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## New member of the family Niphargidae from Croatia, *Niphargus radzai*, sp. n. (Contribution to the Knowledge of the Amphipoda 273)

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### Abstract

One new species of the genus *Niphargus* Schiödte, 1849 (Amphipoda, Gammaridea, Niphargidae) from the subterranean waters (springs) above Ravno Vrdo in Dinara Mountain, Croatia, is described. *Niphargus radzai* sp. n. belongs to the artificial group within *Niphargus* with elevated number of setae along outer margin of dactylus in gnathopods 1 and 2 and dactylus of some or all pereopods provided with additional spines along inner margin. The differences between *N. radzai* and some other similar members of this group of taxa are discussed.

**Key words:** taxonomy, Crustacea, Amphipoda, Niphargidae, *Niphargus radzai*, new species, subterranean waters, Croatia

### Introduction

The amphipods of the family Niphargidae have wide distribution in Europe and Near East till Caucasus, Iran and Iraq. Among several known genera of this family, the genus *Niphargus* Schiödte 1849 is currently presented by almost 300 known taxa settling various types of the subterranean waters, but as the subterranean waters are explored further, it is highly likely that more species will be described. In Croatia over 40 species and subspecies of genus *Niphargus* are known. During recent relatively intense researches of the caves in Croatia provided by various investigators and speleologists, many samples of genus *Niphargus* were collected. In this paper, one new species of this genus collected by speleologist Tonči Radža of the Speleological Society Špiljar from Split, Croatia, is described.

### Material and methods

The collected material was preserved in 70% ethanol. The specimens were dissected using a WILD M20 microscope and drawn using a 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 the tip of head to the 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 thin cover glass. Some morphological terminology and seta formulae follows Karaman's terminology (Karaman, G. 1969; 1970; 1993; 2012): for last mandibular palp [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 [S= corner spine; L= lateral spines; M= facial setae; R= subcorner spine]. Term "setae" and "spines" are used based on its 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.

## Systematics

### Family Niphargidae

#### Genus *NIPHARGUS* Schiödte, 1849

##### *Niphargus radzai* sp. n.

(Figs 1–8)

**Material examined.** S-7210. Spring above “P.D. Sv. Jakov”, Ravno Vrdovo, Dinara Mt., Croatia, 25. 10. 2013 (leg. Tonči Radža), 6 exp. Holotype male 12.7 mm [S-7210A] is deposited in Natural History Museum and Zoo, Split, Croatia.

**Type locality.** Spring above “P.D. Sv. Jakov”, Ravno Vrdovo, Dinara Mt., Croatia.

**Diagnosis.** Epimeral plates 1–3 subrounded; pleopods 1–3 with 2 retinacula each; peduncle of pleopods 1–3 very scarcely setose. Uropod 1 in males with very elongated inner ramus; uropod 3 with elongated second article of outer ramus in male; telson with distal, marginal and facial spines; dactylus of pereopods 3–7 strong, dactylus of pereopods 3 and 4 with 2 strong spines along inner margin; dactylus of pereopods 5–7 with one strong spine along inner margin near the basis of the nail; propodus of gnathopods 1–2 with a row of several setae along outer margin.

**Description. Male** 12.7 mm (holotype). Body relatively slender, pleonites 1–3 with 2–4 dorsolateral short marginal setae each (fig. 1D). Urosomite 1 on each dorsolateral side with 1 seta; urosomite 2 on each dorsolateral side with 3 setae or 1 seta and 2 spines; urosomite 3 naked.

Urosomite 1 on each ventroposterior side with one spine near basis of uropod 1 peduncle.

Epimeral plates 1–2 with strongly subrounded ventroposterior corner and remarkably convex posterior margin bearing several short marginal setae (fig. 1D); epimeral plate 3 slightly less subrounded than epimeral plates 1–2, with marked corner seta and convex posterior margin bearing 5–6 short marginal setae; epimeral plates 2–3 with 3 subventral spines each (fig. 1D).

Head with short rostrum and short subrounded lateral cephalic lobes and excavated ventroanterior sinus, eyes absent (fig. 1A).

Antenna 1 reaching nearly half of body-length (ratio: 60: 117); peduncle scarcely setose, peduncular articles 1–3 progressively shorter (ratio: 65: 47: 25), bearing single short setae each (fig. 1B); main flagellum consisting of 21 articles (most of them with one short aesthetasc). Accessory flagellum much shorter than last peduncular article, 2-articulated.

Antenna 2 remarkably shorter than antenna 1; peduncular article 3 nearly quadrate, with one ventrodial bunch of long simple setae (fig. 1C); articles 4 and 5 of unequal length (ratio: 60: 56); article 4 along ventral margin with 3 bunches of long setae, along dorsal margin with several bunches of short setae; article 5 along ventral margin with 4 bunches of long setae, along dorsal margin with several bunches of short setae (fig. 1C); flagellum slender, longer than last peduncular article (ratio: 83: 56), composed of 11 articles bearing setae along ventral margin longer than these on dorsal margin (fig. 1C). Antennal gland cone short (fig. 1C).

