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A new member of the genus *Niphargus* Schiödte, 1849 (Amphioda Gammaridea, fam. Niphargidae) from Crete Island, Greece (Contribution to the knowledge of the Amphipoda 293)

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Abstract
From the subterranean waters of Pyrgos, Crete island, Greece, is described and figured one new species of the family Niphargidae (Amphipoda Gammaridea), *Niphargus lakusici*, sp. nov., and its taxonomical position regarding other species of this genus known from Greece is discussed, and the list of known *Niphargus* species from Greece is given.

Key words: taxonomy, *Niphargus lakusici*, new species, Crete, Greece, subterranean waters.

Introduction

Based on its specific geological history, geographical position, climate, scarcity of water and various ecological conditions, the fauna of the subterranean waters in Greece is very rich, but only partially known, despite numerous investigations provided by various scientists or scientific expeditions during last two century. Within these various investigations, numerous members of Crustacea Amphipoda have been discovered and described from the epigean and subterranean waters (caves, wells, springs, etc.) by various authors (S. Karaman, C. Bou, S. Ruffo, G. Karaman, G. Pesce, B. Sket, A., Ntakis, S. Pinkster etc.).

Regarding the subterranean family Niphargidae, several species of this family from Greece are known. First species have been discovered by Stanko L. Karaman, who described *Niphargus graecus* sp. n. and *N. adei* sp. n. (1934), and later *N. rhodi* sp. n. and *N. versluysi* sp. n. (1950), as well as *N. lindbergi*, sp. n. (1956). He mentioned (1958) *Niphargus skopljensis* S. Kar. 1929 from Levkas Island (Kaligoni, Greece). G. Karaman (1972) cited list of all known *Niphargus* species from Greece. Pesce & Maggi (1983) cited *N. skopljensis* for Ionian Islands.

Sket described (1990) the species *Niphargobates lefkodemonaki* sp. n. from Crete Island.

Fišer, Trontelj & Sket described (2006) *Niphargus lourensis* n. sp. and Ntakis et al. (2015) described 3 new species from Greece: *N. aitolosi*, *N. karkabounasi* and *N. koukourasi*. G. Karaman described (2015) new species *Niphargus spasenijae* from Thasos island, Greece. He described (2016a) a new species *N. impexus* and (2016b) *Exniphargus tzanisi* n. gen, n. sp., both from Crete Island, removing the species *Niphargobates lefkodemonaki* Sket, 1990, known from Crete Island, Greece, to the new genus *Niphargobatoides*, gen. nov. as typus generis, based on morphological characters.

During our recent study of the subterranean amphipods from Greece, we described and figured here a new species of genus *Niphargus* from Crete Island, *Niphargus lakusici*, sp. nov.

Material and Methods

The 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 glycerin and water for study and drawing. Later, all appendages have been transferred to Liquid of Faure on permanent slides. The body-length of examined specimens were measured by tracing individual's mid-trunk lengths (from tip of head to end of telson) using camera lucida. All illustrations were inked manually.

Some morphological terminology and setae formulae follow G. Karaman's terminology (Karaman, G., 1969; 1993; 2012) regarding the last mandibular palpus article [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 propodus of gnathopods 1 and 2 [S= corner S-spine; L= lateral slender serrate L=spines; M= facial M-setae; R= subcorner R-spine on inner face]. Terms "setae" and "spines" are used based on its shape, not origin.

All studies in this work are based on the classic morphological, ecological and zoogeographical studies.

Taxonomical part

Family Niphargidae

Niphargus lakusici sp. nov.
Figs. 1-4

Material examined: Greece:
S-6557= Crete Island: Pyrgos, May, 1981, 1 exp, (leg. G. Pesce)
S-6555= Crete Island, Pyrgos, May 1981, 2 exp. (leg. G. Pesce)

Diagnosis (only male):
Body relatively slender, metasomal segments with scarce number of dorsoposterior setae, epimeral plates angular. Maxilla 1 inner plate with 2 setae, outer plate with 7 spines (6 spines with one lateral tooth). Maxilliped inner plate is short. Coxae 1-4 are shallow, coxa 4 unlobed, coxa 5 as long as coxa 4. Gnathopods 1 and 2 are larger than corresponding coxae, similar in size, with article 5 short, dactylus bearing 1 median seta along outer margin. Article 2 of pereopods 5-7 are with developed ventroposterior lobe. Dactylus of pereopods 3-7 is at inner margin with one slender spine-like seta. Pleopods are with 2 retinacula. Uropod 1 and uropod 2 are with inner ramus remarkably longer than outer ramus. Uropod 3 is not elongated, with short peduncle and very short inner ramus; outer ramus 2-articulated, first article spiniferous, second article narrow and short. Telson deeply incised, with distal and marginal spines.

