosomal segment 2 at each dorsolateral side with 2 spines of 1 spine and 1 seta (fig. 4G); urosomal segment 3 naked. Urosomal segment 1 on each ventroposterior corner with one short spine (fig. 4G).

Head with short rostrum and short subrounded lateral cephalic lobes and ventroanterior sinus (fig. 4B), eyes absent.

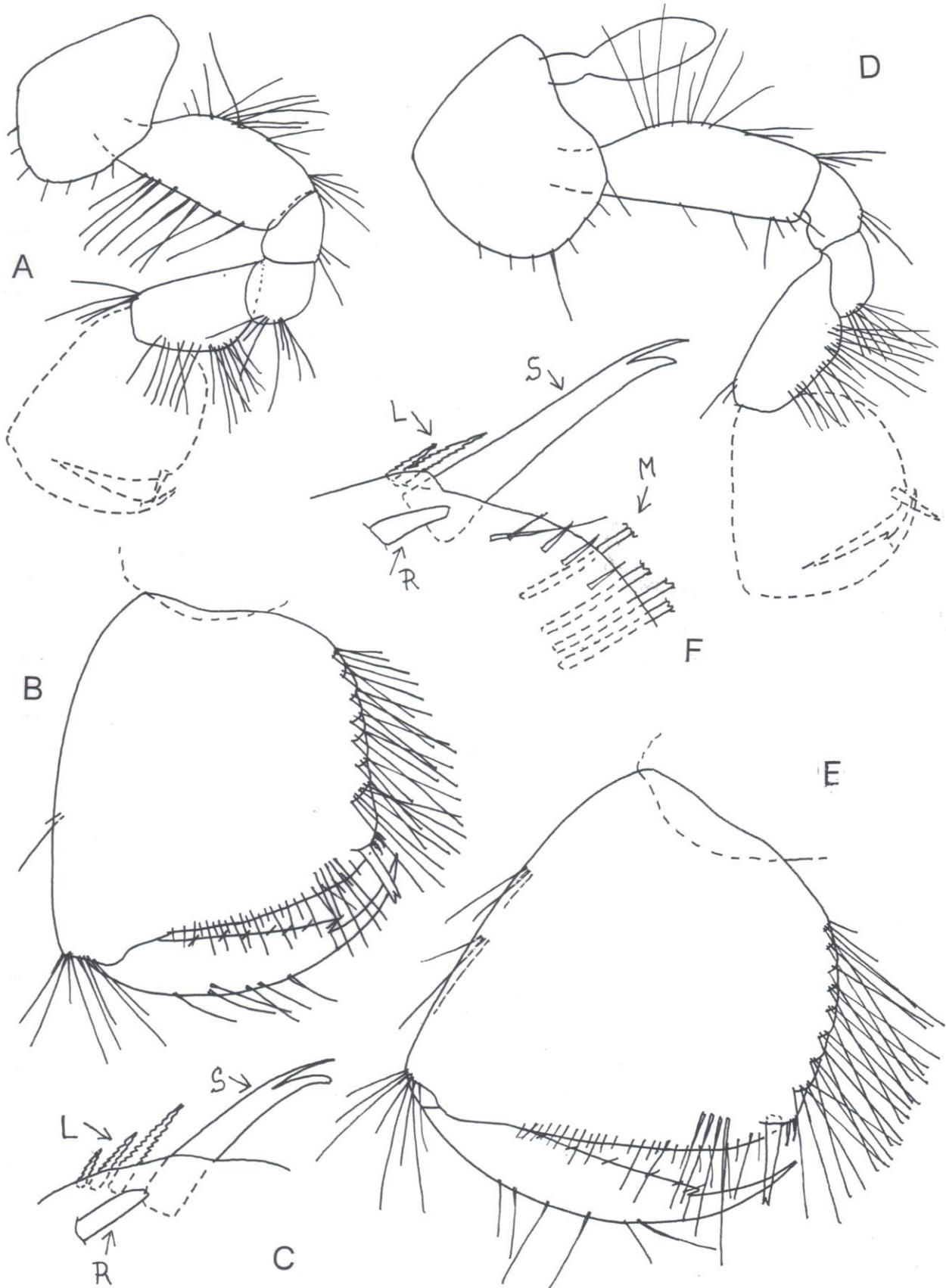
Antenna 1 slightly shorter than half of body-length (ratio: 43:98); peduncular articles 1-3 progressively shorter (ratio: 55:41:20), scarcely setose (fig. 1A); peduncular article 1 with one median spine-like seta; main flagellum consisting of 19 articles (most of them with one aesthetasc); accessory flagellum short, 2-articulated (fig. 1A).



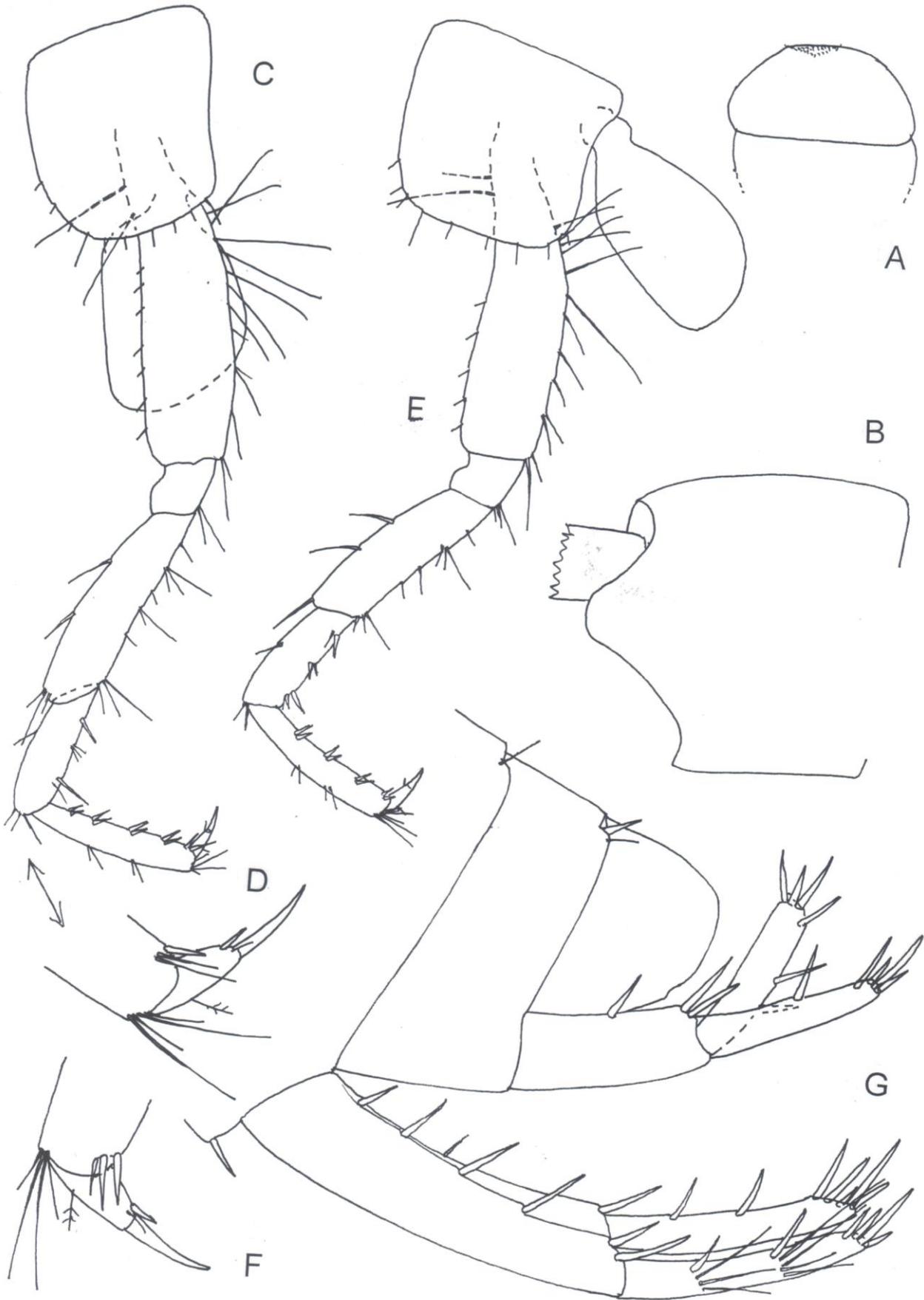
**Figure 1.** *Niphargus impexus*, sp. n., Iraklion, Crete Island, Greece, male 9.8 mm: **A** antenna 1; **B** antenna 2; **C** labium; **D** maxilla 1; **E** maxilla 2; **F** epimeral plates 1-3; **G** telson.