Mouthparts well developed. Labrum entire, broader than long (fig. 5A). Labium broader than long (high), inner lobes well developed, entire; outer lobes subrounded distally (fig. 5B).

Mandibles. Molar triturate; Left mandible: incisor with 5 teeth (fig. 5F), lacinia mobilis with 4 teeth (fig. 5E). Right mandible: incisor with 4 teeth (fig. 5G), lacinia mobilis bifurcate, with several unequal teeth (fig. 5H). Palpus of both mandibles equal, 3-articulate: first article naked, short (fig. 5C); second article with 12 strong setae; article 3 falciform, hardly longer than article 2 (ratio: 70: 67), along margin with 24 short D-setae and 7 long distal E-setae; on outer face appear a row of 5 A-setae, on inner face are attached 4 single B-setae (fig. 5C).

Maxilla 1: inner plate with 4 setae; outer plate with 7 spines [6 spines with one lateral tooth, one spine with 2 spines; or 6 spines with one lateral tooth, one spine with 2–3 lateral teeth]; palp 2-articulated, not reaching distal tip of outer plate spines, provided with 7 setae (fig. 3A).

Maxilla 2: both plates with marginal setae only (fig. 3B).

Maxilliped: inner plate short, left inner plate with 3 distal spines and several marginal setae, right inner plate with 4 distal spines and several marginal setae (fig. 5I); outer plate nearly reaching half of palpus article 2-length, with row of lateral spines and distal setae; palpus article 3 along outer margin with 2 bunches of setae; palpus article 4 along outer margin with one median seta, along inner margin with one seta near basis of the nail (fig. 5I).

Coxae 1–4 relatively short, bearing a row of short marginal setae each. Coxa 1 broader than long (high) (ratio: 50: 40), with subrounded ventroanterior corner (fig. 2A). Coxa 2 slightly broader than long (ratio: 60: 50) (fig. 2D). Coxa 3 slightly broader than long (ratio: 59: 53) (fig. 3C). Coxa 4 remarkably broader than long (ratio: 62: 53) (fig. 3E). Coxae 5–7 progressively shorter. Coxa 5 much broader than long (ratio: 66: 42), with large subrounded anterior lobe bearing 3–4 short marginal setae (fig. 4A). Coxa 6 broader than long (ratio: 55: 30), with subrounded anterior lobe (fig. 4D). Coxa 7 broader than long (ratio: 51: 25), entire (fig. 4F).

Gnathopods 1–2 of moderate size, with propodus nearly as large as the corresponding coxa. Gnathopod 1: basis rather dilated, along anterior and posterior margin with a row of long setae (fig. 2A); ischium along posterior margin with one bunch of setae; carpus shorter than propodus (ratio: 35: 50), along anterior margin with one distal bunch of setae (fig. 2A); propodus slightly trapezoid, longer than broad (ratio: 90: 77), along posterior margin with 8 transverse rows of setae (fig. 2B); palm slightly convex, inclined slightly less than half of propodus-length, defined on outer face by strong corner S-spine accompanied laterally by 3 slender serrate L-spines and a row of 5 facial M-setae, on inner face by one short subcorner R-spine (fig. 2C); dactylus reaching posterior margin of propodus, and provided along outer margin with a row of single or paired 8 median setae (fig. 2B).

Gnathopod 2 only slightly larger than gnathopod 1: basis more slender than that in gnathopod 1, with long setae along anterior and posterior margin (fig. 2D); ischium along posterior margin with one bunch of setae (fig. 2D); carpus slightly shorter than propodus (ratio: 46: 50), along anterior margin with one distal group of setae; propodus slightly trapezoid, hardly longer than broad (ratio: 93: 90), along posterior margin with 10 transverse rows of setae; palm slightly convex, inclined nearly 2/5 of propodus-length, defined on outer face by one corner S-spine accompanied laterally by 3 slender serrate L-spines and a row of 4 facial M-setae, on inner face by one short subcorner R-spine; dactylus reaching posterior margin of propodus, along outer margin with row of 7 median single setae (fig. 2E).

Pereopods 3 and 4 are moderately slender. Pereopod 3: basis along posterior margin with a row of long setae, along anterior margin with row of shorter setae (fig. 3C); merus, carpus and propodus of unequal length (ratio: 55: 38: 50); merus along posterior margin with 4 bunches of setae (the longest setae are slightly longer than the diameter of the article); carpus with several short setae and single spines along posterior margin; propodus with a row of short spines mixed with single short setae along posterior margin; dactylus much shorter than article 6 (ratio: 50: 18), strong, along inner margin with a row of 2 strong spines, along outer margin with one median plumose seta (fig. 3D), nail shorter than pedestal (ratio: 25: 30).