Description
Male 4.0 mm (holotype). Body relatively slender, metasomal segments 1-3 along dorsoposterior margin provided with 4-5 setae (fig. 3H). Metasomal segment 3 at ventral margin with 2 male papillae (fig. 4G). Urosomal segment 1 on each dorsolateral side with 1 seta; urosomal segment 2 at each dorsoposterior marginal side with 1 spine, urosomal segment 3 naked (fig. 2E). Urosomal segment 1 with one ventroposterior spine near basis of uropod 1-peduncle (fig. 2E).

Epimeral plate 1 poorly angular, almost subrounded, with marked ventroposterior corner by one seta and poorly concave ventral margin; posterior margin is convex, bearing 3 setae. Epimeral plate 2 angular with marked ventroposterior corner-seta and with convex ventral margin; posterior margin is nearly straight, with 2-4 setae (fig. 3H). Epimeral plate 3 with obtusely angular ventroposterior corner defined by one stronger seta, ventral margin is convex, posterior margin is poorly inclined, bearing several setae only. Epimeral plates 2 and 3 with 2 subventral spines each (fig. 3H).

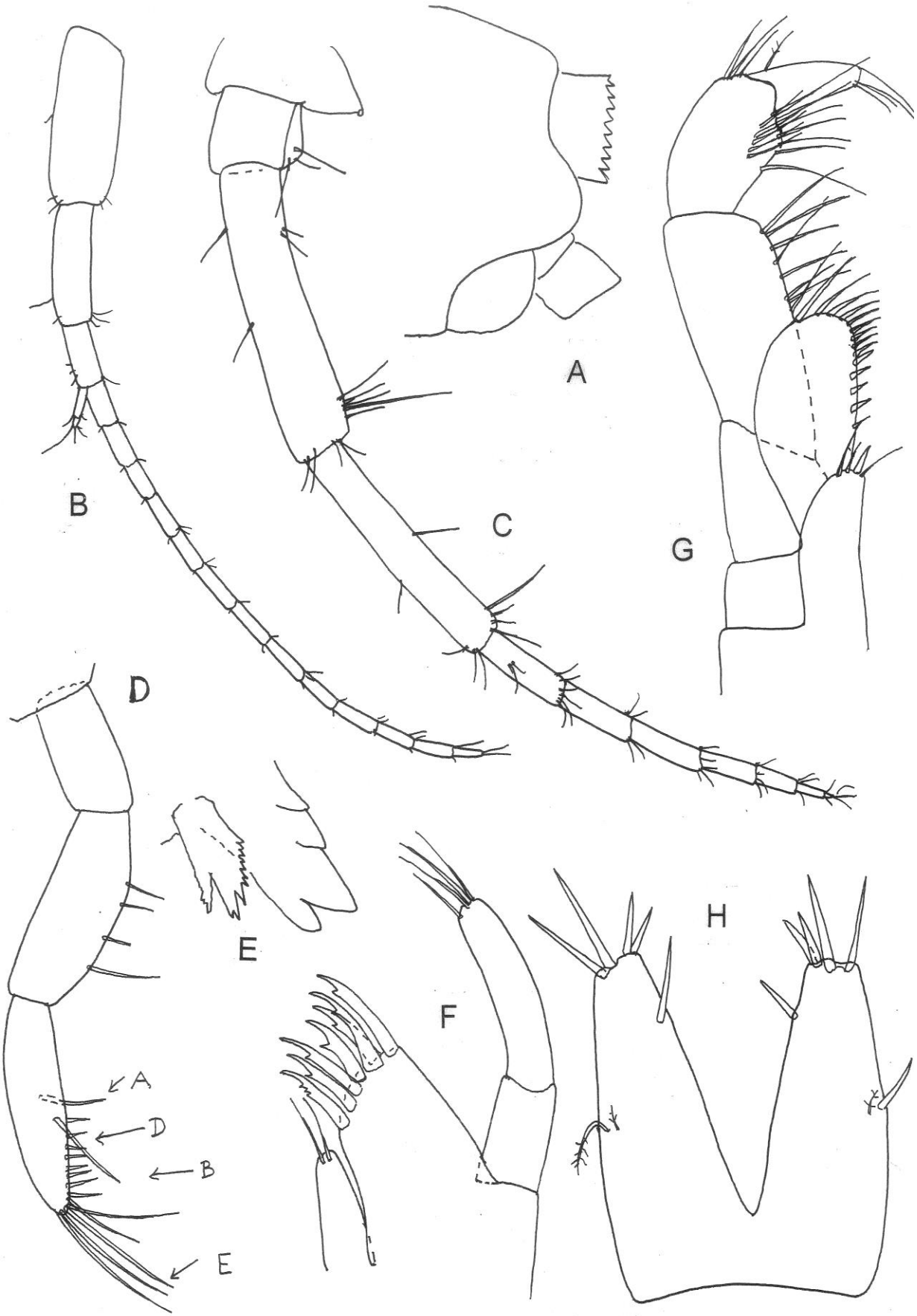

Figure 1. *Niphargus lakusici*, sp. n., Pyrgos, Crete island, male 4.0 mm (holotype): A= head; B= antenna 1; C= antenna 2; D= Mandibular palpus, inner face; E= right incisor and lacinia mobilis; F= maxilla 1; G= maxilliped; H= telson.