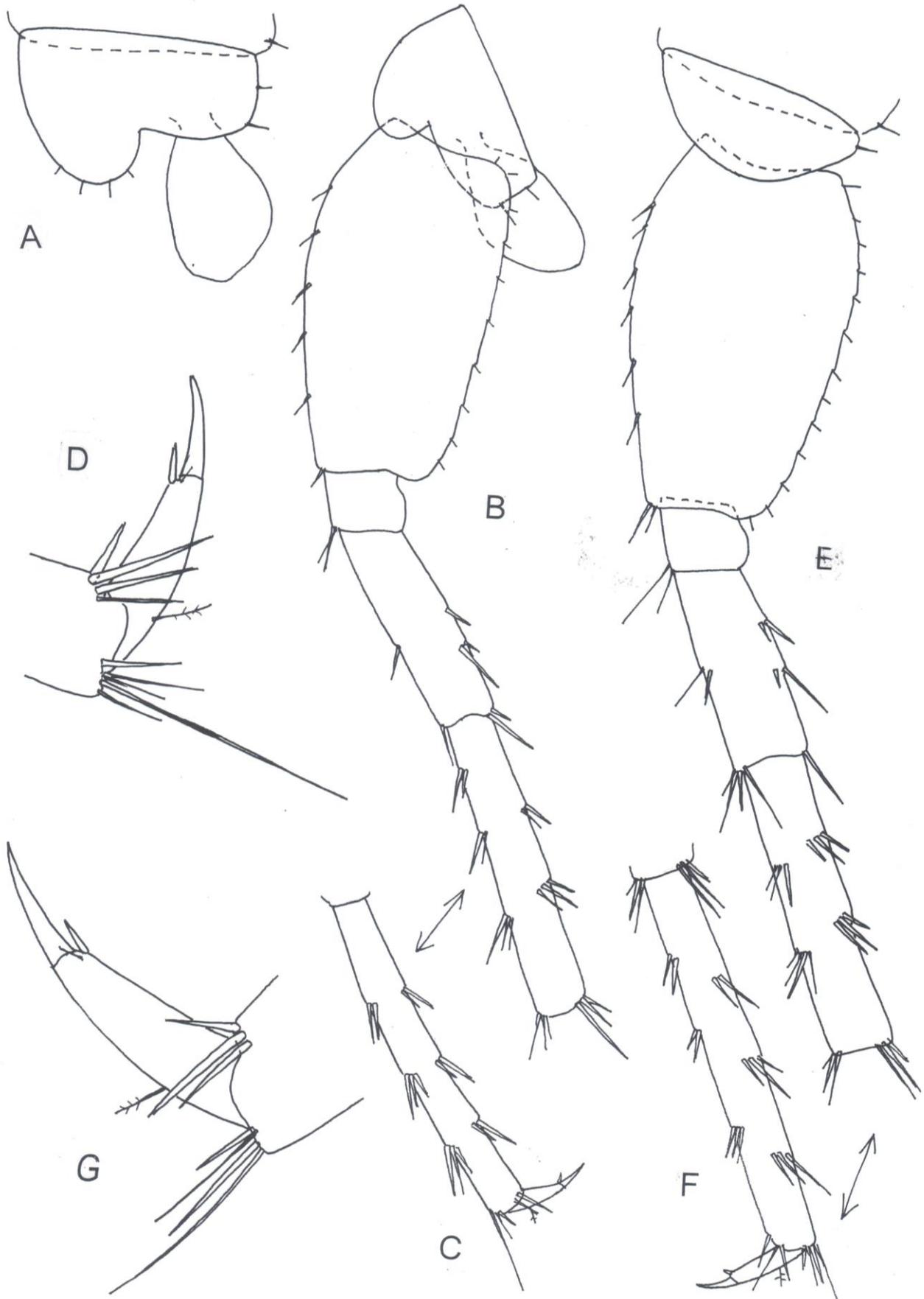
**Figure 2.** *Niphargus impexus*, sp. n., Iraklion, Crete Island, Greece, male 9.8 mm: **A** mandible palpus, outer face; **B** distal mandible palpus article, inner face with B-setae; **C** right mandible incisor, lacinia mobilis and rakers; **D** left mandible incisor and lacinia mobilis; **E** maxilliped; **F** peduncle of pleopod 1; **G** peduncle of pleopod 2; **H** peduncle of pleopod 3; **I**= uropod 3. Female 9.2 mm: **J** third palp article of mandible, inner face with B, D and E-setae.



**Figure 3.** *Niphargus impexus*, sp. n., Iraklion, Crete Island, Greece, male 9.8 mm: **A-B** gnathopod 1, outer face; **C** distal corner of gnathopod 1 propodus, inner face [S-corner spine; L-lateral spines; R-subcorner spine]; **D-E** gnathopod 2, outer face; **F** distal corner of gnathopod 1 propodus, inner face [S-corner spine; L-lateral spines; R-subcorner spine; M-facial setae].



**Figure 4.** *Niphargus impexus*, sp. n., Iraklion, Crete Island, Greece, male 9.8 mm: **A** labrum; **B** head; **C-D** pereopod 3; **E-F** pereopod 4; **G** urosome with uropods 1-2.