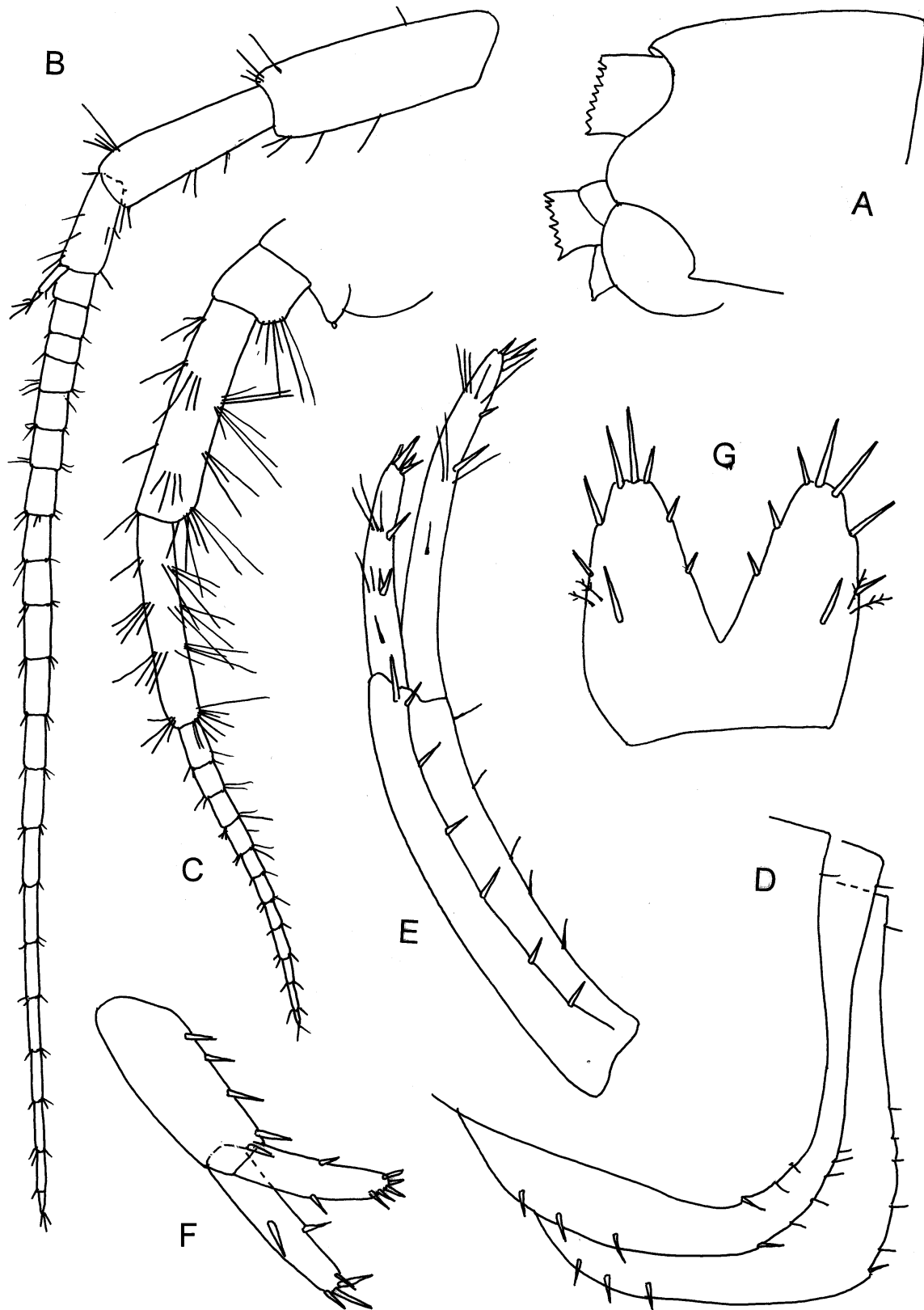
Pereopod 4 mainly similar to pereopod 3, but with hardly shorter setae (fig. 3E); merus, carpus and propodus of unequal length (ratio: 50: 38: 44); dactylus like that in pereopod 3, along inner margin with a row of 2 strong spines, along outer margin with one median plumose seta, nail shorter than pedestal (ratio: 25: 30) (fig. 3F).

Pereopods 5–7 progressively longer (fig. 4A, D, F). Pereopod 5: basis longer than broad (ratio: 66: 45), with rather convex anterior margin bearing several strong spine-like setae, along posterior almost straight margin with nearly 15 short setae, ventroposterior lobe indistinct (fig. 4A); merus, carpus and propodus of unequal length (ratio: 38: 44: 45), along margins with short setae and single spines (fig. 4A); dactylus much shorter than article 6 (ratio: 15: 45), strong, along inner margin with one strong spine near basis of the nail, along outer margin with one median plumose seta (fig. 4B, C); nail shorter than pedestal (ratio: 25: 31 or 24: 35).