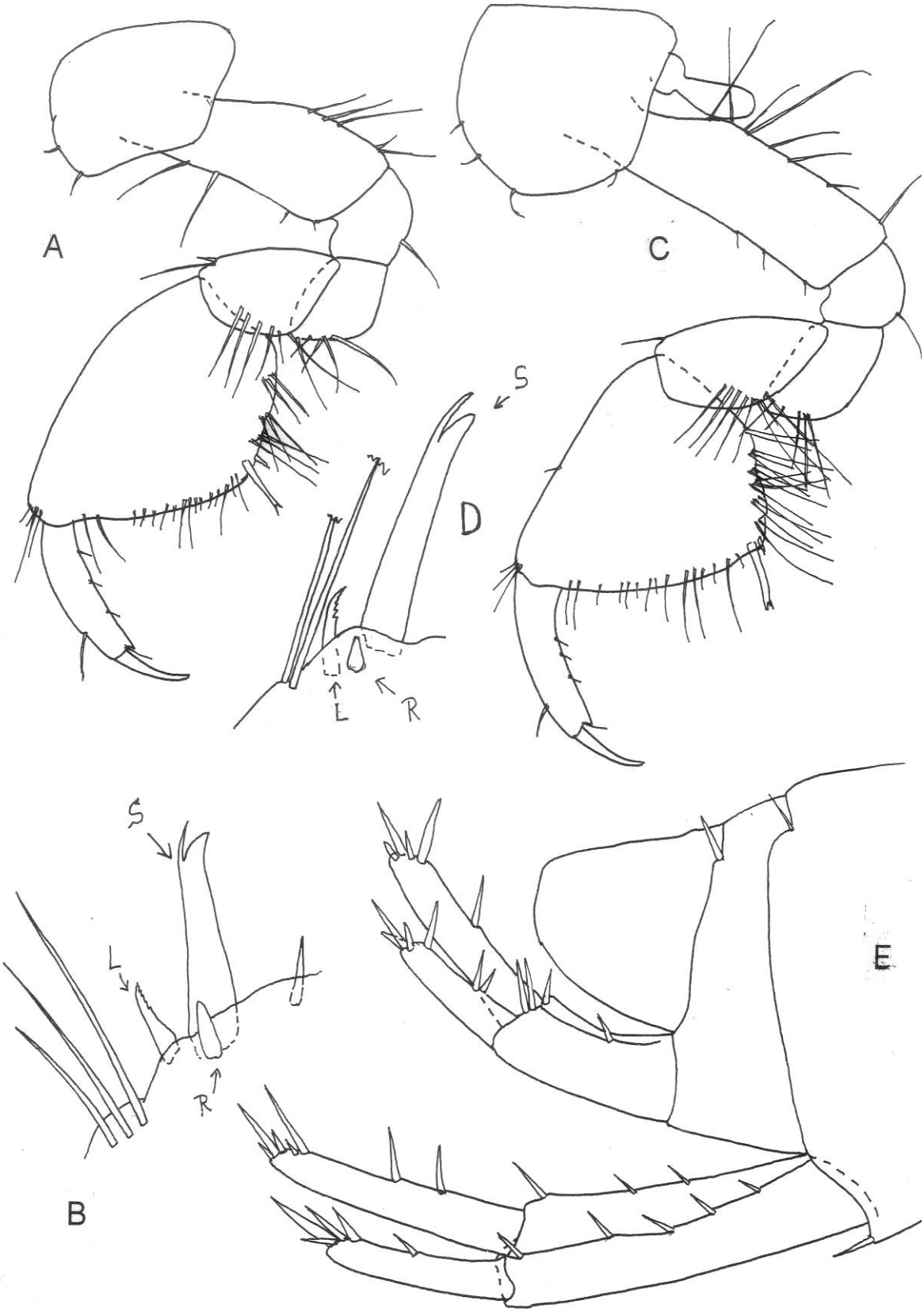

Figure 2. *Niphargus lakusici*, sp. n., Pyrgos, Crete island, male 4.0 mm (holotype): A= gnathopod 1, outer face; B= distal corner of gnathopod 1 propodus, inner face [S= corner S-spine; L= lateral L-spine; R= subcorner R-spine]; C= gnathopod 2, outer face; D= distal corner of gnathopod 2 propodus, inner face [S= corner S-spine; L= lateral L-spine; R= subcorner R-spine]; E= urosome with uropods 1-2.