**Figure 5.** *Niphargus impexus*, sp. n., Iraklion, Crete Island, Greece, male 9.8 mm: **A** coxa 5; **B-C-D** pereopod 6; **E-F-G** pereopod 7.

Antenna 2 moderately slender, more setaceous: article 3 short, with one distal bunch of setae up to as long as diameter of article itself; peduncular article 4 slightly shorter than article 5 (ratio: 68:73), along ventral margin with median and distal setae (the longest setae exceeding diameter of articles themselves) (fig. 1B), along dorsal margin setae are shorter. Article 5 along ventral margin with 2 median and one distal bunch of setae (the longest setae exceeding diameter of article itself); flagellum is longer than last peduncular article and consisting of 8 articles bearing marginal setae (fig. 1B). Antennal gland cone short (fig. 1B).

Mouthparts. Labrum broader than long with convex distal margin (fig. 4A).

Labium broader than long, outer lobes entire, subrounded distally (fig. 1C).

Mandible molar triturative. Right mandible: incisor with 4 teeth, lacinia mobilis bifurcate, with several unequal teeth accompanied by 6-7 rakers (fig. 2C). Left mandible: incisor with 5 teeth, lacinia mobilis with 4 teeth accompanied by 7 rakers (fig. 2D). Mandible palpus 3-articulated: first article naked; second article with 10 setae (fig. 2A); palpus article 3 slightly shorter than article 2 (ratio: 67:70), with 20-22 D-setae and 5-6 distal E-setae; on outer face is attached one bunch of 6 A setae (fig. 2E), on inner face appear 4 groups of B-setae (2-3-1-1) (fig. 2B).

Maxilla 1: inner plate with 2 distal setae (fig. 1D), outer plate with 7 spines: Inner spines with 1-3 lateral teeth, other 6 spines with one lateral tooth each (fig. 1D); palpus 2-articulated, not exceeding distal tip of outer plate spines and provided with 7 setae.

Maxilla 2: inner plate is rather smaller than outer one, both plates with marginal setae only (fig. 1E).

Maxilliped: inner plate not reaching outer distal margin of palpus article 1 and bearing 3 distal smooth spines mixed with single setae (fig. 2E); outer plate not exceeding half of palpus article 2, with row of distomarginal smooth spines; palpus article 2 at inner margin with numerous setae; article 3 at outer margin with one median and one distal bunch of setae (fig. 2E); article 4 (dactylus) along inner margin with 2 setae near basis of the nail, along outer margin with one median seta, nail is shorter than pedestal (fig. 2E).

Coxae relatively short. Coxa 1 much broader than long (ratio: 45:33), with subrounded ventroanterior corner and 7 marginal setae (fig. 3A); coxa 2 poorly longer than broad (ratio: 48:46), with 8 marginal setae (fig. 3D); coxa 3 longer than broad (ratio: 55:50), bearing 10 setae (fig. 4C); coxa 4 poorly broader than long (ratio: 53:50), bearing 9 marginal setae, ventroposterior lobe is not developed (fig. 4E).

Coxa 5 broader than long (ratio: 60:39), anterior lobe subrounded, bearing 4 setae, posterior minor lobe with 2 marginal setae (fig. 5A). Coxa 6 smaller than coxa 5, broader than long (ratio: 50:32), anterior lobe subrounded, posterior lobe with 2 marginal setae (fig. 5B). Coxa 7 entire, broader than long (ratio: 55:24), with convex ventral margin (fig. 5E).

Gnathopods 1-2 of moderate size, propodus of gnathopod 2 nearly as large as corresponding coxa. Gnathopod 1 slightly smaller than gnathopod 2, with article 2 short, along anterior and posterior margin with numerous long setae (fig. 3A); article 3 at posterior margin with one bunch of setae; article 5 slightly shorter than propodus (ratio: 35:47). Propodus trapezoid, slightly longer than broad (ratio: 98:83), along posterior margin with 7 transverse rows of setae (fig. 3B). Palm slightly convex, inclined almost half of propodus-length, defined on outer face by 1 corner S-spine accompanied laterally by 3 L-spines and 5 facial M-setae (fig. 3C), on inner face by one subcorner R-spine (fig. 3C). Dactylus reaching or almost exceeding posterior margin of propodus, along outer margin with 6 median setae, along inner margin with 5-7 short setae (fig. 3B).

Gnathopod 2: article 2 along anterior margin with shorter setae, along posterior margin with row of long setae in proximal part (fig. 3D); article 3 at posterior margin with one bunch of setae; article 5 poorly shorter than propodus: (ratio: 45:48). Propodus trapezoid, slightly longer than broad (ratio: 102:95), along posterior margin with 8 transverse rows of setae (fig. 3E). Palm slightly convex, inclined nearly half of propodus-length, defined on outer face by one corner S-spine accompanied laterally by 2 L-spines and 4 facial M-setae (fig. 3F), on inner face by one short subcorner R-spine (fig. 3F). Dactylus reaching or almost exceeding posterior margin of propodus, along outer margin with row of 6 single setae, on inner margin with row of 5-6 short setae (fig. 3E).

Pereopods 3 and 4 similar to each other, moderately slender. Pereopod 3: article 2 along posterior proximal margin with row of long setae, along anterior margin with row of short distal setae. Articles 4-6 of different length (ratio: 57:35:43), scarcely setose; article 4 along posterior margin with several single or bunches of setae (fig. 4C); article 5 at posterior margin with 2 groups of strong spine-like setae; article 6 along posterior margin with 5 bunches of short spines; dactylus much shorter than pedestal (ratio: 17:43), at

inner margin with one spine and seta near basis of the nail (fig. 4D), at outer margin with one median plumose seta; nail shorter than pedestal (ratio: 25:30) (fig. 4D).

Pereopod 4: article 2 along distoanterior margin with short setae, along proximoposterior margin with long setae (fig. 4E); articles 4-6 of different length (ratio: 47:33:46); article 4 along posterior margin with setae only; article 5 along posterior margin with 3 bunches of short spines; article 6 along posterior margin with 4 bunches of short spines. Dactylus much shorter than article 6 (ratio: 17:46), at inner margin with one spine and short seta near basis of the nail (fig. 4F), along outer margin with one median plumose seta; nail shorter than pedestal (ratio: 23:28).

Pereopod 5 missing.

Pereopod 6 slightly shorter than pereopod 7, with article 2 much longer than broad (ratio: 92:48), along anterior margin with row of 6 spine-like setae (fig. 5B), along posterior poorly convex margin with 10 setae, ventroposterior lobe is not fully developed. Articles 4-6 of various length (ratio: 57:79:90), along both margins with bunches of short spines (fig. 5B); article 6 is almost as long as article 2 (ratio: 90:92) (fig. 5C). Dactylus moderately strong, much shorter than article 6 (ratio: 23:90), along inner margin with one spine and short seta near basis of the nail, along outer margin with one median plumose seta (fig. 5D); nail is shorter than pedestal (ratio: 25:55).