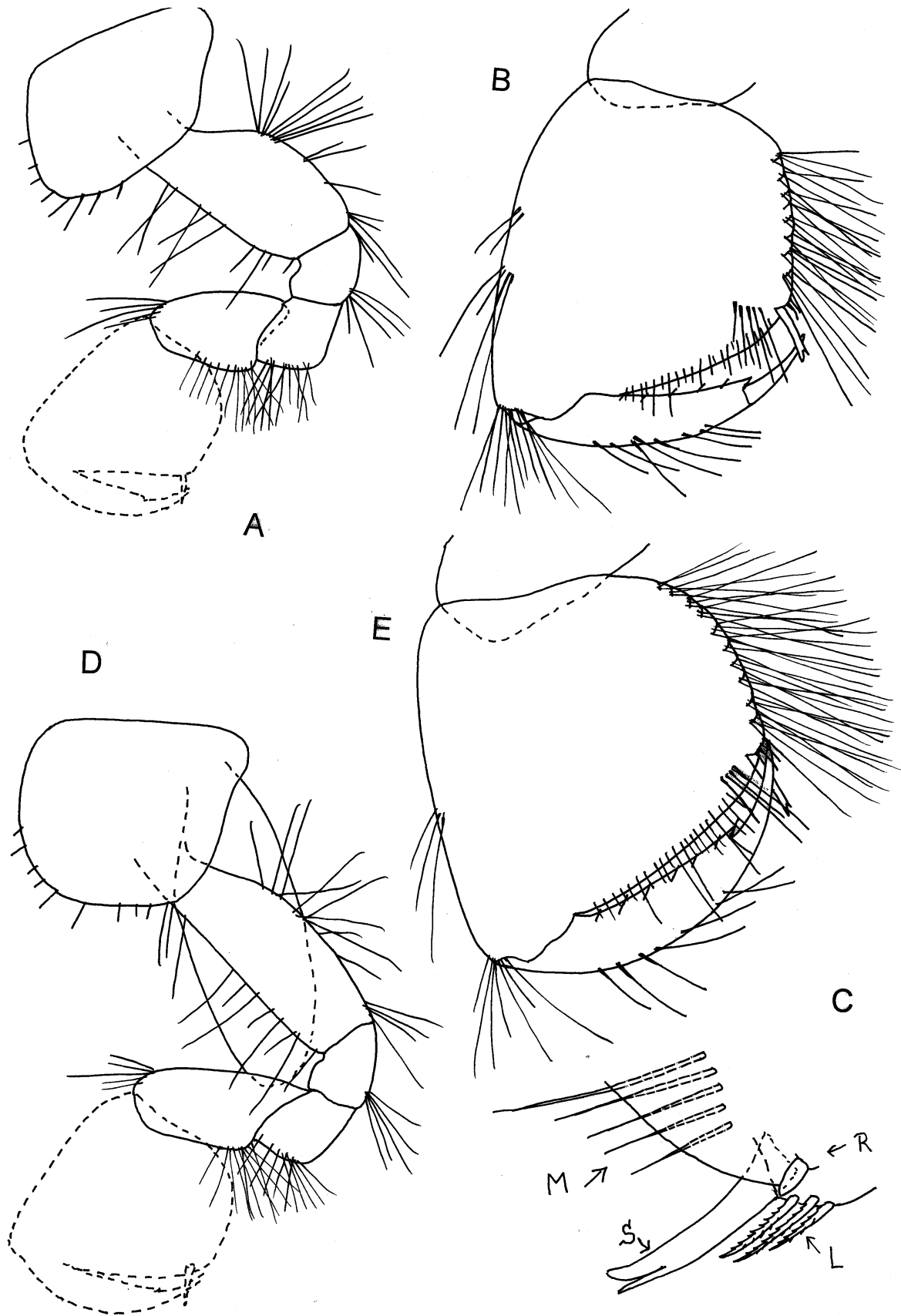
Pereopod 6: basis longer than broad (ratio: 78: 50), along anterior slightly convex margin with a row of strong spine-like setae (fig. 4D), along posterior margin with nearly 13 short setae, ventroposterior lobe indistinct; merus, carpus and propodus of unequal length (ratio: 50: 60: 74), along margins with short setae and short spines; dactylus strong, much shorter than article 6 (ratio: 74: 25), along inner margin with one strong spine near basis of the nail, along outer margin with one median plumose seta (fig. 4E); nail is shorter than pedestal (ratio: 33: 60).

Pereopod 7: basis much longer than broad (ratio: 83: 50), along anterior margin with 6 single strong spine-like setae, along posterior margin with 13–14 short setae (fig. 4F), ventroposterior lobe indistinct; merus, carpus and propodus of unequal length (ratio: 45: 64: 83), along margins with short setae and spines; dactylus strong, much shorter than article 6 (ratio: 83: 25), along inner margin with one strong spine near basis of the nail, along outer margin with one median plumose seta, nail much shorter than pedestal (ratio: 33: 60) (fig. 4G).