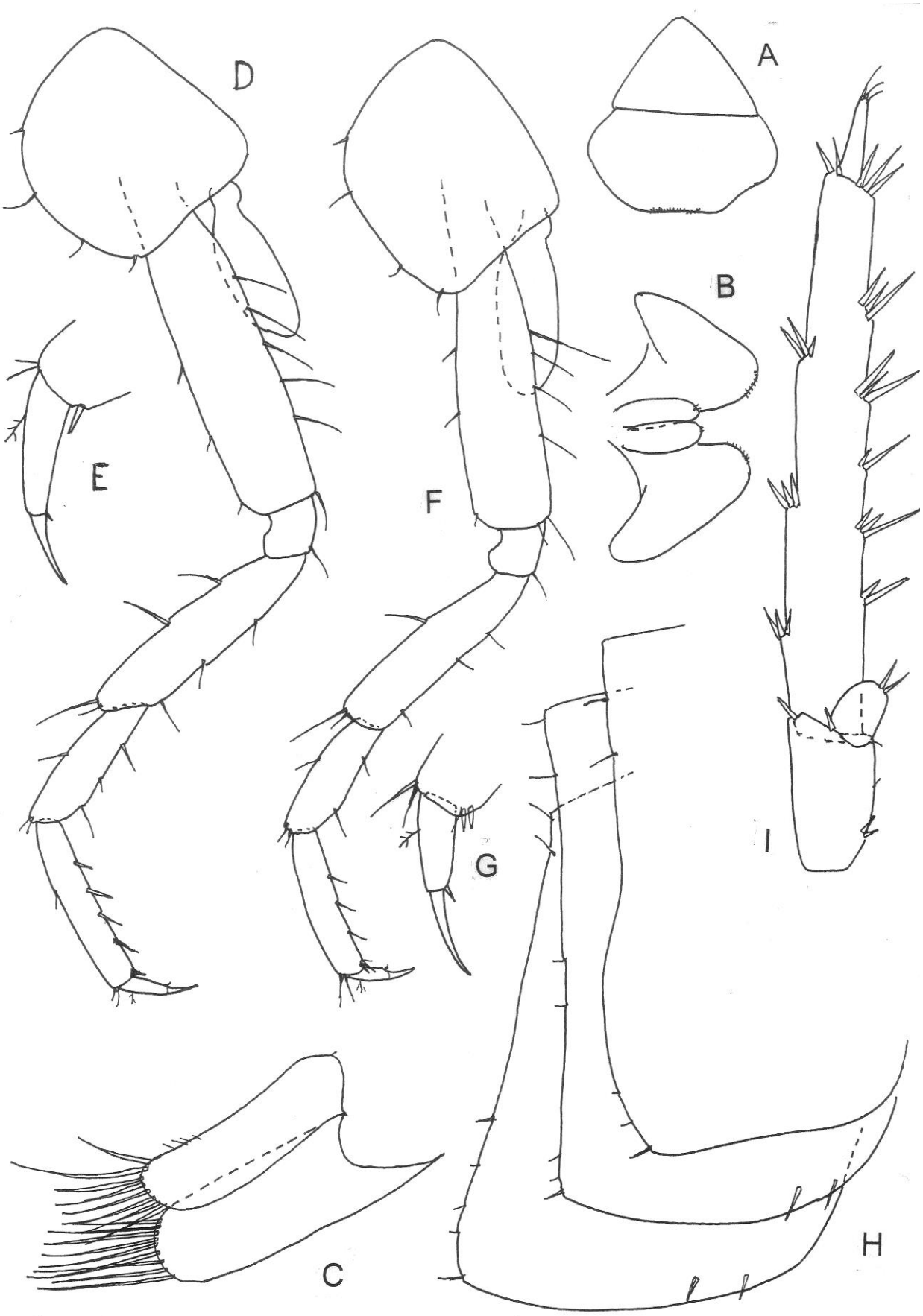

Figure 3. *Niphargus lakusici*, sp. n., Pyrgos, Crete island, male 4.0 mm (holotype): A= labrum; B= labium; C= maxilla 2; D-E= pereopod 3; F-G= pereopod 4; H= epimeral plates 1-3; I= uropod 3.