Pereopod 7: article 2 slightly broader than that of pereopod 6, much longer than broad (ratio: 97:56), along anterior slightly convex margin with row of 7 spine-like setae, along posterior margin with 13 setae, ventroposterior lobe not fully developed (fig. 5E). Articles 4-6 of different length (ratio: 55:78:102), along both margins with bunches of short spines and some single setae (fig. 5F). Article 2 is poorly shorter than article 6 (ratio: 97:102). Dactylus moderately strong, much shorter than article 6 (ratio: 29:102), along inner margin with one spine and short seta near basis of the nail, along outer margin with one median plumose seta (fig. 5G); nail is shorter than pedestal (ratio: 35:65).

Pleopods 1-3 with 2 retinacula each. Peduncle of pleopod 1 along anterior margin with one distal strong seta (fig. 2F); peduncle of pleopod 2 naked (fig. 2G); peduncle of pleopod 3 along posterior margin with 2 median strong spine-like setae (fig. 2H).

Uropod 1: peduncle longer than rami, with dorsoexternal row of spines, along dorsointernal margin appears only one median seta and distal spine (fig. 4G); rami nearly of equal length, outer ramus with 2 median and one distal bunch of moderately long spines, as well as with 2 lateral bunches of simple setae longer than spines (fig. 4G).

Uropod 2: peduncle with dorsal median and distal strong spines. Rami nearly of equal length; outer ramus with 2 lateral single strong spines and one bunch of 4 distal strong spines (fig. 4G); inner ramus with 2 lateral and 4 distal strong spines, spines remarkably shorter than half of rami-length (fig. 4G).

Uropod 3 long, peduncle nearly twice longer than broad, with 2-3 distal short spines. Inner ramus scale-like, much shorter than peduncle, bearing 3 distal spines and one long plumose seta (fig. 2 I). Outer ramus 2-articulated: first article along outer margin with 4 bunches of short spines (fig. 2 I), along inner margin with 5 bunches of spines accompanied by single plumose setae longer than spines themselves; second article slightly shorter than first article (ratio: 103:133), along both margins and tip with bunches of setae as long as or longer than diameter of article itself (fig. 2 I).

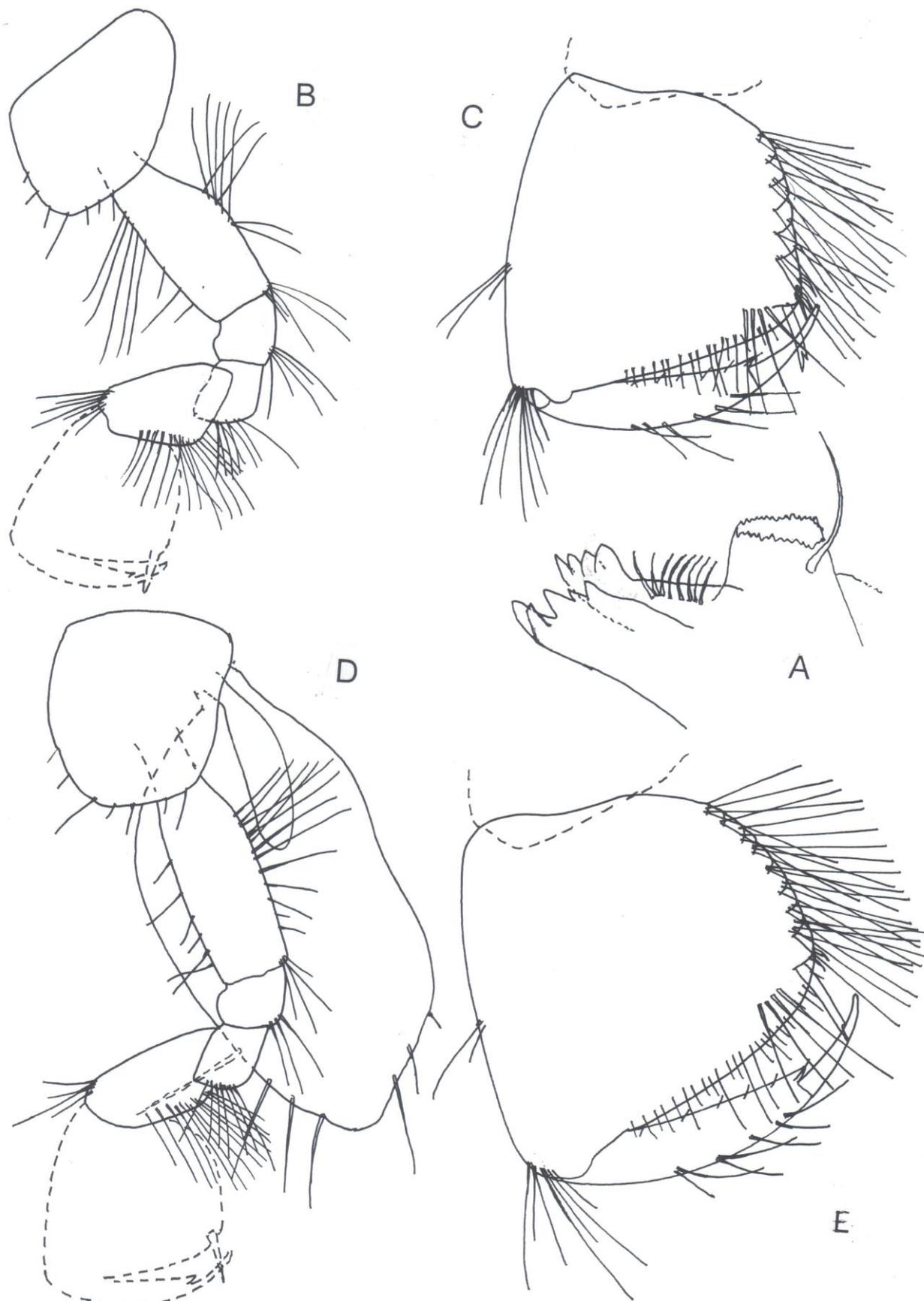
Telson slightly broader than long (ratio: 80:73), deeply incised over 2/3 of telson-length (fig. 1G); each lobe with 3 long distal spines (the longest spines reaching or almost exceeding half of telson-length) (fig. 1G); one distolateral spine is attaches at inner margin of each lobe; a pair of short plumose setae is attached near the middle of each lobe (fig. 1G).

Coxal gills ovoid, not reaching ventral margin of article 2 of corresponding leg (figs. 3D, 4C, 4D, 5A, 5B).