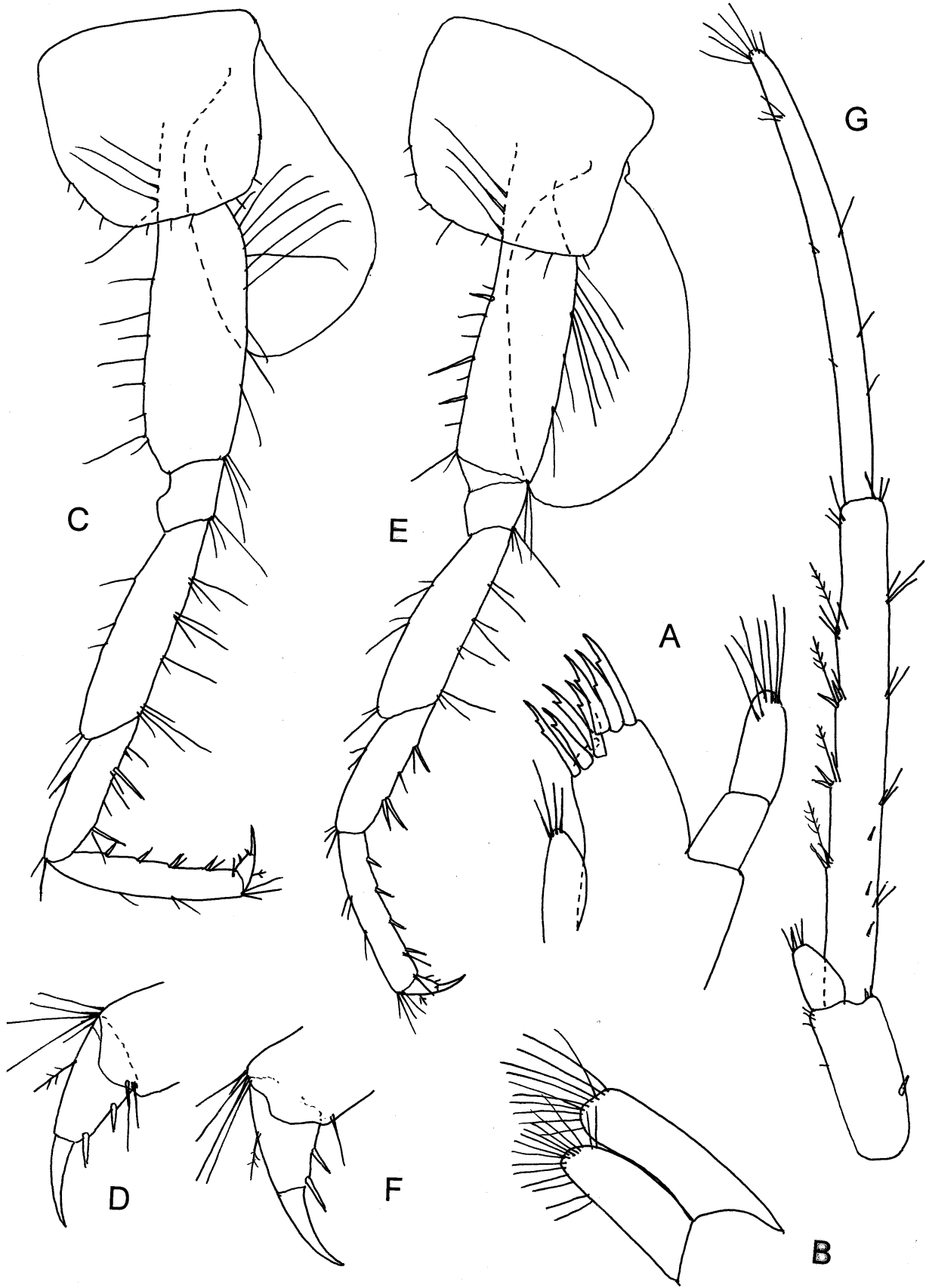
Pleopods 1–3 with 2 retinacula each. Peduncle of pleopod 1 along anterior margin with 3 short setae (in lateral projection) (fig. 5J), peduncle of pleopod 2 with one distal seta at anterior margin (fig. 5K); peduncle of pleopod 3 along posterior margin with 3 strong setae (fig. 5L).