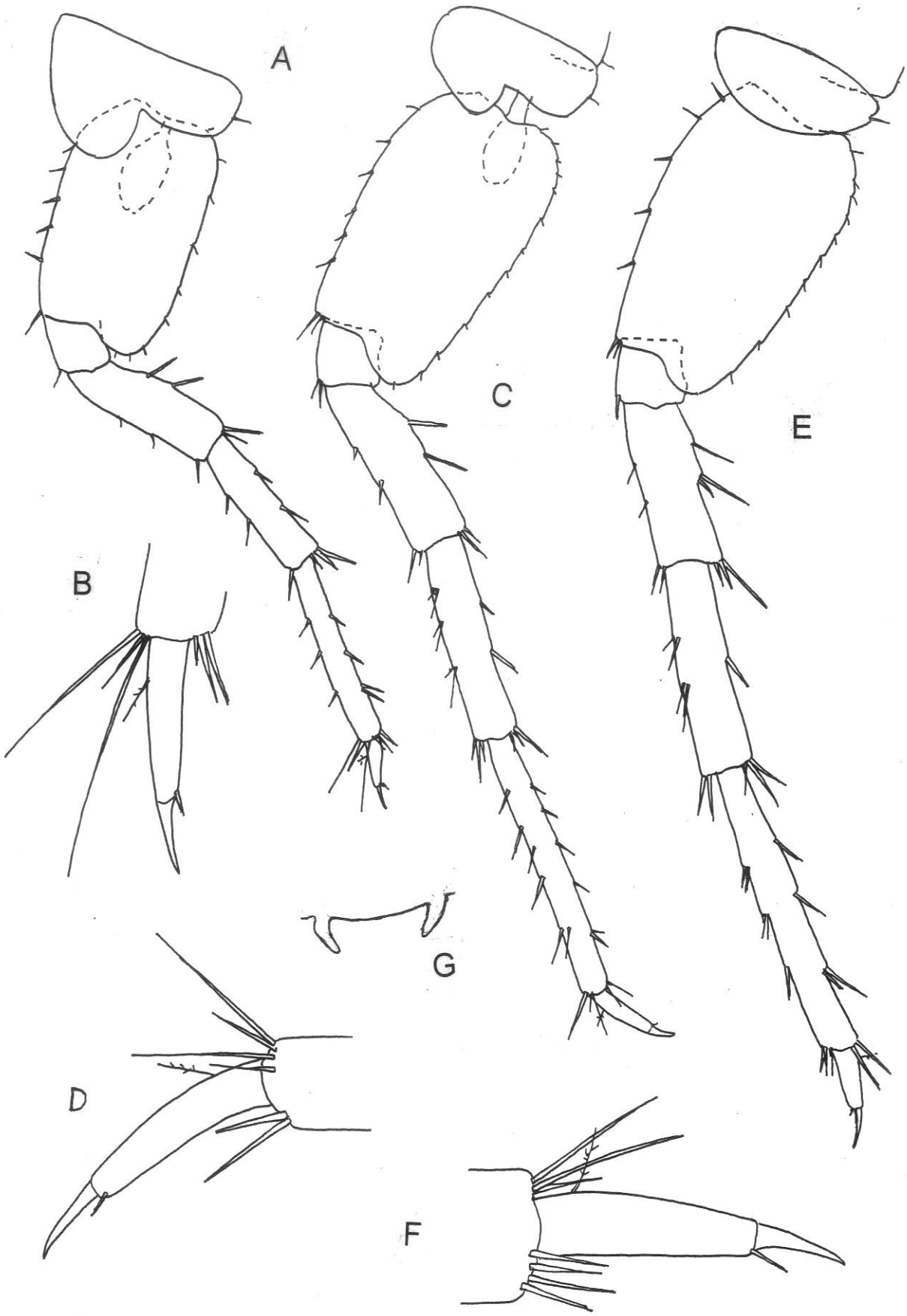

Figure 4. *Niphargus lakusici*, sp. n., Pyrgos, Crete island, male 4.0 mm (holotype): A-B= pereopod 5; C-D= pereopod 6; E-F= pereopod 7; G= ventral tubercles on last metasomal segment.