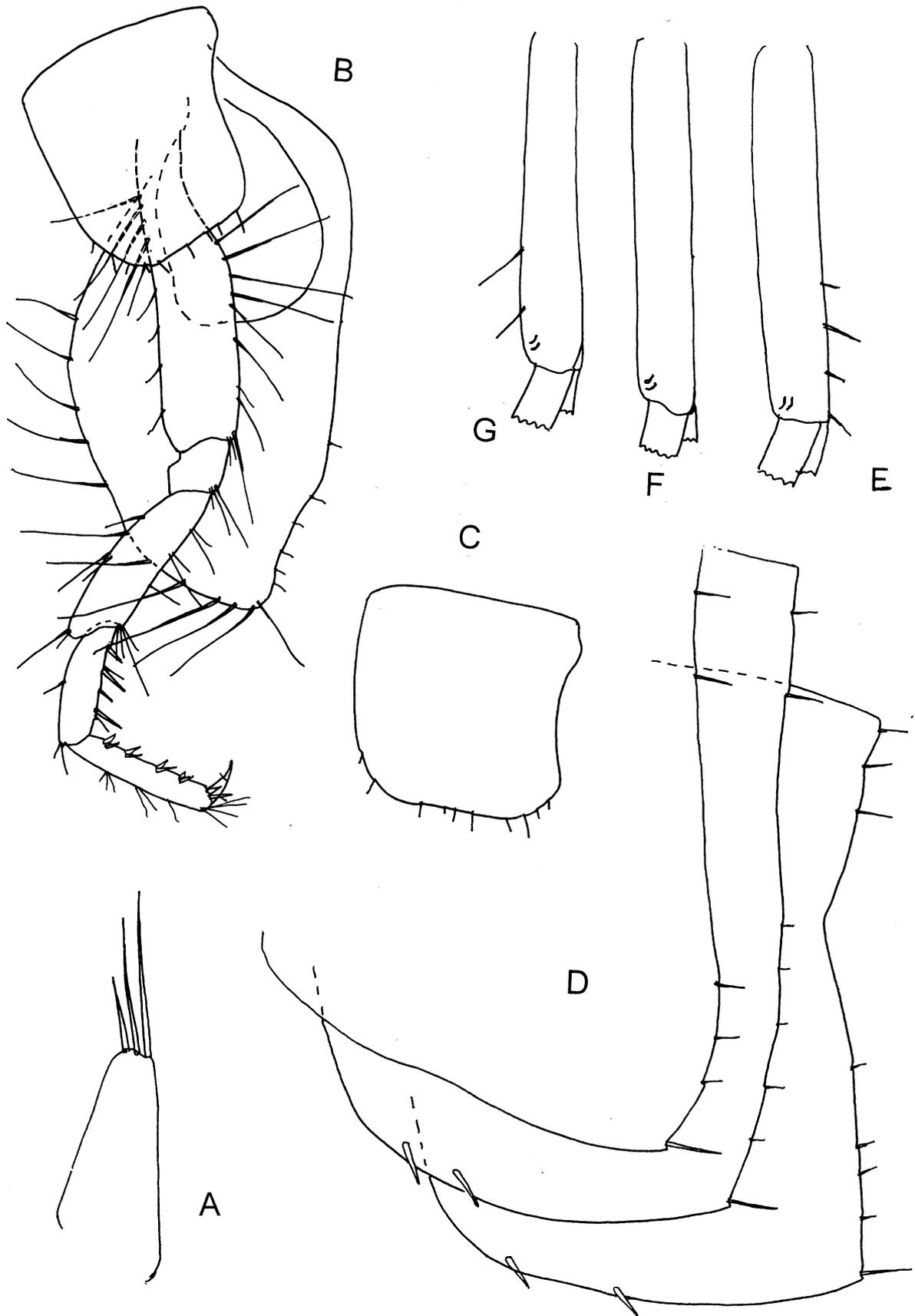
### **Female 9.2 mm with setose oostegites (paratype):**

Body moderately slender, slightly broader than that in male. Metasomal segments 1-3 with 4-6 dorsoposterior marginal setae each (fig. 7D). Urosomal segment 1 on each dorsolateral side with 1 seta; urosomal segment 2 on each dorsolateral side with 1 spine and 1 strong seta; urosomal segment 3 naked. Urosomal segment 1 at ventroposterior corner with one spine near basis of the uropod 1 peduncle.

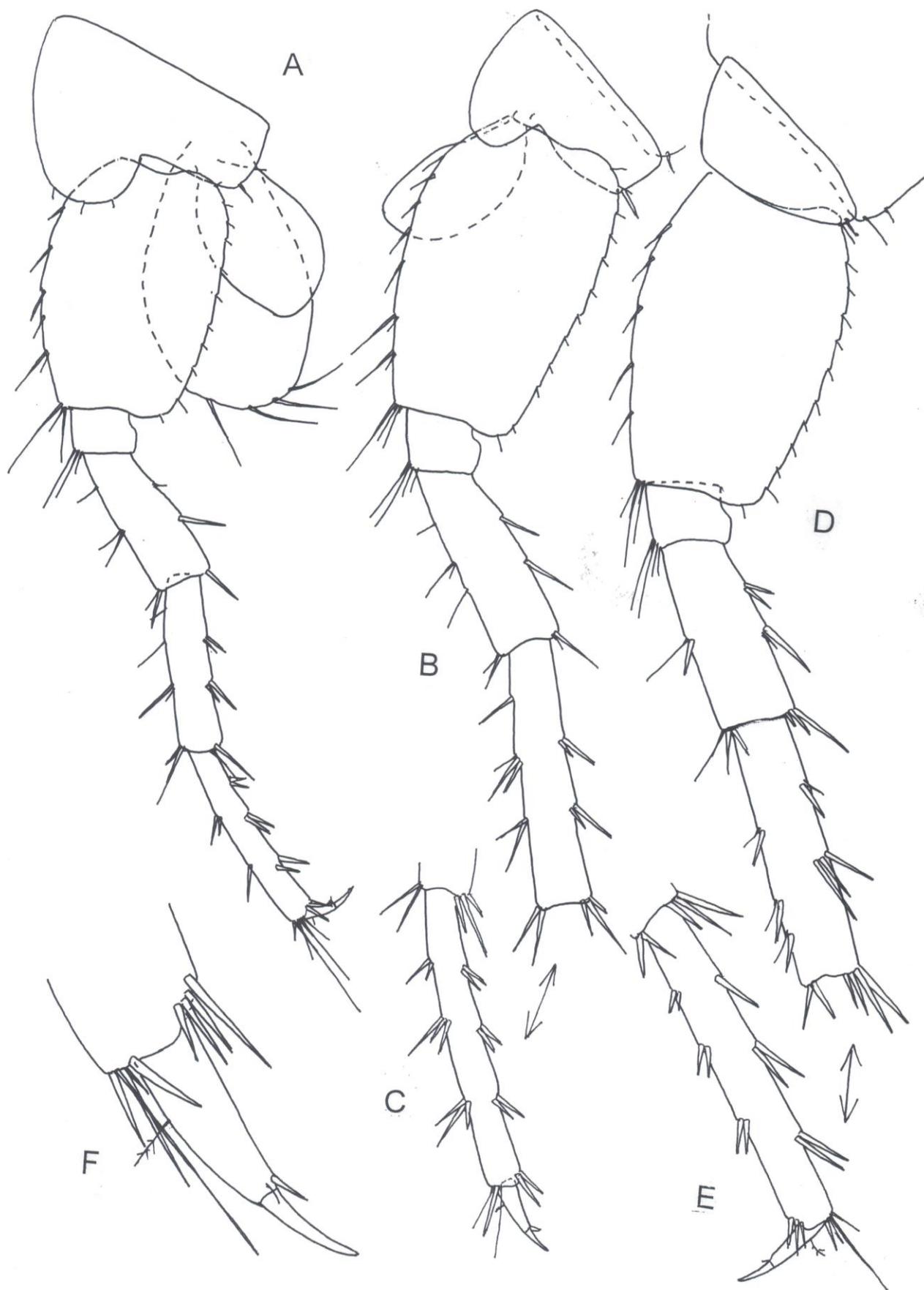
Epimeral plates 1-2 obtusely angular with well marked ventroposterior corner defined by strong spine-like seta and poorly convex posterior margin bearing 3-5 setae (fig. 7D). Epimeral plate 3 distinctly angular, with nearly straight inclined posterior margin bearing 4 setae; two subventral spines are attached on epimeral plates 2 and 3 (fig. 7D).