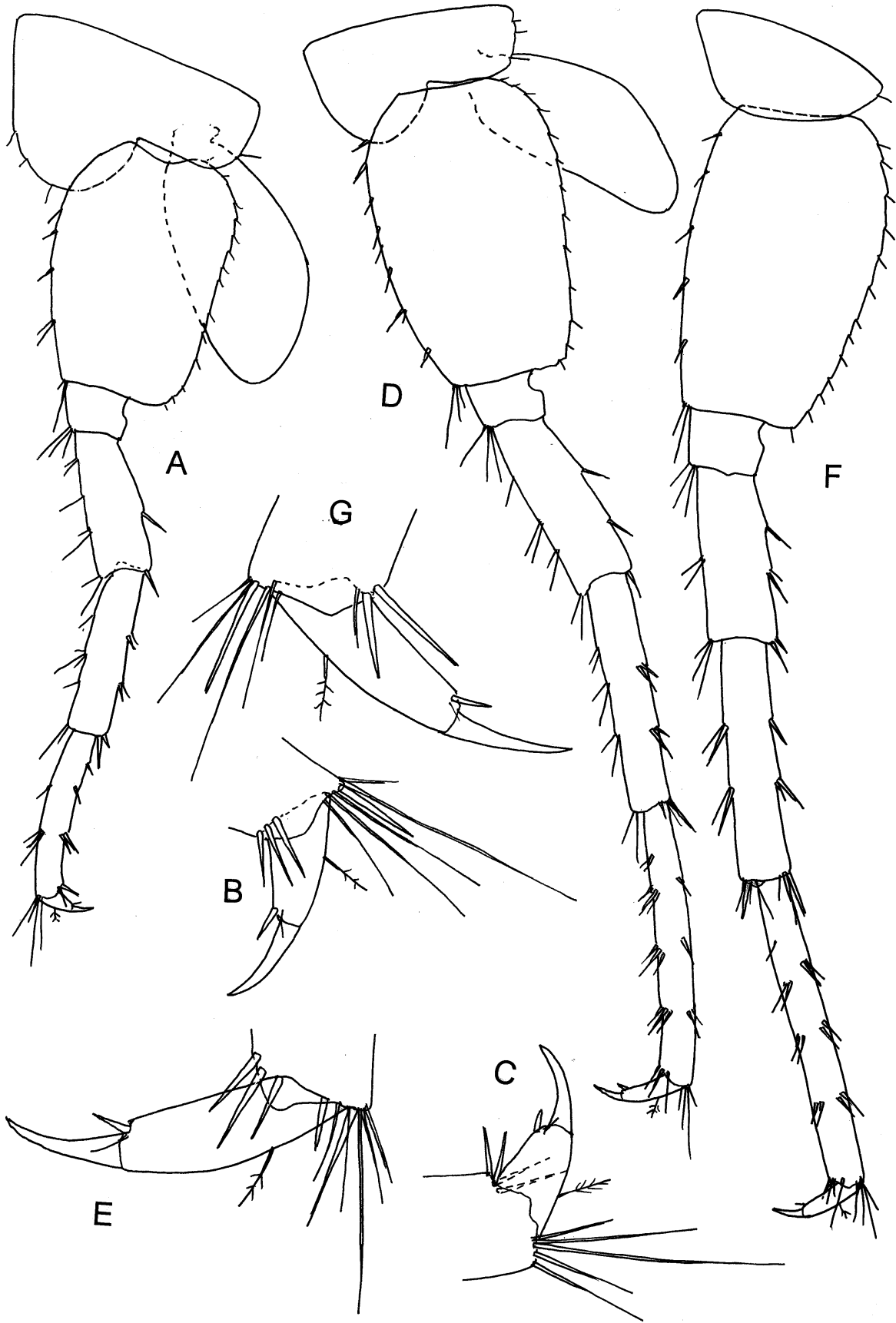
**FIGURE 1.** *Niphargus radzai*, sp. n., male 12.7 mm (holotype), Ravno Vrdovo: A= head; B= antenna 1; C= antenna 2; D= epimeral plates 1-3; E= uropod 1; F= uropod 2; G= telson.



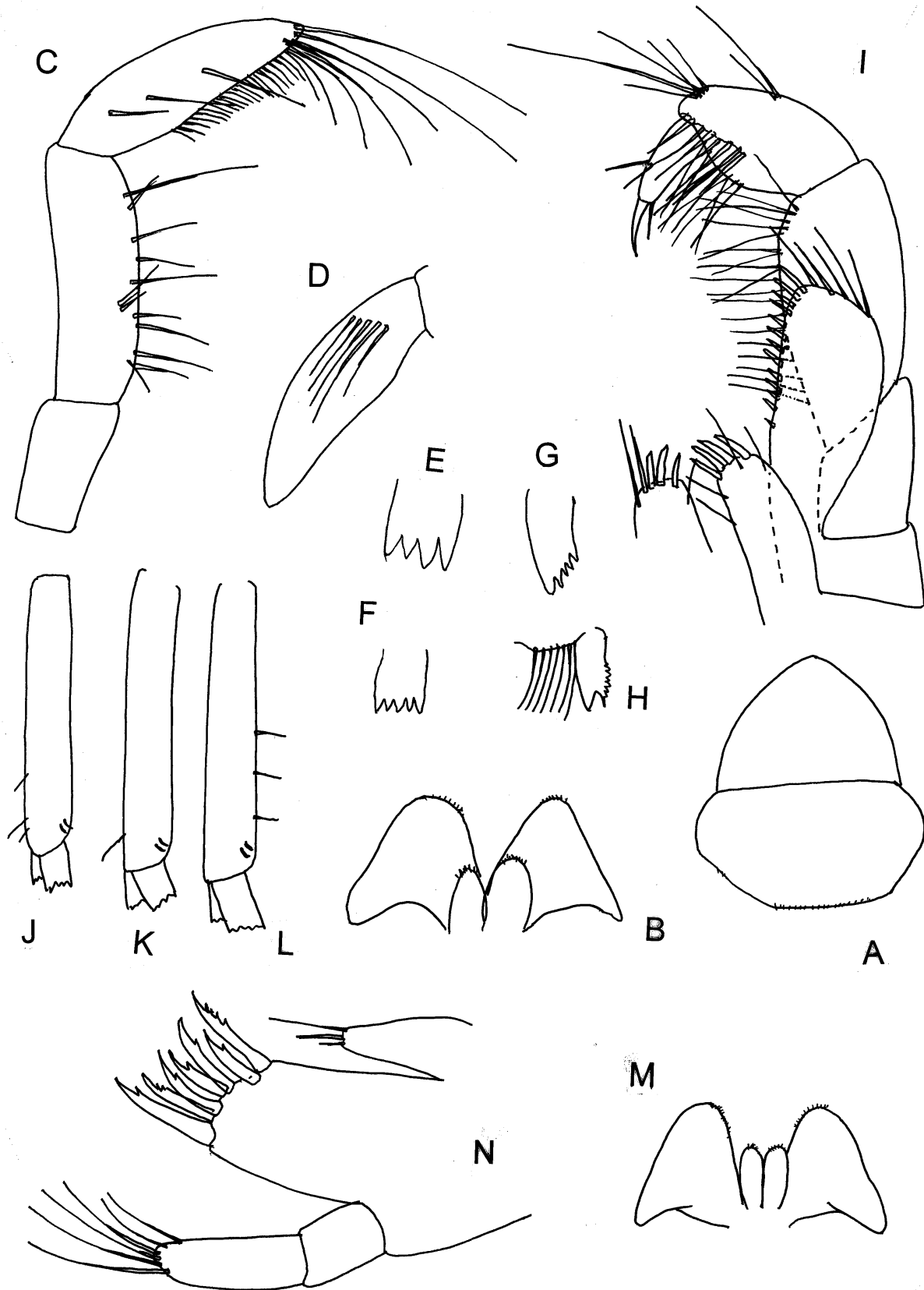
**FIGURE 2.** *Niphargus radzai*, sp. n., male 12.7 mm (holotype), Ravno Vrdovo: A–B= gnathopod 1, outer face; C= distal corner of gnathopod 1 propodus, inner face [S= corner spine; L= lateral spines; M= facial setae; R= subcorner spine]; D–E= gnathopod 2, outer face.



