

Original paper

Some new data on the family Niphargidae from Serbia (Contribution to the Knowledge of the Amphipoda 319)

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Summary. Two members of the subterranean family Niphargidae (Amphipoda, Senticaudata) from Serbia (Kosovo & Metohia region) are treated: *Niphargus deelemanae latellai*, ssp. new from Mermerna pećina – a cave near Lipljan, and *Niphargus multipennatus* Sket 1956 from subterranean waters near Gračanica Lake close to Priština. Both taxa are described and figured, and their taxonomic relationships to some other similar Niphargus taxa are discussed. The subterranean species *Karamaniella parapupetta* (G. Kar. 1984), known from Croatia and Romania, was discovered in Serbia (village Reka near Brza Palanka). Species *Niphargus multipennatus* and *Karamaniella parapupetta* are new for the fauna of Serbia.

Keywords: Amphipoda, Niphargidae, Niphargus, Karamaniella, description, Balkan, Serbia, Kosovo & Metohia, subterranean.

INTRODUCTION

The subterranean fauna of Amphipoda is one of the largest crustacean populations in the subterranean waters, because it settled in all kinds of clean waters (fresh, brackish and salt waters), from the surface to several hundred meters depths. In this large water network, various ecological, physical, geological and geographical conditions enabled the development and diversification of various populations within the family Niphargidae, over large time periods and across multiple settlements of subterranean waters.

Thus, it is not surprising that the existence of over 400 different taxa has been found within this family in Europe, Asia Minor, Russia and the near East. In the fauna of Serbia over 26 taxa of this family are known. Moreover, it is realistic to expect that many undiscovered new taxa exist in

this region. During our investigations, we tried to complete the knowledge of this family in the Balkan Peninsula and especially for the territory of Serbia, using various collected materials for this family from various collectors.

MATERIAL AND METHODS

The studied material was preserved in 70% ethanol. Specimens were dissected using a WILD M20 microscope and drawn using a camera lucida attachment. All appendages were temporarily submersed in a mixture of glycerin and water for study. All illustrations were inked manually. After the end of the study, the dissected body-parts were fixed in Liquid of Faure and covered by thin cover glass.

The terms “setae” and “spines” are used based on their shape, not origin. The investigations are provided based on

morphological, ecological and zoogeographical studies.

Supplementary citations from printed papers are not mentioned.

TAXONOMICAL PART

Family Niphargidae

Niphargus deelemanae latellai ssp. n.

(Figs 1-5)

Material examined

S-7346 = Mermerna pećina Cave [= Shpella e gadimes] near Donje Gadimlje, Lipljan, Kosovo & Metohia, Serbia, 20. 5. 2017, 4 exp (leg. Qenan Maxhuni).

Diagnosis (females only)

Uropod 3 outer ramus with short distal article in female. Urosomal segment 1 on each dorsolateral side with setae, on urosomal segment 2 with spines, urosomal segment 3 naked. Maxilla 1 inner plate with one seta, outer plate with 7 spines bearing mainly one lateral tooth, palpus long, exceeding distal tip of outer plate spines. Coxae relatively short, coxa 4 without ventroposterior lobe.

Gnathopods 1-2 trapezoid, with remarkably inclined palm bearing L-spines sitting laterally of S-spine, dactylus of gnathopods with one outer marginal seta. Pereopod 7 article 6 distinctly longer than article 2, article 2 with very small ventroposterior lobe. Dactylus of pereopods 3-7 at inner margin with one seta or slender spine. Epimeral plates distinctly angular. Pleopods 1-3 with 3-4 retinacula each. Uropod 1 peduncle with dorsointernal row of spines, rami of equal length. Uropod 3 outer ramus with short distal article. Telson deeply incised, with distal and outer marginal spines.

Description

Female ovigerous, 7.8 mm with 9 eggs in marsupium (holotype: S-7346): Head with short rostrum, short subrounded lateral cephalic lobes and excavated ventroanterior sinus, eyes absent (Fig. 4A).

Body moderately slender, metasomal segments 1-3 at dorsoposterior margin with 4 short setae each (Fig. 1E). Urosomal segment 1 at each dorsolateral side with one seta; urosomal segment 2 on each dorsolateral side with one spine; urosomal segment 3 naked (Fig. 1F). Urosomal segment 1 at each ventroposterior corner with one spine near basis of uropod 1 peduncle (Fig. 1F).

Epimeral plates 1-2 obtusely angular, with corner spine-like seta and poorly convex posterior margin. Epimeral plate

3 angular, with marked ventroposterior corner spine-like seta and almost straight posterior margin (Fig. 1E). Subventral part of epimeral plate 2 with 3 spines, on epimeral plate 3 are attached 4 spines; posterior margin of epimeral plates 1-3 provided with scarce number of setae (Fig. 1E).

Antenna 1 slightly exceeding half of body-length (ratio: 78:43); peduncular articles 1-3 progressively shorter (ratio: 61:53:27), scarcely setose (Fig. 3A); main flagellum consisting of 18 articles (some of them with one aesthetasc), scarcely setose. Accessory flagellum short, 2-articulated, shorter than last peduncular article (Fig. 3A).

Antenna 2 moderately setose: peduncular article 3 with 3 ventrodial setae; peduncular articles 4 and 5 unequally long (ratio: 67:63), article 4 at dorsal margin with 2 strong median slender spines and distal seta, at ventral margin with one median and one distal bunch of setae (the longest setae are remarkably longer than the diameter of the articles themselves). Flagellum slender, much longer than last peduncular article, scarcely setose (Fig. 3B). Antennal gland cone short (Fig. 3B).

Mouthparts basic. Labrum much broader than long with poorly concave distal margin (Fig. 4B). Labium broader than long, inner lobes well developed, outer lobes entire, subrounded distally (Fig. 4C).

Mandibles with triturative molar. Left mandible: incisor with 5 teeth, lacinia mobilis with 4 teeth, accompanied by 6 rakers. Right mandible: incisor with 4 teeth, lacinia mobilis bifurcate, pluritoothed, accompanied by nearly 5 rakers. Mandibular palpus 3-articulated: first article short, naked; article 2 slightly shorter than article 3 (ratio: 74:80), bearing 7 strong setae; article 3 subfalciform, with nearly 14 D- setae, 5 long E- setae, on outer face are attached 5-6 A- setae (Fig. 1B), on inner appear 4 B- setae (Fig. 1A).

Maxilla 1: inner plate with one seta; outer plate with 7 partially serrate spines (5-3-2-1-1-1-1); palpus 2-articulated, almost reaching distal tip of outer plate-spines and provided with 6 distal setae (Fig. 1C, D).

Maxilla 2: both plates with distomarginal setae, inner plate with several distomesial setae (Fig. 4D).

Maxilliped: inner plate short, with 2-3 distal smooth spines accompanied by several marginal setae (Fig. 4E); outer plate exceeding half of palpus article 2 and provided with a row of mesial spines transforming gradually into setae toward distal tip of plate. Palpus 4-articulated, third article along outer margin with distal bunch of setae, along mesial margin with bunch of long setae; article 4 at outer margin with one median plumose seta, along inner margin with 2 short setae near basis of the nail (Fig. 4E).

Coxae are moderately short. Coxa 1 broader than long (ratio: 50:36), with subrounded ventroanterior corner (Fig. 2A) bearing 7 marginal setae. Coxa 2 slightly longer than

broad (ratio: 56:50) with convex ventral margin bearing nearly 7 setae (Fig. 2D). Coxa 3 longer than broad (ratio: 60:54), along ventral margin with 8 setae (Fig. 3C). Coxa 4 nearly as long as broad, along ventral margin with 6 setae, posterior margin slightly excavated, without distinct ventro-posterior lobe (Fig. 3E).

Coxa 5 shallow, much broader than long (ratio: 65:42), anterior lobe almost as long as coxa 4, bearing 3 marginal setae, posterior lobe short, with 2 setae (Fig. 4F). Coxa 6 broader than long (ratio: 51:30) (Fig. 4G), posterior lobe with one seta; coxa 7 entire, much broader than long (ratio: 55:25) with one seta at posterior margin (Fig. 4H).

Gnathopods 1-2 moderately large, with propodus slightly larger than corresponding coxa (Fig. 2A, D). Gnathopod 1: article 2 along anterior margin with long proximal and shorter distal setae, along posterior margin with numerous long setae; article 3 at posterior margin with one distal bunch of setae (Fig. 2A). Article 5 shorter than propodus (ratio: 32:49), along anterior margin with distal bunch of setae. Propodus trapezoid, poorly longer than broad (ratio: 68: 65), along posterior margin with 5 transverse rows of setae (Fig. 2B); palm slightly convex, inclined hardly over half of propodus-length, defined on outer face by one corner S-spine accompanied laterally by 3 slender L spines and 3 long facial M-setae, on inner face by one subcorner R-spine (Fig. 2C). Dactylus reaching posterior margin of propodus, at outer margin with one median seta, along inner margin with several short setae (Fig. 2B).

Gnathopod 2 remarkably larger than gnathopod 1; article 2 along anterior and posterior margin with numerous long setae; article 3 at posterior margin with one distal bunch of setae; article 5 shorter than propodus (ratio: 48:58), along anterior margin with bunch of 3 distal setae (Fig. 2D). Propodus trapezoid, poorly longer than broad (ratio: 90:83). Palm almost straight, inclined nearly 3/4 of propodus-length, defined on outer face by one corner S-spine accompanied laterally by 2 L-spines and 3 long facial M-setae (Fig. 2E), on inner face by one subcorner R-spine (Fig. 2F). Dactylus reaching posterior margin of propodus, along outer margin with one strong median seta, along inner margin with several short setae (Fig. 2D).

Pereopods 3 and 4 moderately slender. Pereopod 3 slightly longer than pereopod 4, article 2 provided with long setae along posterior margin and short setae along anterior margin. Articles 4-6 of unequal length (ratio: 52:38:46); article 4 along posterior margin with several setae shorter than diameter of article itself; article 5 along posterior margin with 4 slender spines or spine-like setae; article 6 along posterior margin with 5 single short spines (Fig. 3C). Dactylus short and strong, much shorter than article 6 (ratio: 18:46), along inner margin with one spine-like seta, along outer

margin with one median plumose seta (Fig. 3D); nail shorter than pedestal (ratio: 25:31).