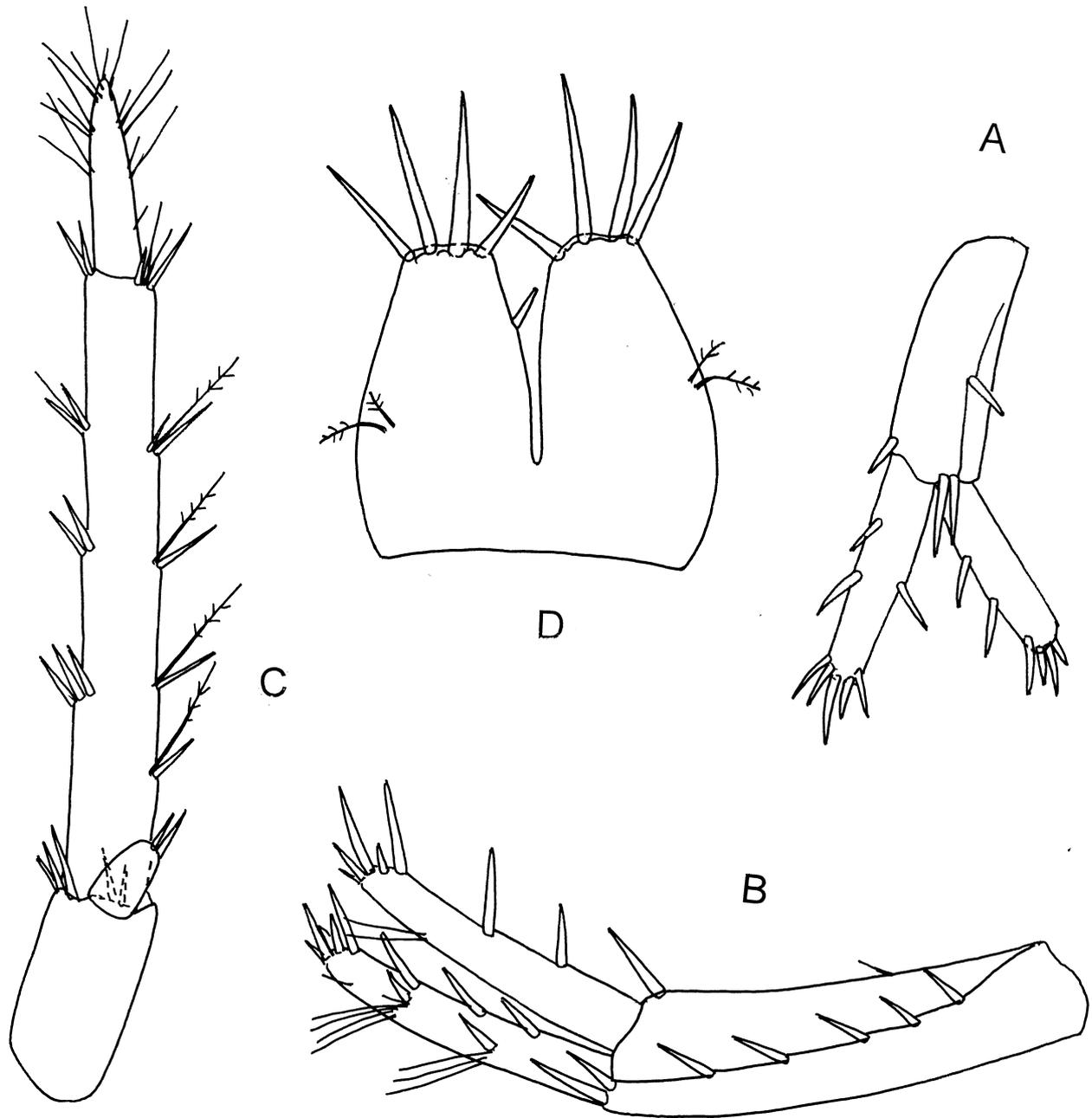
**Figure 6.** *Niphargus impexus*, sp. n., Iraklion, Crete Island, Greece, female 9.2 mm: **A** left mandible, incur and lacinia mobilis; **B-C** gnathopod 1, outer face; **D-E** gnathopod 2, outer face.



**Figure 7.** *Niphargus impexus*, sp. n., Iraklion, Crete Island, Greece, female 9.2 mm: **A** inner plate of maxilla 1; **B** pereopod 3; **C** coxa 4; **D** epimeral plates 1-3; **E** peduncle of pleopod 1; **F** peduncle of pleopod 2; **G** peduncle of pleopod 3.



**Figure 8.** *Niphargus impexus*, sp. n., Iraklion, Crete Island, Greece, female 9.2 mm: **A** pereopod 5; **B-C** pereopod 6; **D-E-F** pereopod 7.



**Figure 9.** *Niphargus impexus*, sp. n., Iraklion, Crete Island, Greece, female 9.2 mm: **A** uropod 1; **B** uropod 2; **C** uropod 3; **D** telson.

Head like that in male. Antenna 1 reaching almost half of body-length (ratio: 45:92), pilosity like that in male. Peduncular articles 1-3 progressively shorter (ratio: 50:40:19); main flagellum consisting of 19 articles (most of them with one aesthetasc).

Antenna 2: peduncular article 4 slightly longer than article 5 (ratio: 47:39), along ventral margin with one median and one distal bunch of setae (the longest setae are longer than diameter of the article itself); article 5 along ventral margin with 3 bunches of setae longer than diameter of the article itself; flagellum consisting of 8 articles.