**FIGURE 3.** *Niphargus radzai*, sp. n., male 12.7 mm (holotype), Ravno Vrdovo: A= maxilla 1; B= maxilla 2; C-D= pereopod 3; E-F= pereopod 4; G= uropod 3.

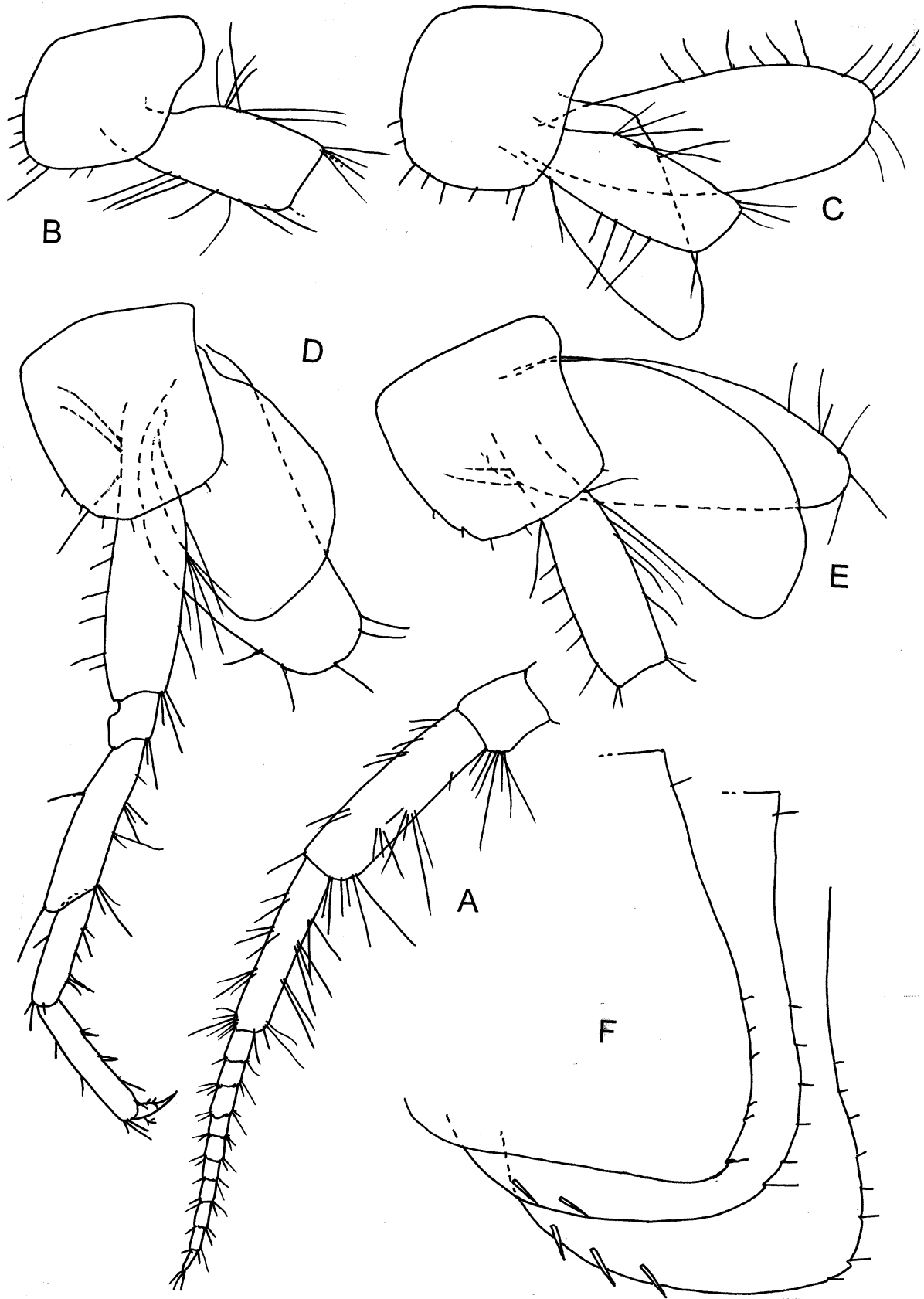


**FIGURE 4.