Head with short rostrum and short subrounded lateral cephalic lobes, ventroanterior sinus well developed, eyes absent (fig. 1A). Antenna 1 reaching almost half of body-length; peduncular articles relatively slender, progressively shorter towards article 3 (ratio: 47:32:18), very scarcely setose (fig. 1B); article 3 is not elongated; main flagellum consisting of 13 articles (most of them with one short aesthetasc each). Accessory flagellum short, 2-articulated, shorter than third peduncular article (fig. 1B).

Antenna 2 moderately slender, peduncular article 3 short, with 3 distoventral short setae; peduncular article 4 slightly longer than article 5 (ratio: 80:68), Peduncular article 5 more narrow than article 4 and provided with several short lateral and distal setae and one distoventral seta longer than diameter of article itself (fig. 1C); flagellum slender, much longer than last peduncular article (ratio: 102:68), consisting of 7 slender articles bearing short setae. Antennal gland cone short (fig. 1C).

Mouthparts well developed. Labrum is broader than long, with nearly straight distal margin (fig. 3A).

Labium is broader than long, with broad entire outer lobes and small but well developed inner lobes (fig. 3B).

Mandibles are with triturative molar. Right incisor with 4 teeth and 5 rakers, lacinia mobilis bifurcate, with several lateral teeth (fig. 1E). Left incisor with 5 teeth, lacinia mobilis with 4 teeth, rakers 5. Mandibular palpus 3-articulated: first article longer than broad, naked; second article with 4 setae (fig. 1D); third article subfalciform, slightly longer than article 2 (ratio: 60:55), along margin with 8 D-setae and 5 distal long E-setae, on outer face by one median A-seta, on inner face appears one facial B-seta (fig. 1D).

Maxilla 1: inner plate narrow, with 2 distal setae; outer plate with 7 distal spines [6 spines with one lateral tooth, one spine with 3 small lateral teeth); palpus 2-articulated, nearly reaching tip of outer plate-spines and provided with 4 distal setae (fig. 1F),

Maxilla 2: lobes longer than broad, inner lobe is slightly more narrow than outer lobe, both lobed with numerous distomarginal setae only (fig. 3C).

Maxilliped: inner plate short, not reaching distal outer tip of palpus article 1 and provided with 2-3 distal spines mixed with single setae longer than spines (fig. 1G); outer plate reaching nearly half of palpus article 2 and provided with nearly 15 marginal spines and spine-like setae (fig. 1G); palpus article 3 along outer margin with one distal bunch of setae; palpus article 4 at outer margin with one median plumose seta, at inner margin with 2 distal setae near basis of the nail (fig. 1G).

Coxae 1-4 shallow. Coxa 1 is much broader than long (ratio: 50:34), with poorly concave ventral margin and subrounded ventroanterior corner bearing 2 marginal setae (fig. 2A).

Coxa 2 is slightly broader than long (ratio: 55:48), with subrounded ventral margin bearing 4-5 setae (fig. 2C). Coxa 3 broader than long (ratio: 55:50), with subrounded ventral margin bearing 4 marginal setae (fig. 3D). Coxa 4 is remarkably broader than long (ratio: 55:48), along ventral convex margin provided with 4 setae, posterior margin almost concave, ventroposterior lobe absent (fig. 3F).

Coxa 5 shallow, much broader than long (ratio: 52:32), anterior lobe nearly as long as coxa 4 (fig. 4A). Coxa 6 broader than long (ratio: 45:27) (fig. 4C). Coxa 7 shallow, broader than long (ratio: 45:22), with entire convex ventral margin and one seta at posterior margin (fig. 4E).

Gnathopods 1 and 2 are nearly of the same size, much larger than corresponding coxa (fig. 2A, C). Gnathopod 1: article 2 along anterior margin with 2 long proximal and 2-3 short distal setae, along posterior margin with several long setae (fig. 2A); article 3 at posterior margin with one seta; article 5 much shorter that propodus (ratio: 35:75), along posterior margin with one distal bunch of setae. Propodus almost ovoid, much broader than long (ratio: 75:50), along posterior margin with 3 transverse rows of several setae only (fig. 2C). Palm slightly convex, inclined nearly half of propodus-length, defined on outer face by one corner S-spine accompanied laterally by one strong L-spine, on inner face by one short subcorner R-spine (fig. 2B), M-setae absent. Dactylus reaching posterior margin of propodus, along outer margin with one median seta, along inner margin with 4 short setae (fig. 2A).