Mouthparts rather similar to these in male. Left mandible: incisor with 5 teeth, lacinia mobilis with 4 teeth and 8 rakers (fig. 6A); right mandible: incisor with 4 teeth, lacinia mobilis bifurcate, serrate, accompanied by 6 rakers; palpus article 2 with 12 setae; distal article with nearly 21 D-setae and 5 distal E-setae, on inner face appear 7 B-setae (3-1-2-1; or 3-3-1) (fig. 2J), on outer face is attached one bunch of 7 A-setae.

Maxilla 1 inner plate with 3 setae (fig. 7A), outer plate with 7 spines (one spine with 3 lateral teeth, 6 spines with one lateral tooth), palpus with 7 distal setae. Maxilliped: inner plate with 3 distal spines accompanied by several setae, palpus article 4 at inner margin with 2 setae near basis of the nail.

Coxa 1 broader than long (ratio: 40:35), with subrounded ventroanterior corner and bearing 7 marginal setae (fig. 6B). Coxa 2 slightly longer than broad (ratio: 51:46), with 7 marginal setae (fig. 6D). Coxa 3 longer than broad (ratio: 58: 54), with 9 marginal setae (fig. 7B); coxa 4 nearly as long as broad, without ventroposterior lobe and bearing nearly 10 marginal setae (fig. 7C).

Coxa 5 broader than long (ratio: 63:45), with subrounded anterior lobe, posterior shallow lobe with ventroposterior corner spine-like seta (fig. 8A). Coxa 6 smaller than 5, broader than long (ratio: 54:36), anterior lobe subrounded, posterior lobe with strong ventroposterior corner spine-like seta (fig. 8B). Coxa 7 entire, broader than long (ratio: 54:25), with convex ventral margin and bearing ventroposterior spine-like seta (fig. 8D).

Gnathopod 1 slightly smaller than gnathopod 2, with article 2 bearing proximoanterior row of long setae and short distoanterior several setae (fig. 6B), along posterior margin with numerous long setae; article 3 at posterior margin with one bunch of setae. Article 5 shorter than propodus (ratio: 33:40), along anterior margin with distal bunch of setae (fig. 6B). Propodus (article 6) trapezoid, slightly longer than broad (ratio: 83:76), along posterior margin with 6 transverse groups of setae (fig. 6C); palm slightly convex, inclined nearly half of propodus-length, defined on outer face by one corner S-spine accompanied laterally by 3 L-spines and 4 facial M-setae (fig. 6C), on inner face by one subcorner R-spine. Dactylus reaching or almost exceeding posterior corner of propodus, along outer margin with row of 6 median single setae, along inner margin with 6-8 short setae (fig. 6C).

Gnathopod 2: article 2 along anterior margin with row of shorter setae, along posterior margin with numerous long setae; article 3 at posterior margin with one bunch of setae (fig. 6D); article 5 shorter than propodus (ratio: 38:46), along anterior margin with one distal bunch of setae. Propodus trapezoid, almost as long as broad (ratio: 89:92), along posterior margin with 8 transverse bunch of setae (fig. 6E). Palm slightly convex, inclined nearly half of propodus-length, defined on outer face by one corner S-spine accompanied laterally by 2 L-spines and 4 long facial M-setae, on inner face by one subcorner R-spine. Dactylus reaching posterior margin of propodus, along outer margin with row of 7 single and paired setae (2-2-1-1-1), along inner margin with 7-8 short setae (fig. 6E).

Pereopods 3-4 rather similar to each other. Pereopod 3: article 2 at anterior margin with row of several proximal long setae and distal short setae, along posterior margin with numerous long setae. Articles 4-6 of unequal length (ratio: 45:33:40), article 4 along both margins with setae (the longest setae are longer than diameter of article itself); article 5 at posterior margin with single spines and setae (fig. 7B); article 6 at posterior margin with 5 bunches of short spines and single short setae. Dactylus much shorter than article 6 (ratio: 14:40), along inner margin with one spine and short seta near basis of the nail, along outer margin with one median plumose seta.

Pereopod 4 like pereopod 3.

Pereopod 5 remarkably shorter than pereopods 6 and 7, with article 2 longer than broad (ratio: 68:46), along convex anterior margin with row of 6 groups or single spine-like setae, along posterior margin with 11 short setae, ventroposterior lobe poorly marked (fig. 8A). Articles 4-6 of unequal length (ratio: 43:48:53), along both margins with bunches of strong spines. Article 2 is longer than article 6 (ratio: 68:55). Dactylus is much shorter than article 6 (ratio: 17:53), at inner margin with one spine and short seta near basis of the nail, at outer margin with one median plumose seta, nail shorter than pedestal.

Pereopod 6: article 2 remarkably longer than broad (ratio: 84:51), along anterior convex margin with row of 8 single or paired spine like setae, setae in distal part are longer than these in proximal part (fig. 8B), along posterior poorly convex margin with 12 short setae; ventroposterior lobe poorly marked (fig. 8B). Articles 4-6 of unequal length (ratio: 55:70:82), along both margin with strong spines and single setae (fig. 8C). Article 2 is hardly longer than article 6 (ratio: 84:82). Dactylus much shorter than article 6 (ratio: 22:82), at inner margin with one spine and short seta near basis of the nail, at outer margin with one median plumose seta, nail shorter than pedestal.

Pereopod 7: article 2 longer than broad (ratio: 85:52), along anterior convex margin with row of 5 median spine-like setae and distal bunch of setae, along posterior convex margin with 12 short setae, ventroposterior lobe poorly marked (fig. 8D). Articles 4-6 of unequal length (ratio: 51:73:95), along both margins with bunches of strong spines (fig. 8E). Article 2 is slightly shorter than article 6 (ratio: 85:95).

Dactylus is much shorter than article 6 (ratio: 28:95), at inner margin with spine and short seta near basis of the nail, at outer margin with one median plumose seta (fig. 8F); nail is shorter than pedestal (ratio: 28:52).

Pleopods 1-3 with 2 retinacula each. Peduncle of pleopod 1 at anterior margin with 4 setae in distal part (fig. 7E); peduncle of pleopod 2 naked (fig. 7F); peduncle of pleopod 3 at posterior margin with 2 strong setae in distal part (fig. 7G).

Uropod 1: peduncle longer than rami, with dorsoexternal row of strong spines, at dorsointernal margin appears one median seta and one distal spine (fig. 9B). Rami of the same length; outer ramus with 3 dorsomedian and 2 dorsofacial strong spines and with 5 distal short spines; 2 median bunches of simple setae longer than spines are attached laterally on outer ramus. Inner ramus with 2 strong dorsolateral strong spines and one lateral bunch of simple setae, as well as with 5 short strong distal spines (fig. 9B).

Uropod 2: peduncle with dorsal and distal spines. Outer ramus is slightly shorter than inner ramus, both rami with strong short lateral and distal spines (fig. 9A).