Pereopod 4 rather similar to pereopod 3, articles 4-6 of unequal length (ratio: 45:35:41), scarcely setose; article 4 along posterior margin with single short setae; article 5 along posterior margin with row of short spine-like setae; article 6 along posterior margin with 4 short spines (Fig. 3E). Dactylus short and strong, much shorter than article 6 (ratio: 13:41), with one spine-like seta at inner margin and one median plumose seta at outer margin, nail rather shorter than pedestal (ratio: 20:25) (Fig. 3F).

Pereopods 5 and 6 missing. Pereopod 7 moderately strong; article 2 much longer than broad (ratio: 86:50), along anterior slightly convex margin with row of 6 short spines (Fig. 4H), along posterior slightly convex margin with 8 short setae, ventroposterior lobe very short and shallow. Articles 4-6 of unequal length (ratio: 55:73:100) bearing along both margins bunches of short spines (spines never exceeding diameter of articles themselves). Article 6 longer than article 2 (ratio: 100:86). Dactylus short, partially damaged, at inner margin with one spine-like seta, at outer margin with one median plumose seta (Fig. 4 I).

Pleopods 1-3 with elevated number of retinacula (4-3-3); peduncle of pleopod 1 with 2 median setae at anterior margin (Fig. 4J); peduncle of pleopod 2 naked (Fig. 4K); peduncle of pleopod 3 with one median seta at posterior margin (Fig. 4L).

Uropods relatively short. Uropod 1: peduncle with dorsoexternal and dorsointernal row of strong spines (Fig. 1F), rami of equal length, not paddle-shaped, with 2 lateral and 4-5 distal short spines.

Uropod 2 with rami of equal length, bearing one lateral and 4-5 distal short strong spines (Fig. 1F).

Uropod 3 narrowed, with peduncle longer than broad (ratio: 47:19), bearing 3 distal spines; inner ramus scale-like, short, not exceeding diameter of uropod 3 peduncle, bearing 2 distal spines; first article of outer ramus with short strong spines along both margins (Fig. 1G), distal part of uropod 3 missing.

Telson relatively short, deeply incised, poorly longer than broad (ratio: 70:73), each lobe with 3 strong distal spines shorter than half of telson-length (Fig. 4M), along outer margin attached 2 strong single spines, at mesial margin appears one short spine. A pair of short plumose setae is attached at the outer margin near the middle of each lobe.

Coxal gills relatively short, ovoid, not exceeding ventral margin of corresponding article 2 of pereopods (Figs 2D, 3C, 4F, G). The longest coxal gills appear on pereopod 4 (Fig. 3E).

Oostegites large, along margins with long setae (Fig. 3C).

Female 6.5 mm with setose oostegites: Similar to holotype. Metasomal and urosomal segments, as well as epimeral plates like these in holotype. Coxa 1 broader than long (ratio: 44:34), with subrounded ventroanterior corner bearing 7 short setae (Fig. 5A). Coxa 2 poorly longer than broad (ratio: 50:40), along ventral convex margin with 8 short setae (Fig. 5B). Other coxae and mouthparts like those in holotype (Fig. 5E).

Gnathopod 1 propodus trapezoid, poorly longer than broad (ratio: 72:68), along posterior margin with 4 transverse rows of setae (Fig. 5C). Palm slightly convex, inclined half of propodus-length, defined on outer face by one corner S-spines accompanied laterally by 3 L-spines and 3 facial M-setae, on inner face by one R-spine; dactylus reaching to almost slightly exceeding posterior margin of propodus, along outer margin with one median seta, along inner margin with several short setae (Fig. 5C).

Gnathopod 2: propodus trapezoid, as long as broad, along posterior margin with 7 transverse rows of setae (Fig. 5D); palm poorly convex, inclined nearly 2/3 of propodus-length, defined on outer face by one corner S-spine accompanied laterally by 3 L-spines and 4 facial M-setae, on inner face by one R-spine. Dactylus almost exceeding posterior margin of propodus, along outer margin with one median seta, along inner margin with several short setae (Fig. 5D).

Pereopods 3-4 like these in holotype. Pereopods 5 and 6 missing.

Pereopod 7 moderately strong, article 2 longer than broad (ratio: 72:43), along anterior margin with 6 spines, along posterior slightly convex margin with 6 short setae, ventroposterior lobe short (Fig. 5E). Articles 4-6 of unequal length (ratio: 45:62:86), along anterior and posterior margins with bunches of short spines. Article 2 shorter than article 6 (ratio: 72:86). Dactylus short and strong, much shorter than article 6 (ratio: 24:86), at inner margin with one spine-like seta near basis of the nail, along outer margin with one median plumose seta (Fig. 5F); nail shorter than pedestal (ratio: 22:45).

Pleopods and uropods 1-2 like these in holotype. Uropod 3 narrow: peduncle longer than broad (ratio: 45:20), with 2 distal short spines. Inner ramus short, scale-like, shorter than diameter of peduncle, bearing 2 distal short spines (Fig. 5G). Outer ramus 2-articulate: first article long, along outer margin with 4 bunches of short spines, along inner (mesial) margin with 6 bunches of short spines accompanied by 1-2 short plumose setae only; second article much shorter than first article (ratio: 157:27), with several very short slender marginal setae.

Telson slightly longer than broad (ratio: 70:65), deeply incised; each lobe with 3 long distal spines and one spine at outer margin (Fig. 5H); a pair of short plumose setae appears in the middle of outer margin.

Male 5.3 mm (juv.) like females, partially damaged, uropod 3 missing.

Variability

Based on the scarce material available at the time of the present study, it was not possible to establish the variability of taxonomical characters of this taxon.

Remarks and affinities

The collected adult specimens from Mermerna pećina Cave are females only. Based on its taxonomical characters, specimens are close to *Niphargus deelemanae deelemanae* G. Karaman, 1973, known from Eastern Serbia (loc. typ.: Držina pećina Cave near Pirot, Morava river drainage system), mentioned later by G. Karaman (1998) for Bezimena pećina Cave in Asurovo Kale Mt. near Zvonačka Banja (nearly 20 km S. from Pirot, Serbia) also, by various characters (dactylus of gnathopods 1 and 2 along the outer margin with 1 median seta, nearly angular epimeral plates, elevated number of retinacula, the absence of facial spines on telson, short distal article of uropod 3 outer ramus, equal rami of uropod 1, low number of M-setae on propodus of gnathopods 1-2, etc.). Specimens from Mermerna pećina Cave differ from *N. deelemanae deelemanae* by the presence of shorter coxae, broader and more inclined palm of gnathopods 1-2, a dorsointernal row of spines on uropod 1-peduncle, and the inner plate of maxilla 1 with one seta.

From the subterranean waters near Šarbanovac (Crni Timok River drainage system, NE Serbia), subspecies *Niphargus deelemanae grex* (G. Karaman, 2013) was described to be rather similar to specimens from Mermerna pećina Cave by various characters (an elevated number of retinacula on pleopods, dactylus of gnathopods 1-2 along outer margin with one median seta, by angular epimeral plates, similar armature on urosomal segments 1-3, similar telson and uropods 1-3, similar pereopods 5-7). Specimens from Mermerna pećina Cave differs from ssp. *grex* by a larger propodus of gnathopods 1-2 with a more inclined palm, by shorter maxilla 1 palpus bearing distal spines only, by the presence of shorter spines on pereopods and uropods, by article 6 of pereopod 7 distinctly longer than article 2, etc.

Specimens of Mermerna pećina Cave seem to be more similar (based on the known adult females) to specimens from Šarbanovac (ssp. *grex*, over 200 km N from Mermerna pećina Cave) than to specimens from Pirot (ssp. *deelemanae*, nearly 100 km NE from Mermerna pećina Cave). The specimens from Mermerna pećina Cave are established as a different new subspecies, *N. deelemanae latellai* ssp. nov.

As all three taxa are described based on relatively scarce material and unknown adult males, further discov-