Gnathopod 2: article 2 along anterior margin with 3 short setae in distal part only, along posterior margin with a row of long setae (fig. 2C). Article 3 at posterior margin with one seta; article 5 remarkably shorter than propodus (ratio: 45:67), along anterior margin with one distal seta only. Propodus nearly trapezoid, slightly longer than broad (ratio: 67:56), along posterior margin with 6 transverse rows of setae (fig. 2C). Palm slightly convex, inclined slightly over half of propodus-length, defined on outer face by one corner S-spine accompanied laterally by one short L-spine, on inner face by one short R-spine, facial M-setae not observed (fig. 2D). Dactylus reaching posterior margin of propodus, along outer margin with one median seta, along inner margin with 4 short setae (fig. 2C).

Pereopods 3 and 4 are moderately slender, rather similar to each other. Pereopod 3: article 2 along anterior margin with single short setae, along posterior margin with row of longer setae. Articles 4-6 of unequal length (ratio: 60:37:48), articles 4 and 5 along both margins with several spine-like setae (fig. 3D); article 6 along posterior margin with row of 5 spine-like setae. Dactylus is moderately slender, much shorter than article 6 (ratio: 21:48), along inner margin with 1 spine-like seta near basis of the nail, along outer margin with one median seta (fig. 3E); nail shorter than pedestal (ratio: 20:39).

Pereopod 4: article 2 along anterior margin with several short setae, along posterior margin with 5-6 longer setae. Articles 4-6 of unequal length (ratio: 56:35:40), pilosity of articles is poorly smaller than that in pereopod 3 (fig. 3F). Article 6 along posterior margin with 4 groups of spine-like setae; dactylus is much shorter than article 6 (ratio: 19:40), at inner margin with one spine-like seta near basis of the nail, along outer margin with one median seta (fig. 3G); nail slightly shorter than pedestal (ratio: 24:26).

Pereopods 5-7 is progressively longer towards pereopod 7 (fig. 4A, C, E). Pereopod 5: article 2 is remarkably longer than broad (ratio: 62:38), along anterior margin with row of 6-7 short spine-like single setae, along posterior almost straight margin with 8 short setae, ventroposterior lobe well developed (fig. 4A); articles 4-6 of unequal length (ratio: 43:39:50), along both margins with slender spines; article 6 is shorter than article 6 (ratio: 50:62), with distal setae up to as long as dactylus; dactylus much shorter than article 6 (ratio: 19:50), relatively slender, at inner margin with one spine-like seta near basis of the nail (fig. 4B), along outer margin with one median seta; nail is shorter than pedestal (ratio: 20:42).

Pereopod 6: article 2 much longer than broad (ratio: 77:45), along anterior margin with 7 spine-like setae, along posterior margin with nearly 13 short setae, ventroposterior lobe well developed (fig. 4C). Articles 4-6 of unequal length (ratio: 50:53:72), along both margins with slender short spines or spine-like setae; article 6 is slightly shorter than article 2 (ratio: 72:76). Dactylus is much shorter than article 6 (ratio: 24:72), relatively slender, along inner margin with one spine-like seta near basis of the nail, along outer margin with one median seta (fig. 4D); nail is shorter than pedestal (ratio: 56:23).

Pereopod 7: article 2 is remarkably longer than broad (ratio: 78:47), along anterior margin with nearly 6 spine-like setae, along posterior margin with nearly 10 short setae, ventroposterior lobe well developed (fig. 4E); articles 4-6 of unequal length (ratio: 43:55:78), along both margins with slender spines. Article 6 is as long as article 2, with short spines and setae. Dactylus is much shorter than article 6 (ratio: 26:78), relatively slender, along inner margin with one spine-like seta near basis of the nail, along outer margin with one median plumose seta (fig. 4F); nail is shorter than pedestal (ratio: 25:60).

Pleopods 1-3 with 2 retinacula each, peduncle is almost naked.

Uropod 1: peduncle longer than rami, with dorsointernal row of setae (except distal spine) and dorsoexternal row of spines (fig. 2E), distal tubercle absent; inner ramus with 2 lateral and 5 distal spines; outer ramus reaching nearly 3/5 of outer ramus-length, with one lateral and 4-5 distal spines.