Uropod 3 relatively narrow, with peduncle nearly twice as long as broad (fig. 9C), with distal spines. Inner ramus short, scale-like, much shorter than peduncle and bearing 2 distal spines (fig. 9C). Outer ramus 2-articulated: first article along outer margin with 4 bunches of strong short spines, along inner margin with 5 bunches of slender spines and single long plumose setae (fig. 9C); second article remarkably shorter than first article (ratio: 43:130), along both margins and tip with bunches of simple setae (fig. 9C).

Telson relatively short, poorly broader than long (ratio: 73:69), incised over 2/3 of telson-length; each lobe with 4 distal spines [the longest spines exceeding half of telson-length (ratio: 34:43)] (fig. 9D); one lateral spine is attaches at inner margin of left lobe. A pair of short plumose setae is attached at margin near the middle of each lobe (fig. 9D).

Coxal gills 3-6 ovoid, never reaching ventral margin of corresponding article 2 of the legs (figs. 7B, 8A, 8B); coxal gill on gnathopod 2 narrow and small (fig. 6D).

Oostegites very large, provided with long marginal setae (figs. 6D, 7B, 8A).

**Variability:** Variability of male unknown. Characters of other females agree with paratype, including equal rami of uropod 1 and short second article of uropod 3 outer ramus.

**Locus typicus:** Greece: Crete Island, Iraklion, well 1 km after Panagio-Nigaditos.

**Distribution:** Known only from type-locality.

**Derivatio nominis.** The name *impexus* came from the Latin “impexus” meaning “disheveled” alluding to the numerous B setae on mandibular palpus.

**Remarks and affinities.** *Niphargus impexus* sp. n. is rather similar to *Niphargus hvarensis* S. Karaman, 1952a, described from Hvar Island (Adriatic Sea) (rami of uropod 1 in males and females of equal length, 2 retinacula on pleopods 1-3, shape of gnathopods 1-2 propodus, presence of one spine at inner margin of dactylus in pereopods 3-7, etc.) but *N. impexus* differs from this species by less number of setae on maxilla 1 inner plate, by lower number of spines and setae on urosomal segments 1 and 2, absence of facial spines on telson, etc.

*Niphargus boskovici* S. Kar., 1952b, known from Bosnia and Herzegovina [loc. typ.: Vjetrenica Cave in Popovo polje], is also rather similar to our species (rami of uropod 1 in males of the equal length, 2 retinacula on pleopods 1-3, one spine at inner margin of dactylus in pereopods 5-7, etc.), but *N. boskovici* differs from *N. impexus* by more pointed epimeral plate 3, higher number of distal spines on maxilliped inner plate, etc.

*Niphargus pedemontanus* Ruffo, 1937 known from northern Italy (Grotta di Oropa), has also equal rami of uropod 1 in males, 2 retinacula, angular epimeral plates, etc., but this species differs from *N. impexus* by narrowed basipodit of pereopods 5-7, different armature of telson, etc.

Regarding the known *Niphargus* species from Greece, our species is rather similar to *Niphargus rhodi* S. Karaman, 1950b [loc. typ.: spring Nympha on Prophetic Mt, Rhodes Island], but *N. rhodi* (female) differs from our species (female) by obtuse epimeral plate 3, more narrowed article 2 of pereopods 5-7, shorter peduncle and distal article of outer ramus in uropod 3 (female), strong spine at inner margin of dactylus in pereopods 3-7, by more narrowed telson bearing higher number of spines, less inclined palm of

gnathopods 1-2, by narrower gnathopod 2 propodus, by presence of 4-5 distal spines on maxilliped inner plate, etc.

As the male of *N. rhodi* is unknown, and known description of female is not very detailed, further comparison between these two taxa was not possible, although based on zoogeographical history, the taxa in these two very distant islands have rather different origin.

Regarding another two *Niphargus* species known from Greece, *N. aitolosi* Ntakis et al., 2015 [loc. typ.: Lake Lysimachia, Padanassa, Agrinio] and to *N. koukourasi* Ntakis et al., 2015 [loc. typ.: Springs of Louros River, Vouliasta, Ioannina], *N. aitolosi* differs from our species by remarkably pointed epimeral plates, poorly inclined propodus of gnathopods 1-2, rather unequal rami of uropod 1, etc., and *N. koukourasi* differs from our species by strongly spiniferous telson, epimeral plates, etc.

### *Niphargus salonitanus* S. Karaman, 1950b

*Niphargus (Orniphargus) salonitanus* S. Karaman, 1950b: 137, figs. 62-72;

*Niphargus salonitanus* G. Karaman, 2014a: 215; G. Karaman, 2014b: 51 (other synonyms omitted).

#### **Material examined:**

S-7137= Lastovo island, spring Lokanj, Uble, Croatia, 2.8.2006, 3 juv. exp. (leg. K. Žganec).

**Remarks:** The specimens in hands (3 juv. exp. up to 9.3 mm) have all taxonomical characteristics of *N. salonitanus*: elongated third peduncular article of antenna 2, flagellum of antenna 2 slender, longer than last peduncular article. Inner plate of maxilla 1 with 3 setae (juvenile exp.). Coxa 1 with subrounded ventroanterior corner. Propodus of gnathopods 1-2 large, with remarkably inclined palm; L-spines on palm of gnathopod 1 propodus sitting laterally of the S-spine; L-spines on palm of gnathopod 2 propodus sitting behind the S-spine; dactylus of gnathopods 1-2 along outer margin with row of single setae. Dactylus of pereopods 3-7 at inner margin with one slender spine or spine-like seta; epimeral plates 1-3 with pointed ventroposterior corner. Article 2 of pereopod 7 broad, with short ventroposterior lobe. Uropod 1 peduncle with dorsointernal row of spines, rami nearly equal, without plumose setae. Uropod 2 inner ramus slightly longer than outer one, both rami without plumose setae. Uropod 3 short. Telson longer than broad, lobes with 3 distal short spines each and a pair of longer lateral plumose setae.

**Locus typicus:** subterranean waters in Solin near Split, Croatia.

**Distribution:** *Niphargus salonitanus* is known from various localities in central and southern coastal region of Dalmatia and Herzegovina: Split region (S. Karaman, 1950a), Cavtat (S. Karaman, 1953); Neretva river (G. Karaman, 1984), Dubrovnik (Vilina pećina Cave) (G. Karaman, 2014a). Recently G. Karaman mentioned this species for Island Korčula (2014b).

Discovery of this species in another Adriatic island more far from the Dalmatian coast, Lastovo Island, extends known area of distribution of this species on other southern Adriatic islands, and probably this species settled also some other adjacent southern Adriatic islands.

#### **Acknowledgements**

I am indebted to the speleologists Mr. Sci. Roman Ozimec from Zagreb, Dr. Krešimir Žganec from the University of Zagreb, as well as to speleologist Dr. R. Argano from Italy, who collected the material of Amphipoda and given me at disposition for this study. This work was realized thanks to the support of the Montenegrin Academy of Sciences and Arts in Podgorica, Montenegro.

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