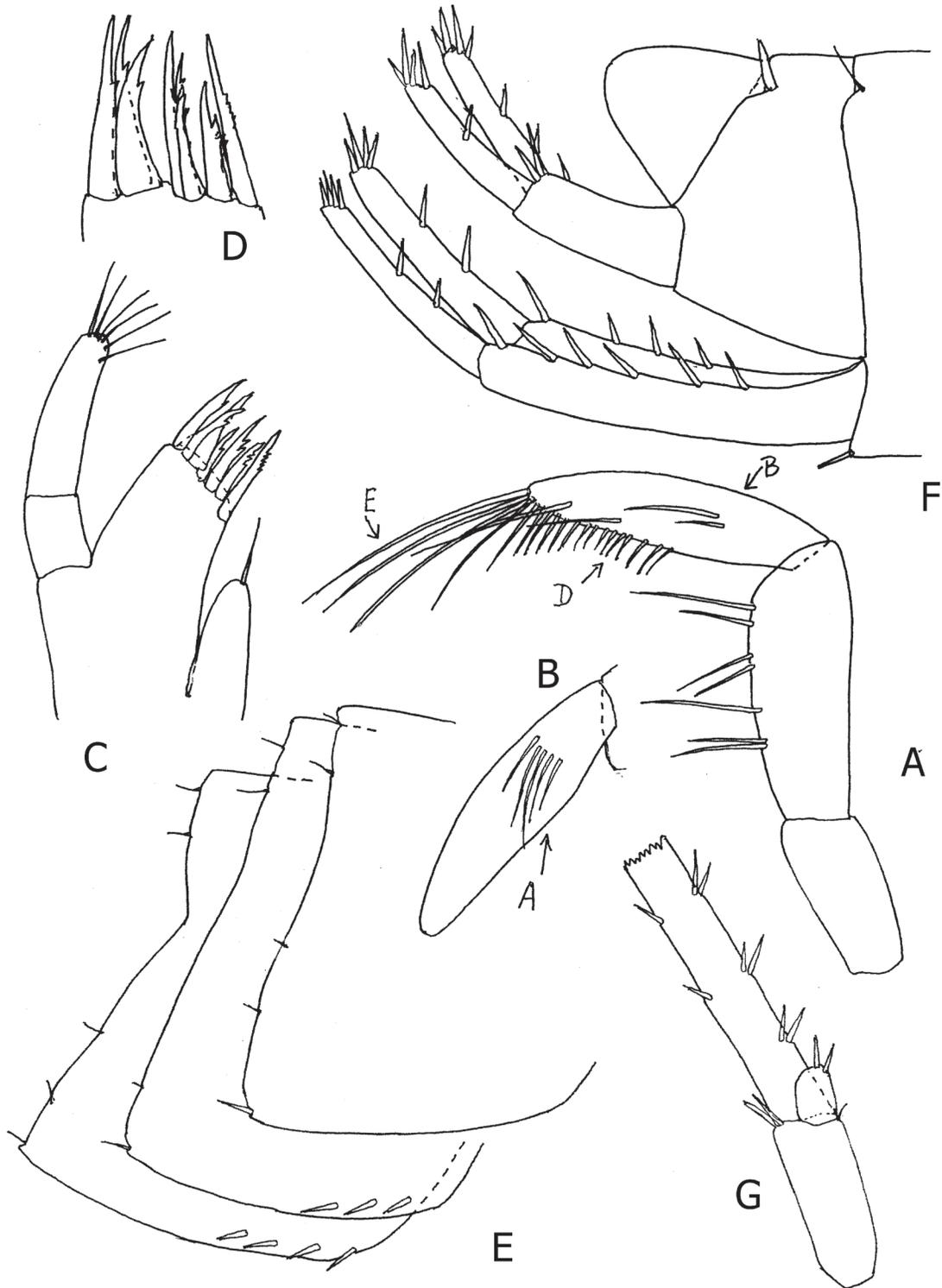


Fig. 1. *Niphargus deelemanae latellai*, ssp. n., Mermerna pećina Cave near Gadimlje, Lipljan, female 7.8 mm. **A**, palpus mandibulae, inner face (B = facial B-setae; D = marginal D-setae; E = distal E-setae); **B**, distal article of mandibular palp, outer face (A = facial A-setae); **C**, maxilla 1; **D**, spines on maxilla 1 outer plate; **E**, epimeral plates 1-3; **F**, urosome with uropods 1-2; **G**, uropod 3, proximal part.

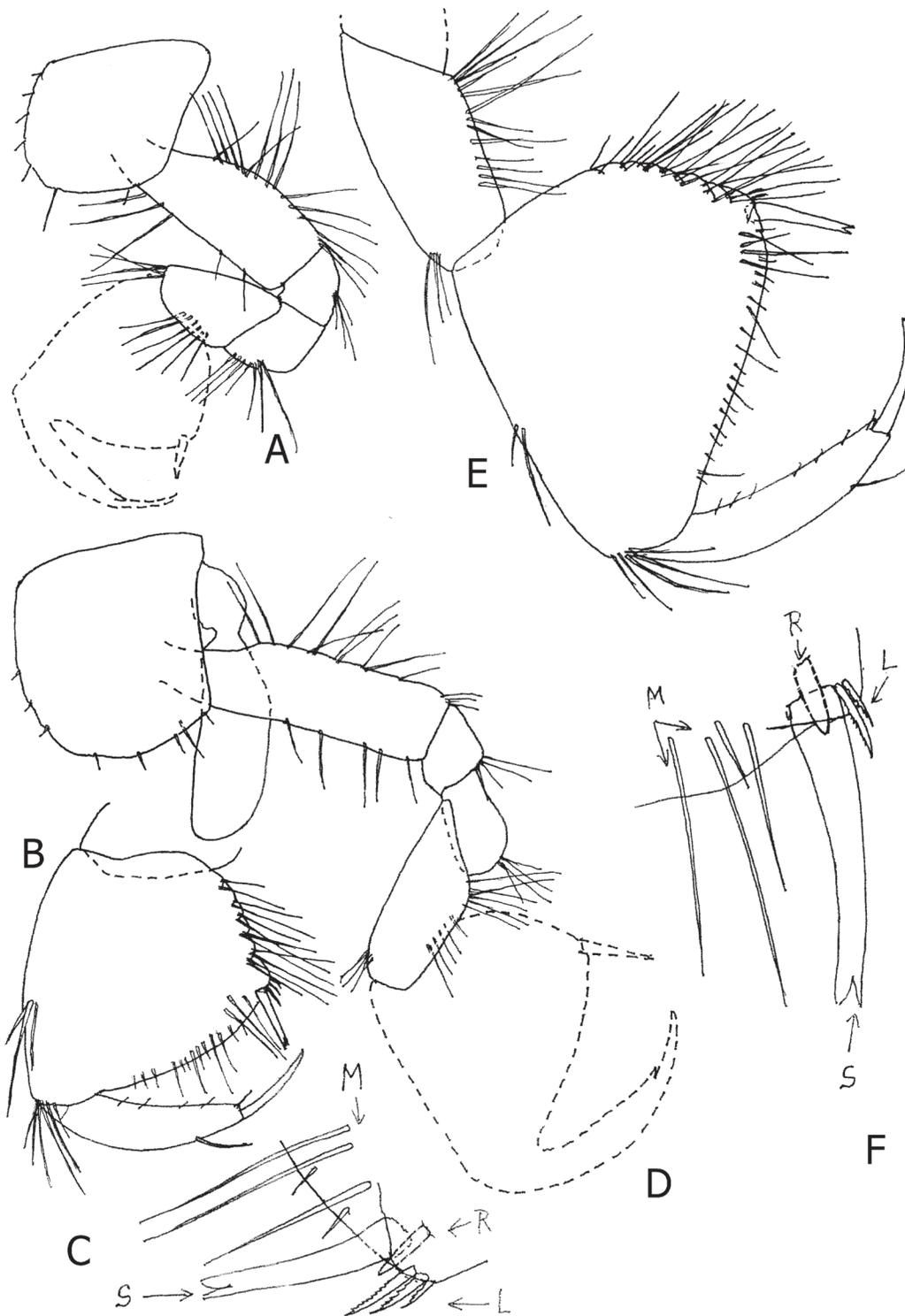


Fig. 2. *Niphargus deelemanae latellai*, ssp. n., Mermerna pećina Cave near Gadimlje, Lipljan, female 7.8 mm. **A-B**, gnathopod 1, outer face; **C**, distal corner of gnathopod 1 propodus, outer face (S = corner S-spine; L = lateral L-spines; R = subcorner R-spine; M = facial M-setae); **D-E**, gnathopod 2, outer face; **F**, distal corner of gnathopod 2 propodus, outer face (S = corner S-spine; L = lateral L-spines; R = subcorner R-spine; M = facial M-setae).

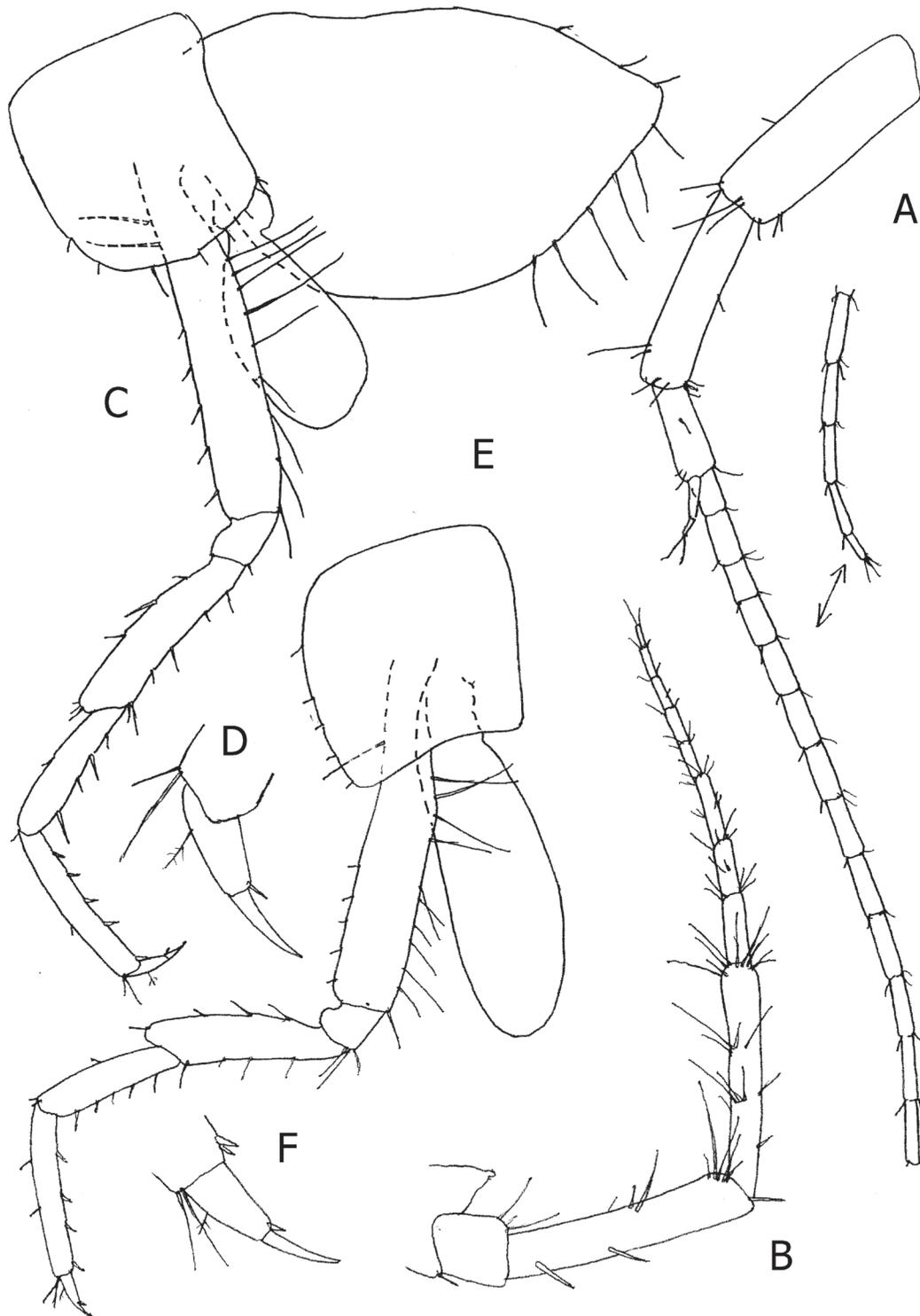


Fig. 3. *Niphargus deelemanae latellai*, ssp. n., Mermerna pećina Cave near Gadimlje, Lipljan, female 7.8 mm. **A**, antenna 1; **B**, antenna 2; **C-D**, pereopod 3; **E-F**, pereopod 4.