Uropod 2: peduncle with 1 lateral and 3 distal spines; inner ramus bearing one lateral and 4-5 distal spines (fig. 2E); outer ramus slightly exceeding half of inner ramus-length, provided with 2 lateral and 4 distal spines.

Uropod 3 is not elongated: peduncle is longer than broad (ratio: 49:21), with single distal spines; inner ramus scale-like, much shorter than peduncle and provided with 2 distal spines (fig. 3 I). Outer ramus 2-articulated: first article along outer margin provided with 4 groups of short spines, along inner (mesial) margin provided with 6 groups of spines (the longest spines almost reaching diameter of article itself), plumose setae are not observed; second article is much shorter than first article (ratio: 24:147), with 3 distal short setae only (fig. 3 I).

Telson longer than broad (ratio: 90:77), deeply incised; each lobe provided with 4 distal spines, one spine at inner (mesial) margin and with 0-1 spine along outer margin (fig. 1H); a pair of unequal plumose setae appear near the middle of each lobe (on right lobe one plumose seta is missing).

Coxal gills on legs 2-6 are very small (figs. 2C, 3D, F; 4A, C), probably not fully developed.

Female: unknown.

Variability: Male juv. 3.5 mm: Similar mainly to the holotype. Antenna 1 reaching 2/5 of body-length. Epimeral plates similar to these in holotype, but epimeral late 3 with 3 subventral spines, epimeral plate 2 with 2 subventral spines.

Mandibles with 5 rakers each; mandibular palpus article 2 with 4 setae, article 3 with 5-6 D-setae and 4 E-setae, on outer face by 3 A-setae, on inner face with 1+1 seta.

Maxilla 1: inner plate with 2 setae, outer plate and palpus like these in holotype.

Maxilliped: inner plate reaching mesial tip of palpus article 1 and provided with 2 spines and 3 setae; outer plate reaching half of palpus article 2 outer tip; and provided with 12 distomesial spines; palpus article 3 at outer margin with one distal bunch of setae; article 4 (dactylus) at inner margin with 2 setae near basis of the nail.

Coxa 1 with slightly concave ventral margin. Gnathopods 1-2 like these in holotype, propodus of gnathopod 1 along posterior margin with 3 transverse rows of small number of setae each; propodus of gnathopod 2 along posterior margin with 5 transverse rows of only several setae each; M-setae are not observed.

Article 2 of pereopods 5-7 with ventroposterior small lobe. Dactylus of pereopods 3-7 relatively slender, with one spine-like setae along inner margin near basis of the nail.

Uropods 1-3 like these in holotype, plumose setae along mesial margin of outer ramus are not observed.

Telson distinctly longer than broad, exceeding peduncle of uropod 3, deeply incised nearly 4/5 of telson-length; each lobe is provided with 4 distal spines, one distomesial spine; along outer margin of only left lobe appear one distomarginal spine; a pair of unequal plumose setae appears near the middle of each lobe.

Female: unknown.

Holotype: male 4.0 mm. Holotype is deposited in Karaman`s Collection in Podgorica, Montenegro.

Remarks and affinities

Within the known fauna of genus *Niphargus* in Greece, *Niphargus lakusici* is rather similar to *Niphargus karkabounasi* Ntakis et al., 2015, described from Agioi Theodoroi, Korinthos, Peloponnese, Greece, by presence of one median seta at outer margin of gnathopods 1-2 dactylus, by subequal size of gnathopods 1 and 2 and very inclined propodus of gnathopods 1-2, by maxilla 1, shallow coxae 1-4, distinctly unequal length of rami in uropods 1 and 2, etc.; but N. *karkabounasi* differs distinctly from *N. lakusici* by long second article of uropod 3 outer ramus, by long distal spines on telson without lateral spines, by long dactylus of pereopods 3-7, by longer outer ramus of maxilliped, by unlobed article 2 of pereopods 5-7, by 3 setae on inner plate of maxilla 1, etc.

The presence of subequal propodus of gnathopods 1 and 2 and short uropod 3 in males were observed in some taxa of *Niphargus jovanovici*-group, but telson of *N. lakusici* is without long plumose setae usually present in *N. jovanovici*-group.

Derivatio nominis: This species is dedicated to deceased botanist Prof. Dr. Radomir Lakušić from Sarajevo, Bosnia & Herzegovina, for his excellent studies of the flora and vegetation of Balkan peninsula.

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