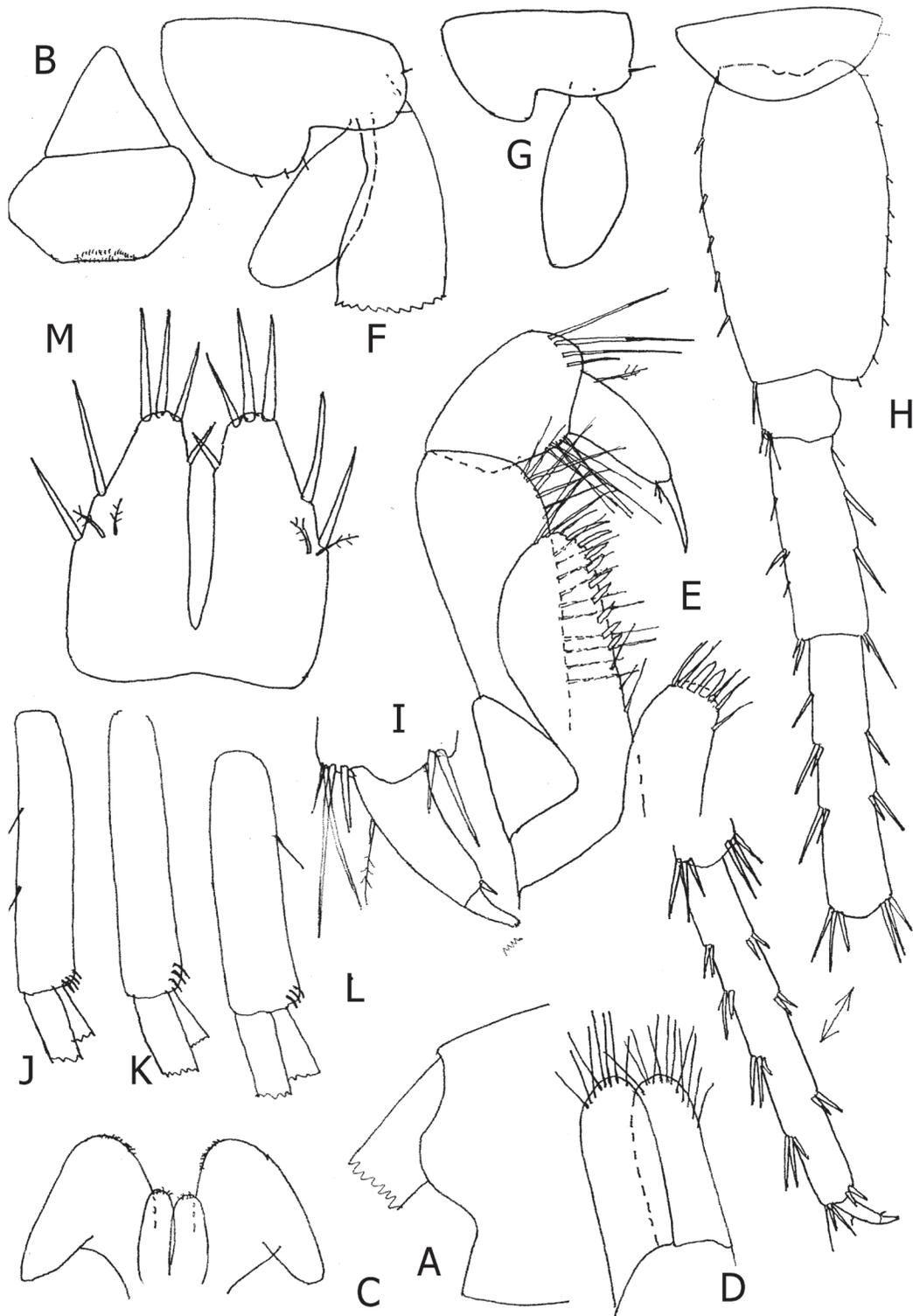


Fig. 4. *Niphargus deelemanae latellai*, ssp. n., Mermerna pećina Cave near Gadimlje, Lipljan, female 7.8 mm. **A**, head; **B**, labrum; **C**, labium; **D**, maxilla 2; **E**, maxilliped; **F**, coxa 5; **G**, coxa 6; **H**, pereopod 7; **I**, dactylus of pereopod 7; **J**, peduncle of pleopod 1; **K**, peduncle of pleopod 2; **L**, peduncle of pleopod 3; **M**, telson.

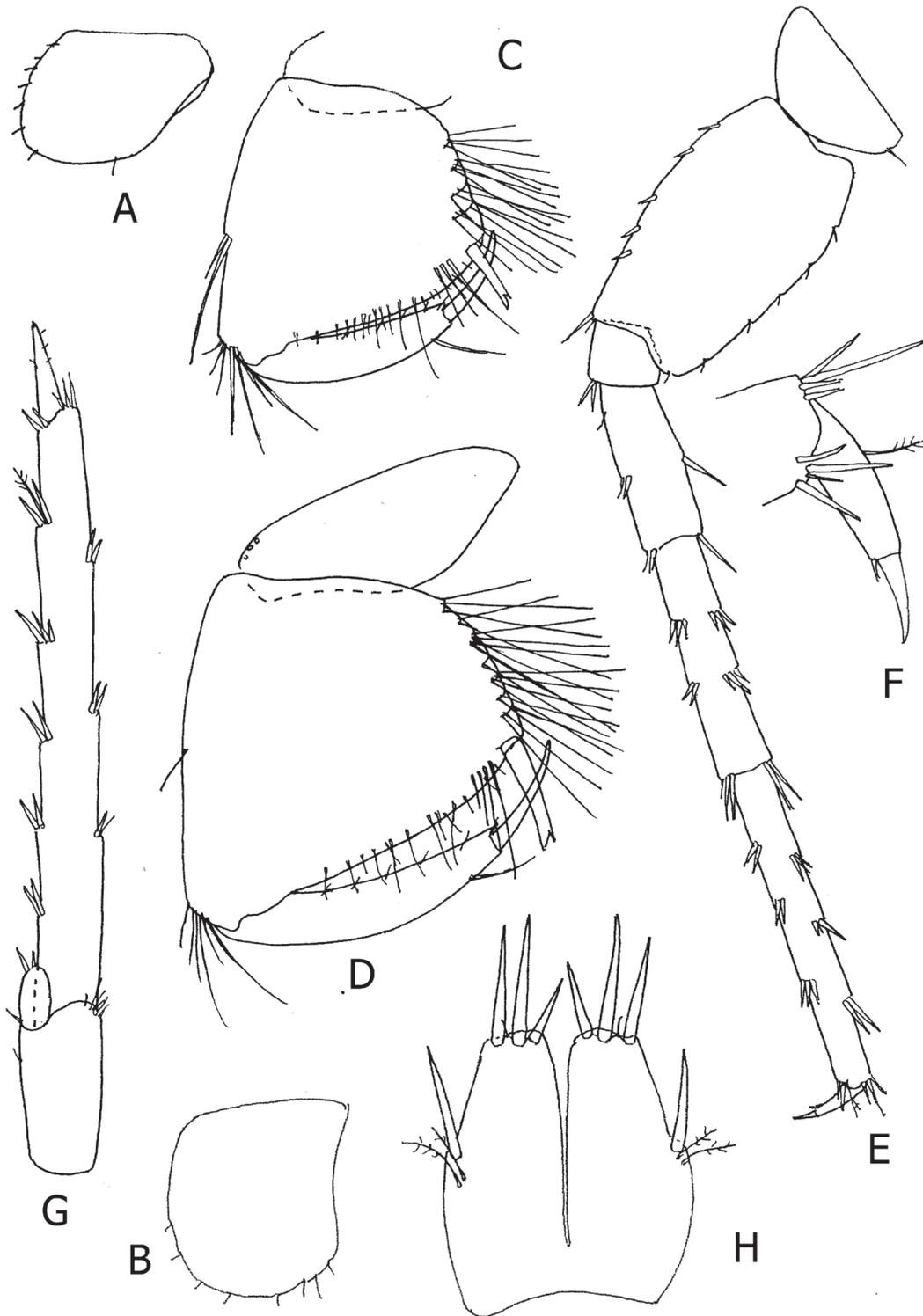


Fig. 5. *Niphargus deelemanae latellai*, ssp. n., Mermerna pećina Cave near Gadimlje, Lipljan, female 6.5 mm. A, coxa 1; B, coxa 2; C, gnathopod 1-propodus, outer face; D, gnathopod 2-propodus, outer face; E-F, pereopod 7; G, uropod 3; H, telson.

ery of adult males and new localities of these taxa over the entire Morava and Timok river drainage systems will show the morphological variability and real status of these taxa. Although all three taxa morphologically differ slightly from each other, and settle different areas (for the most part only type-localities are known), possible misidentification of populations with different morphological characters as putative subspecies or species remains possible, because of the convergence process of morphological characters observed within the entire *Niphargus* genus.

Locus typicus

Mermerna pećina Cave near Donje Gadimlje, Kosovo & Metohia region, Serbia.

Holotype: Female 7.8 mm. Holotype and paratype are temporarily deposited in Karaman's Collection in Podgorica, Montenegro.

Derivatio nominis: This taxon is dedicated to Dr. Leonardo Latella from the Museum of Natural History in Verona (Italy) who kindly sent me this material for study.

Niphargus multipennatus Sket 1956 (Figs 6-9)

Niphargus jovanovici multipennatus Sket 1956: 71, Fig. 3; Sket 1959: 105; Sket 1972: 106, Figs 25-42; G. Karaman 1972: 5; G. Karaman 1974: 19; Barnard J and Barnard C 1983: 692;

Niphargus (Jovaniphargus) jovanovici multipennatus S. Karaman 1960: 77;

Niphargus multipennatus G. Karaman 1980: 19; G. Karaman and Ruffo 1986: 528; G. Karaman 1988: 25; G. Karaman 1994: 32; G. Karaman 1997: 45; Kralj 2001: 148.

Material examined

S-5068= spring/torrent near Gračanica Lake by Priština, Kosovo & Metohia, Serbia, 2. 8. 1975, 10 exp mixed with *Niphargus biljanae* G. Kar. 1998 (leg. Spasenija Karaman).

Short description

Female 5.2 mm with oostegites: The specimens from Gračanica mainly agree with the description of this species from Slovenia, although we added some taxonomical characters that were not previously mentioned.

Body slender, metasomal segments 1-3 with 2-4 short dorsoposterior setae (Fig. 7B); urosomal segment 1 on each dorsolateral side with one seta, on urosomal segment 2 with one seta or weak spine on each dorsolateral side; urosomal segment 3 naked.

Urosomal segment 1 at each ventroposterior corner

with one spine-like seta near basis of uropod 1-peduncle (Fig. 8H).

Epimeral plate 1 almost angular, with marked ventroposterior corner and almost straight posterior margin bearing 2-3 short setae; epimeral plate 2 with distinct ventroposterior corner and slightly inclined posterior margin with 3 short marginal setae (Fig. 7B) and 0-1 subventral spine; epimeral plate 3 with poorly pointed ventroposterior corner and convex posterior margin bearing 3 short setae as well as one subventral facial spine.

Head with short rostrum and short subrounded lateral cephalic lobes, eyes absent (Fig. 8A).

Antenna 1 reaching nearly half of body-length, with moderately slender peduncular articles progressively shorter (ratio: 57:43:21), scarcely setose (Fig. 8B); main flagellum consisting of 18 articles (most of them with one aesthetasc) (Fig. 8C); accessory flagellum 2-articulated, almost as long as the last peduncular article (Fig. 8B).

Antenna 2 relatively slender, peduncular article 3 short, with 2 distoventral setae; article 4 slightly shorter than article 5 (ratio: 53:58), along both margins with several setae usually not exceeding diameter of article itself (Fig. 8D); article 5 with several short setae along both margins, some distal setae longer than diameter of article; flagellum slender, consisting of 7 scarcely setose articles; antennal gland cone short (Fig. 8D).

Mouthparts basic. Labrum broader than long, entire. Labium with entire outer lobes and small inner lobes.

Mandibles with triturative molar. Left mandible: incisor with 5 teeth, lacinia mobilis with 4 teeth and 5 rakers. Right mandible: incisor with 4 teeth, lacinia mobilis serrate, with 5 rakers. Mandibular palpus 3-articulated: first article naked, longer than broad; second article with 4 strong setae (Fig. 6A); third article narrow, longer than broad, semifalciform, longer than second one (ratio: 67:48), bearing 9-11 D-setae, 3-4 distal E-setae, on outer face with one row of 4 A-setae, on inner face appears one median B-seta (Fig. 6A).

Maxilla 1: inner plate with one distal seta, outer plate with 7 spines (6 spines with one lateral tooth, mesial spine with 2-3 teeth); palpus 2-articulated, reaching distal tip of outer plate spines and bearing 3 short distal setae (Fig. 7A).

Maxilla 2: longer than broad, inner plate slightly smaller than outer one, both plates with 7 distal seta each (the longest setae exceeding half of lobes-length (Fig. 8E).

Maxilliped: inner plate with 2 distal spines and single setae, outer plate reaching nearly half of palpus article 2, with row of distolateral spines; palpus article 4 with one seta at inner margin near the basis of the nail.

Coxae short. Coxa 1 much shorter than broad (ratio: 29:39), anterior margin not produced, bearing 4 short setae (Fig. 6B). Coxa 2 moderately broader than long (ratio: 46:37),

with 4 short marginal setae (Fig. 6E); coxa 3 broader than long (ratio: 47:37), with 4-5 marginal setae (Fig. 8F). Coxa 4 remarkably broader than long (ratio: 45:36), with 4 marginal short setae, posterior lobe absent (Fig. 8G).

Coxa 5 very hardly shorter than 4, bilobed, much broader than long (ratio: 42: 28) (Fig. 7C). Coxa 6 nearly as long as coxa 5, bilobed, broader than long (ratio: 42:24), anterior lobe rounded (Fig. 7D). Coxa 7 entire, as long as coxa 6, broader than long (ratio: 42:22) (Fig. 7E).

Gnathopods 1-2 propodus remarkably larger than corresponding coxa (Fig. 6A). Gnathopod 1: article 2 along anterior margin with 5 long proximal setae, along posterior margin with nearly 6 long setae; article 3 at posterior margin with distal seta; article 5 narrow, shorter than propodus (ratio: 36:64), along anterior margin with 2 distal setae, and numerous setae along posterior margin (Fig. 6B). Propodus large egg-shaped, longer than broad (ratio: 102:78), along posterior margin with 5 transverse rows of setae (Fig. 6C). Palm strongly inclined almost $\frac{3}{4}$ of propodus-length, poorly convex, defined on outer face by 2 corner unequal S-spines and 2 corner facial M-setae, on inner face by one short sub-corner R-spine; L-spines absent (Fig. 6D). Dactylus longer than diameter of propodus, along outer margin with one median seta, along inner margin with several short setae (Fig. 6C).

Gnathopod 2: article 2 along anterior margin with several short setae, along posterior margin with several bunches of long setae; article 3 with one posterodistal seta (Fig. 6E). Article 5 much shorter than propodus (ratio: 38:58), with one distoanterior seta and numerous posteromarginal setae. Propodus egg-shaped, longer than broad (ratio: 105:60), nearly as long as that of gnathopod 1 but slightly broader; along posterior margin with 4 transverse rows of setae (Fig. 6F); palm slightly convex, strongly inclined nearly $\frac{4}{5}$ of propodus-length, defined on outer face by 2 unequal corner S-spines and 2 corner facial M-setae, on inner face by one subcorner R-spine, L-spines absent (Fig. 6G). Dactylus longer than diameter of propodus, along outer margin with one median seta along inner margin with several short setae (Fig. 6F).

Pereopods 3-4 relatively slender. Pereopod 3: article 2 along anterior margin with a row of short setae, along posterior margin with groups of setae rather longer than these of anterior margin, but shorter than diameter of article itself. Articles 4-6 of unequal length (ratio: 42:32:40), article 4 along both margins with single short setae; articles 5 and 6 along posterior margin with single spine-like setae (Fig. 8F). Dactylus much shorter than article 6 (ratio: 15:40), along inner margin with one spine-like seta near basis of the nail, along outer margin with one median seta; nail slightly shorter than pedestal.

Pereopod 4 similar to pereopod 3 but hardly shorter. Setae on article 2 not exceeding diameter of article itself. Articles 4-6 of different length (ratio: 37:30:37); pilosity like that of pereopod 3 (Fig. 8G). Dactylus much shorter than article 6 (ratio: 14:37), at inner margin with one spine-like seta near the basis of the nail, along outer margin with one median seta (Fig. 8G); nail shorter than pedestal.

Pereopods 5-7 slender, progressively longer towards pereopod 7 (Fig. 7C, D, E). Pereopod 5: article 2 linear, much longer than broad (ratio: 71:30), along anterior margin with 6 single short stronger setae, along posterior almost straight margin with nearly 7 short setae; tapering ventrally (Fig. 7C). Articles 4-6 of different length (ratio: 40:47:48), along both margins with mainly single short setae or slender spines. Article 2 is remarkably longer than article 6 (ratio: 71:48). Dactylus shorter than article 6 (ratio: 16:48), at inner margin with one strong spine-like seta, at outer margin with one median seta; nail strong and short (Fig. 7C).

Pereopod 6 is remarkably longer than 5. Article 2 linear, much longer than broad (ratio: 82:30), along anterior margin with 5 single or paired short setae, along posterior poorly concave margin with 6 short setae, ventroposterior dilatation absent (Fig. 7D). Articles 4-6 of different length (ratio: 52:66:82), article 4 along both margins with single setae, along posterior margin with 2 spines; articles 5 and 6 along both margins with single or paired spines, the longest spines exceeding diameter of articles themselves. Article 2 as long as article 6. Dactylus much shorter than article 6 (ratio: 27:82), at inner margin with one spine near basis of the nail, at outer margin with one median seta; nail is much shorter than pedestal, strong (Fig. 7D)

Pereopod 7: article 2 linear, but slightly dilated proximally, much longer than broad (ratio: 84:40), along anterior margin 7 single slender spines, along posterior slightly concave margin with 7-8 short setae. Articles 4-6 of different length (ratio: 56:80:117): article 4 at anterior margin with 2 groups of setae and distal spine, along posterior margin with 3 strong single spines; articles 5 and 6 with 3-5 groups of strong spines (the longest spines exceeding diameter of articles themselves). Article 2 is shorter than article 6 (ratio: 84:117). Dactylus is much shorter than article 6 (ratio: 35:117), at inner margin with spine near basis of the nail, at outer margin with one median seta; nail strong and much shorter than pedestal (Fig. 7E).

Pleopods with 2 retinacula; peduncles almost naked or with 2-3 short marginal setae (Fig. 6H).

Uropod 1: peduncle is shorter than rami, with dorso-external and dorsointernal row of strong spines (Fig. 8H), distoventral tubercle absent. Both rami of equal length, inner ramus with 2 lateral and 5 distal spines (the longest spine poorly shorter than half of ramus-length; outer ramus with

one lateral bunch of spines and 2 median single simple setae, at tip appear 5 unequal spines.

Uropod 2: peduncle with 5 distal spines; inner ramus is longer than peduncle, with 3 lateral and 5 distal unequal spines; outer ramus shorter than inner one, with 5 distal unequal spines (the longest spine exceeding half of ramus-length (Fig. 8I).

Uropod 3 not pronounced; peduncle nearly 2 times longer than broad (Fig. 7F); inner ramus very short, scale-like, shorter than diameter of peduncle; outer ramus 2-articulated: first article along inner and outer margin with 5 bunches of strong spines (the longest spines exceeding diameter of article itself), plumose setae absent. Second article narrow, much shorter than first article (ratio: 27:143), with one short subdistal simple seta.

Telson as long as broad or poorly longer than broad, deeply incised (over 6/7 of telson-length), gaping; lobes remarkably tapering distally, provided with 2 slender distal spines and 5, rarely 4 distolateral long strong plumose single setae rather shorter than telson-length (Fig. 8J).

Coxal gills on gnathopod 2 and pereopods 3-6 ovoid, relatively short, never reaching ventral tip of corresponding article 2 (Figs 6E, 7D; 8F, G).

Oostegites ovoid, setose, appear on gnathopod 2 and pereopods 3-5 (Figs 6E, 8G).

Males like females (with the exception of oostegites and copulative tubercles).

Variability

Lobes of telson are usually provided with 5 long plumose setae, rarely only 4 or 6 setae; Dorsointernal margin of uropod 1-peduncle is always with row of strong spines.

Urosomal segment 1 usually with one weak seta at each dorsolateral side, rarely absent (perhaps broken or missing?), on urosomal segment 2 with one seta and/or one spine.

Remarks and affinity

Niphargus multipennatus clearly differs from all other known *Niphargus* species by the presence of 5 very long distal plumose setae on each lobe of telson.

In general, based on morphological characters, specimens from Gračanica agree completely with those from Bosnia, Croatia and Slovenia, despite the over 500 km distance between them. This high morphological stability is also present in some other members of the subgenus *Jovaniphargus* S. Kar. 1960 (typus subgeneris: *Niphargus jovanovici* S. Karaman 1931): *N. serbicus* S. Karaman 1960 (loc. typ.: Ćuprija, Serbia), known from Austria to Montenegro and Romania

(G. Karaman, 1997); *N. bajuvaricus* Schell. 1932 (loc. typ.: Wells in Moosach near München, Germany), known from Germany to Serbia and Romania; *N. grandii* Ruffo 1937 (loc. typ. Verona, Italy), known from Italy to NE Croatia, etc.

This stability of morphological characters supports the possibility of a very old, Tertiary origin for this group, where species from this subgenus are no longer in the process of morphological diversification despite the large distances between known localities within the entire area. In contrast, for many species from other groups of amphipods such as the *Niphargus stygius* (Schiödte 1847) group, or species of subgenus *Orniphargus* S. Kar. 1950 (typus subgeneris: *Niphargus orcinus* Joseph 1869), etc., many species are still in the active process of morphological diversification, forming various subspecies, forms and transitive populations.

Locus typicus

Pomp-well on Sava coast in Stožice near Ljubljana (Slovenia).

Localities cited

Slovenia: Sava coast in Stožice near Ljubljana (Sket 1956; Sket 1959; G. Karaman 1972; G. Karaman 1974; G. Karaman 1980); Beričevo near Ljubljana (Sket 1972; G. Karaman 1974; G. Karaman 1980); Dovjež (Sket 1972; G. Karaman 1974; G. Karaman 1980); Kranj (Sket 1972; G. Karaman 1974; G. Karaman 1980); Brežice (Sket 1972; G. Karaman 1974; G. Karaman 1980) Mostnica near Bohinj; Bohinj (Sket 1972; G. Karaman 1974; G. Karaman 1980); wells, hyporheic waters in Slovenia (G. Karaman and Ruffo 1986).

Croatia: Zagreb (Sket 1972; G. Karaman 1974; G. Karaman 1980); Zagreb region (G. Karaman and Ruffo 1986); Podsused W. of Zagreb (with *N. labacensis* and *N. longidactylus*, (G. Karaman 1994; G. Karaman 1997); numerous localities in Zagreb region (Valley of Sava river; Trnje; Vrbik; Vrapče; Podsused; Bestovje; Blato; Opatovina) (Kralj 2001; G. Karaman 1980).

Bosnia and Herzegovina: Well between Dolac and Travnik (Sket 1972; G. Karaman 1974; G. Karaman 1980; G. Karaman and Ruffo, 1986); torrent Zujevna in Blažuj near Sarajevo, with *N. longidactylus* and *N. serbicus*; (G. Karaman 1988).

Serbia (Kosovo & Metohia): Spring near Gračanica Lake by Priština (new). This is the first known locality of this species so far from the SW part of the Balkans (see map), and new for the fauna of Serbia.

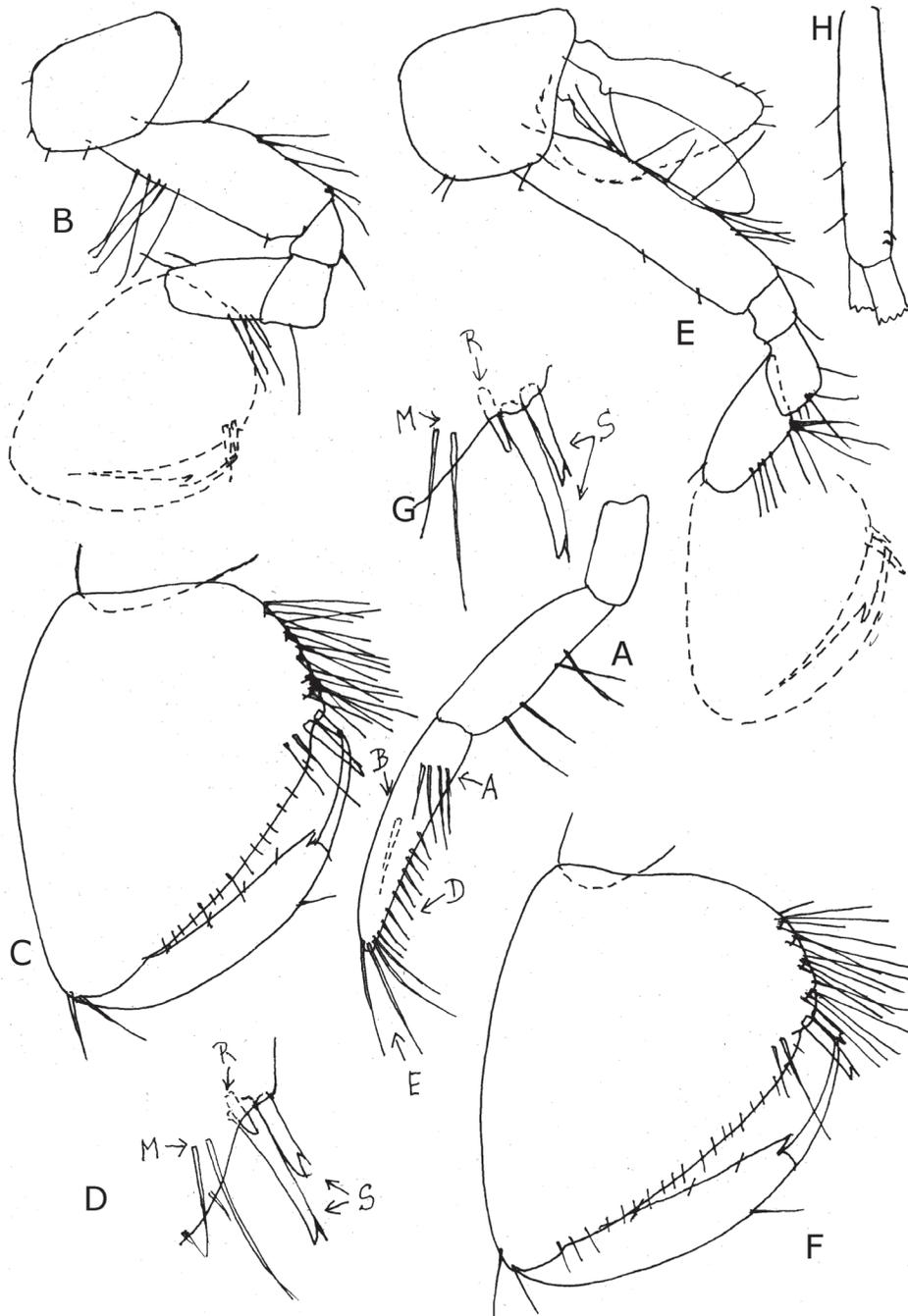


Fig. 6. *Niphargus multipennatus* Sket 1956, spring/torrent near Gračanica Lake by Priština, female 5.2 mm. A, mandibular palpus, outer face (A = facial A-setae; B = facial B-setae; D = lateral D-setae; E = apical E-setae); B-C, gnathopod 1, outer face; D, distal corner of gnathopod 1 propodus, outer face (S = corner S-spine; L = lateral L-spines; R = subcorner R-spine; M = facial M-setae); E-F, gnathopod 2, outer face; G, distal corner of gnathopod 2 propodus, outer face (S = corner S-spine; L = lateral L-spines; R = subcorner R-spine; M = facial M-setae); H, peduncle of pleopod 1.

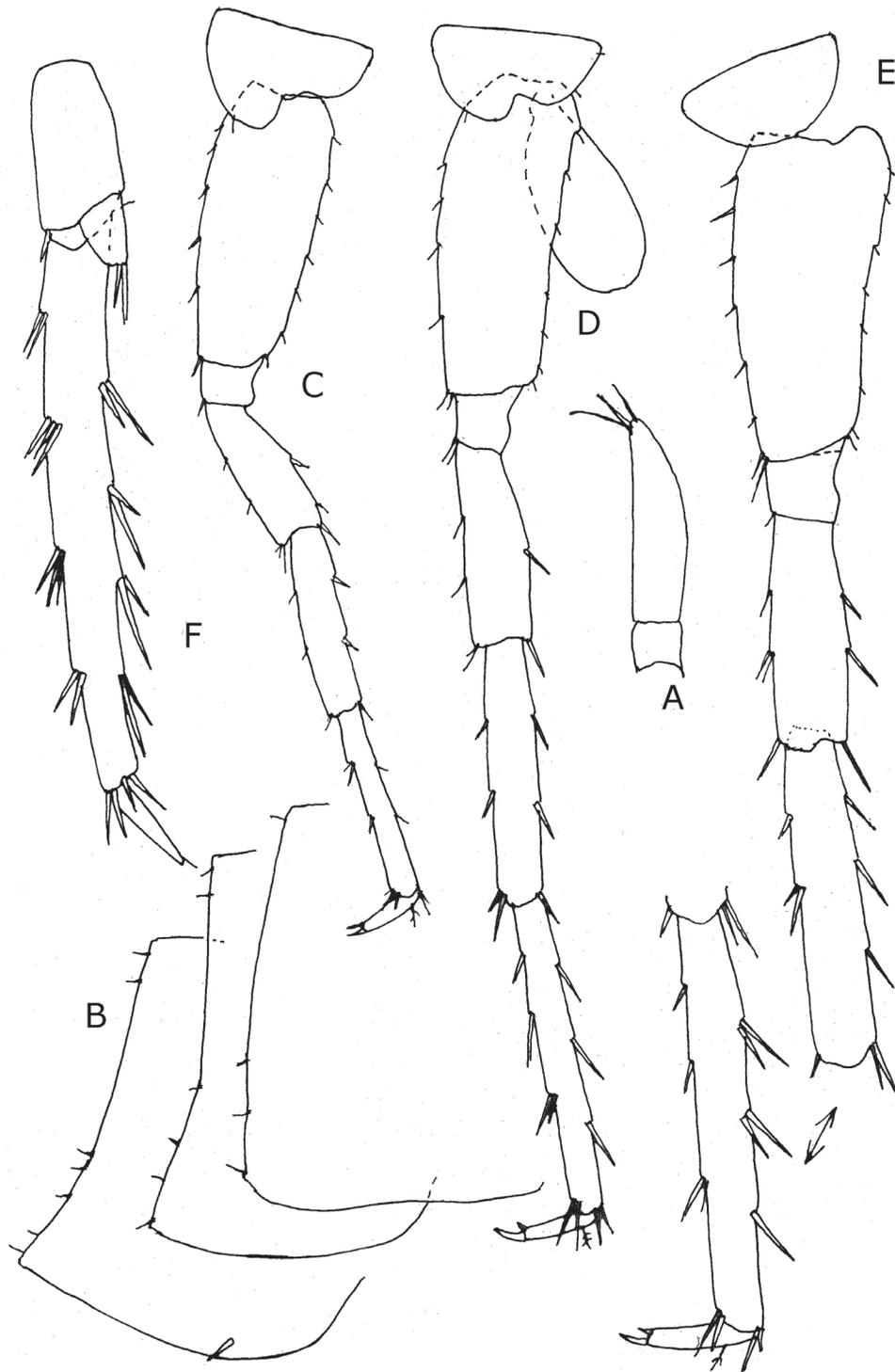


Fig. 7. *Niphargus multipennatus* Sket 1956, spring/torrent near Gračanica Lake by Priština, female 5.2 mm. A, maxilla 1-palpus; B, epimeral plates 1-3; C, pereopod 5; D, pereopod 6; E, pereopod 7; F, uropod 3.

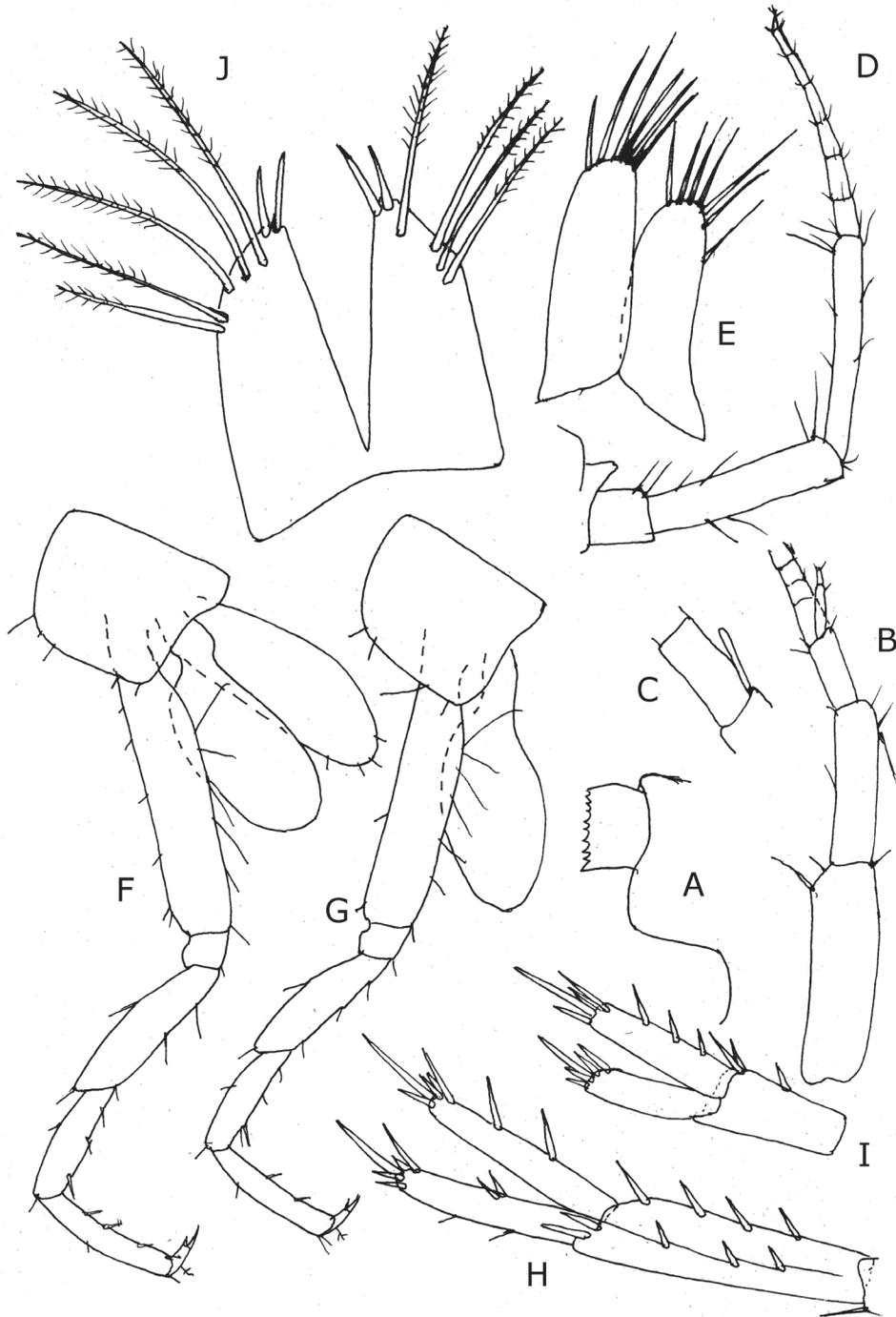


Fig. 8. *Niphargus multipennatus* Sket 1956, spring/torrent near Gračanica Lake by Priština, female 5.2 mm. **A**, head; **B**, antenna 1; **C**, aesthetasc on antenna 1 main flagellum; **D**, antenna 2; **E**, maxilla 2; **F**, pereopod 3; **G**, pereopod 4; **H**, uropod 1; **I**, uropod 2; **J**, telson.

General distribution

Slovenia, Croatia, Bosnia & Herzegovina, Serbia (Kosovo & Metohia) (Fig. 9).

Karamaniella parapupetta (G. Karaman 1984)

Niphargus parapupetta G. Karaman 1984: 61, Fig. X, 1-4; G. Karaman 1985: 22 (key); G. Karaman and Ruffo 1986: 534; Kralj 2001: 154;

Karamaniella pupetta Dancau 1972: 226, Figs 1-4;

Niphargus pupetta pupetta (part.) G. Karaman 1974: 23;

?*Niphargus parapupetta* G. Karaman 2011: 150.

Material examined

S-7359= Serbia: village Reka near Brza Palanka, pump in torrent, 28.7. 2020, 8 exp., mixed with *Bogidiella albertimagni* Hertzog 1933 and *Niphargus* sp. (leg. Raško Karaman & Ivo Karaman).

Remarks

The specimens from Reka near Brza Palanka agree with the specimens known from Romania, and Croatia. The females were with setose oostegites, but without eggs.

Karamaniella parapupetta is new for the fauna of Serbia. This species is characterized by a prominent dorsoanterior tip off of the head, the prominent dorsoanterior tip of peduncular article 1 of antenna 1, narrowed lateral cephalic lobes, accessory flagellum 1-articulated, epimeral plates 1-3 strongly pointed ventroposteriorly, telson long, etc. It is very easily distinguishable from similar species known from Italy and Slovenia, *Karamaniella pupetta* Sket 1962 (loc. typ.: Petrovče near Celje, Slovenia) by the absence of strong ventroposterior spine on urosomal segment 1 near the basis of uropod 1-peduncle and unequal rami of uropod 1.

Karamaniella parapupetta belongs to the group of species that tend to bend into a ball, thanks to their specific body shape and the size of their extremities. This morpho-

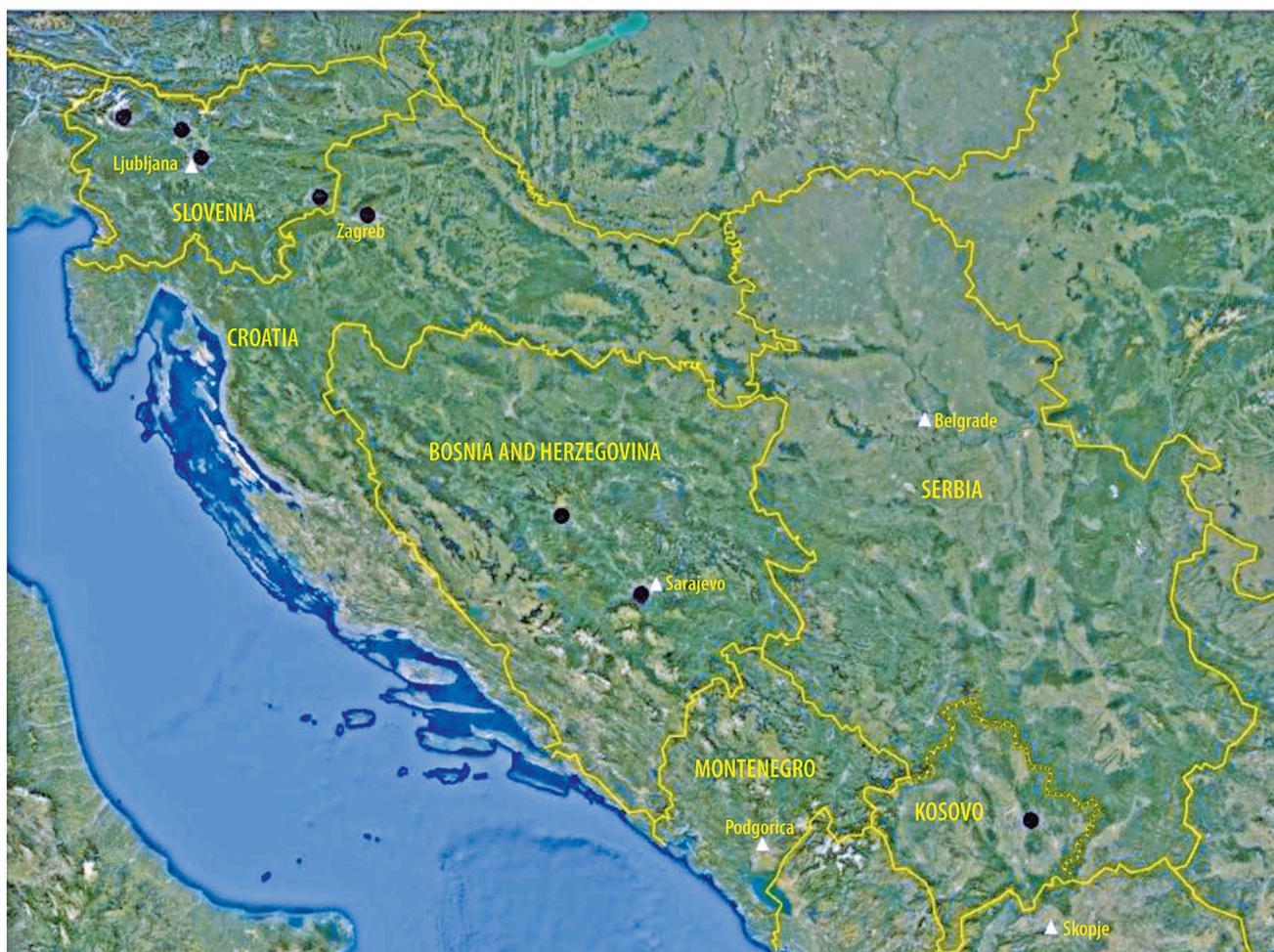


Fig. 9. Distribution of *Niphargus multipennatus* Sket 1956 (black dots).

logical adaptation represents a very ancient character, very rare among the over 400 known taxa of genus *Niphargus* (*sensu auct.*) and other Niphargidae members.

Sket (1962) described *Karamaniella pupetta* gen. nov. sp. nov. from Slovenia, species with these characters. Later, various authors moved this species to the genus *Niphargus*. After discovery of several other similar species, *Karamaniella* was erected again as a distinct genus (G. Karaman 2016; Karaman and Sket 2019). Recently various authors, based on molecular investigations only, attempted to fuse several genera of family Niphargidae within the genus *Niphargus*, without using the known molecular data from all members of that genera and the family. It is clear that the over 400 known taxa of genus *Niphargus* with very different origins have to be separated into different genera and subgenera, which will illustrate the great age and dynamic history of this group. Further investigations will shed more light on these problems.

Locus typicus

Podsused near Zagreb, Croatia.

Localities cited

Croatia: Podsused and Opatovina near Zagreb (G. Karaman 1984; Kralj 2001); Zagreb (Sket and Notenboom, 1993; Kralj 2001).

Serbia: Reka near Brza Palanka (now).

Romania: Berzasca; (Dancău 1972, sub *N. pupetta*; G. Karaman 1984); Liubotina; Plavisevita (Dancău 1972, sub *N. pupetta*).

Distribution

Croatia, Romania, Serbia (present data). All localities belong to the Danube drainage system, and we suppose that this species will be found in Hungary also.

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REFERENCES

- Barnard JL, Barnard CM. 1983. Freshwater amphipods of the World. I. Evolutionary patterns. II. Handbook and bibliography. Mt. Vernon, Virginia: Hayfield Associates.
- Dancău D. 1972. Sur la présence en Roumanie du genre *Karamaniella* (Amphipoda). Travaux de l'Institut de Spéologie "Emile Racovitza". 11:225–231.
- Karaman G. 1969. XXVII. Beitrag zur Kenntnis der Amphipoden. Arten der Genera *Echinogammarus* Stebb. und *Chaetogammarus* Mart. an der jugoslawischer Adriaküste. Glasnik Republičkog zavoda za zaštitu prirode i Prirodnjačke zbirke u Titogradu. 2:59–84.
- Karaman G. 1972. Le probleme du Genre *Niphargus* en Yougoslavie. Actes du Ier Colloque International sur le genre *Niphargus*-Verona, 15-19 Aprile 1969, Museo Civico di Storia Naturale, Verona, Memorie fuori serie. 5:1–10.
- Karaman G. 1973. Two new Species of Family Gammaridae from Yugoslavia, *Niphargus deelemanae* n. sp. and *Typhlogammarus algar*, n. sp. (XLVIII. Contribution to the Knowledge of the Amphipoda). Archiv für Hydrobiologie, Stuttgart. 72(4):490–500.
- Karaman G. 1974. Catalogus Faunae Jugoslaviae, Crustacea Amphipoda (Contribution to the Knowledge of the Amphipoda 60). Consilium Academicum Scientiarum Rei Publicae Socialisticae Foederativae Jugoslaviae, Academia Scientiarum et Artium Slovenica, Ljubljana, 3 (3): 1-44.
- Karaman, G. 1980. Revision of *Niphargus jovanovici*-group (Fam. Gammaridae) (Contribution to the Knowledge of the Amphipoda 110). Poljoprivreda i šumarstvo, Titograd. 26(2):3–22.
- Karaman G. 1984. Description of several new *Niphargus* species (Gammaridea, Niphargidae) from southern Europe (Contribution to the Knowledge of the Amphipoda 136). Poljoprivreda i šumarstvo, Titograd. 30(2-3):39–64.
- Karaman G. 1985. The taxonomy of *Niphargus transitivus* Sket 1971 with remarks to *N. armatus* G. Kar. 1985 (Fam. Niphargidae) in Italy (Contribution to the Knowledge of the Amphipoda 149). Poljoprivreda i šumarstvo, Titograd. 31(2-3):21–35.
- Karaman G, Ruffo S. 1986. Amphipoda: *Niphargus*-Group (Niphargidae sensu Bousfield, 1982). In: Botosaneanu L, editor. Stygofauna Mundi, A faunistic, distributional, and ecological synthesis of the world fauna inhabiting subterranean waters (including the marine interstitial). Leiden: E. J. Brill/ Dr. W. Backhuys. p. 514–534.
- Karaman G. 1988. New species of family Niphargidae and new localities of some other subterranean Gammaridean species from Yugoslavia (Contribution to the Knowledge of the Amphipoda 166). Glasnik Republičkog zavoda za zaštitu prirode i Prirodnjačkog muzeja u Titogradu. 19:15–32. (1986).
- Karaman G. 1990. Taxonomical investigations on *Niphargus bajuvaricus* Schell. 1932 and its subspecies (Contribution to the Knowledge of the Amphipoda 200). Glasnik Republičkog zavoda za zaštitu prirode i Prirodnjačkog muzeja u Titogradu. 22:95–111. (1989).
- Karaman G. 1994. Some new or interesting Gammaridean species from Austria and adjacent regions (Contribution to the Knowledge of the Amphipoda 206). Glasnik

- Republičkog zavoda za zaštitu prirode i Prirodnjačkog muzeja u Podgorici. 24:29–39. (1991).
- Karaman G. 1997. On some interesting *Niphargus* species from Europe (Amphipoda Gammaridea, fam. Niphargidae). (Contribution to the Knowledge of the Amphipoda 229). Glasnik Republičkog zavoda za zaštitu prirode i Prirodnjačkog muzeja u Podgorici. 25:41–52. (1992).
- Karaman, G. 1998. On some interesting Gammaridean species from Serbia (Yugoslavia) and Slovenia (Contribution to the Knowledge of the Amphipoda 231). Glasnik Republičkog zavoda za zaštitu prirode i Prirodnjačkog muzeja u Podgorici. 26:31–40. (1993).
- Karaman G. 2011. Check list of the Amphipoda (Crustacea, Malacostraca) from Serbia (Contribution to the Knowledge of the Amphipoda 255A). Glasnik Republickog zavoda za zaštitu prirode, Podgorica 31/32:143–161.
- Karaman G. 2012. Further investigations of the subterranean genus *Niphargus* Schiöde, 1849 (fam. Niphargidae) in Serbia. (Contribution to the Knowledge of the Amphipoda 264). Agriculture and Forestry, Podgorica. 58(2):45–64.
- Karaman G. 2013. On two members of the genus *Niphargus* Schiöde, 1849 (Crustacea: Niphargidae) from Balkan Peninsula, *N. deelemanae* grex, ssp. n. and *N. jurinaci* S. Kar. 1950 (Contribution to the Knowledge of the Amphipoda 271). Acta Entomologica Serbica, Beograd. 18(1/2):207–235.
- Karaman G. 2016. Two new genera of the family Niphargidae from Greece (Contribution to the Knowledge of the Amphipoda 287). Agriculture and Forestry, Podgorica. 62(1):7–27.
- Karaman G, Sket B. 2019. New genus and species of the family Niphargidae (Crustacea: Amphipoda: Senticaudata), *Chaetoniphargus lubuskensis* gen. nov., sp. nov. from Croatia. Zootaxa 4545(2):249–263.
- Karaman S. 1950. Podrod *Orniphargus* u Jugoslaviji. I. Deo. [Das Subgenus *Orniphargus* in Jugoslavien]. Srpska Akademija Nauka, Posebna Izdanja knj. 158. Odeljenje Prirodno-matematičkih nauka, Beograd. 2:119–136, 145–156, 160–167.
- Karaman S. 1960. Weitere Beiträge zur Kenntnis der Jugoslawischen Niphargiden. Glasnik Prirodnjačkog muzeja Beograd, Serie B. 15:75–90.
- Kralj K. 2001. Raznolikost faune rakušaca (Amphipoda) slatkih i bočatih voda Hrvatske. [Diplomski rad]. Sveučilište u Zagrebu, Prirodoslovno-matematički fakultet, Biološki odsjek. 224 pp.
- Sket B. 1956. Einige neue Formen der Malacostraca (Crustacea) aus Jugoslawien. Bulletin Scientific. 3(3):70–71.
- Sket B. 1957. Über Zoogeographie und Phylogenie der Niphargen. Verh. der Deutsch. Zool. Ges. Graz. p. 484–486.
- Sket B. 1959. Einige Formen der Malacostraca aus Jugoslawien II. Bulletin Scientifique. 4(4):105.
- Sket B. 1962. *Karamaniella pupetta*, n.g., n.sp., ein neuer Amphipode aus Slovenien. Izdanija, Zavod za Ribarstvo Makedonije, Skopje. 3(2):27–32. (1960).
- Sket B. 1972. Die *Niphargus giovanovici* Gruppe (Amphipoda, Gammaridae) in Jugoslawien und NO-Italien, Taxonomisch, Zoogeographisch und Phylogenetisch Betrachtet. Razprave, Slovenska Akademija Znanosti in Umetnosti, Ljubljana, Razred Prirod. i medic. vede. 15(5):1–45.
- Sket B, Notenboom J. 1993. Phylogeny and biogeography of the *Niphargus transitivus* group of species (Crustacea, Amphipoda). Bijdragen tot de Dierkunde. 63:149–161.