** *Niphargus radzai*, sp. n., male 12.7 mm (holotype), Ravno Vrdovo: A–B= left pereopod 5; C= dactylus of right pereopod 5; D–E= pereopod 6; F–G= pereopod 7.

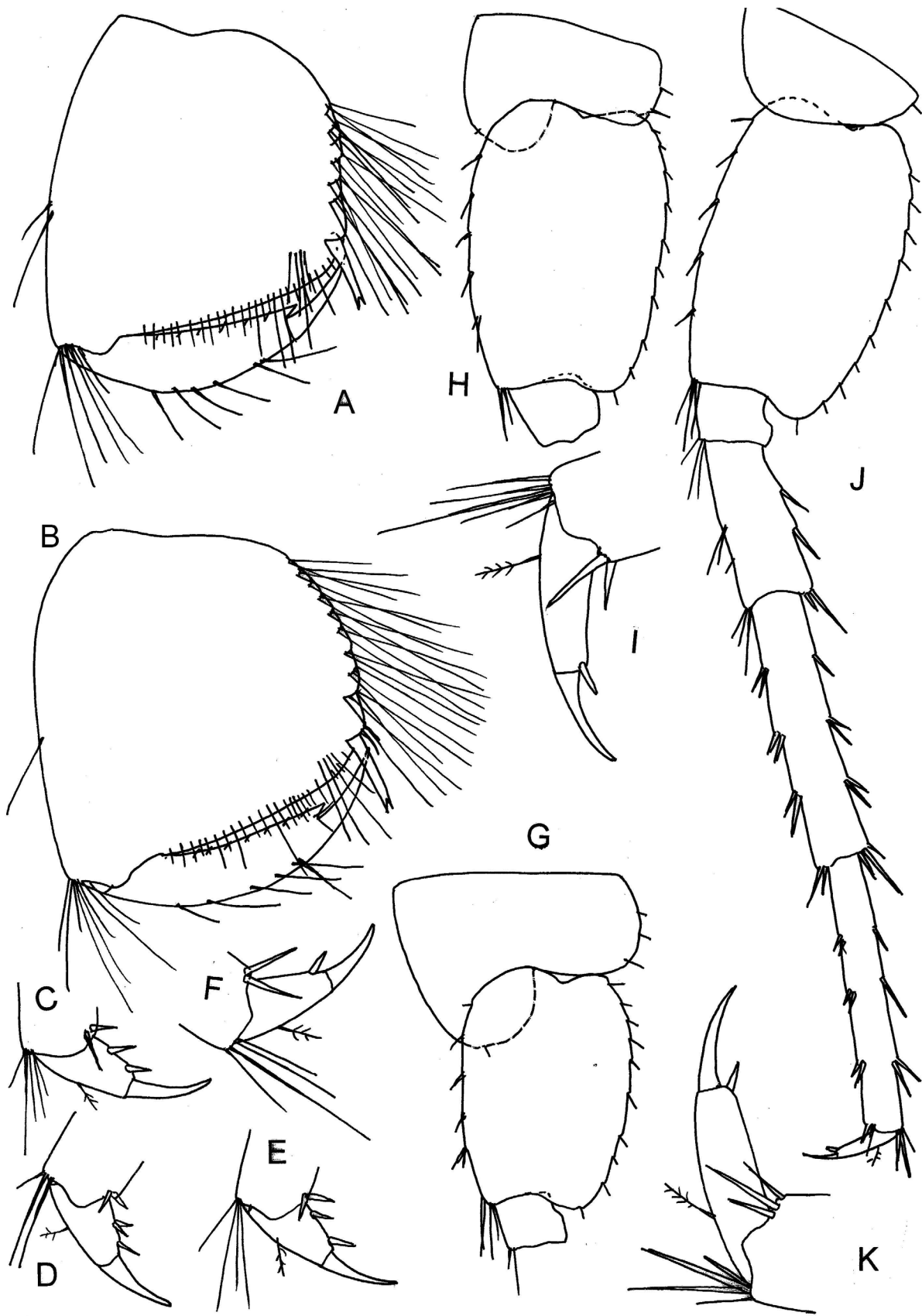


**FIGURE 5.** *Niphargus radzai*, sp. n., male 12.7 mm (holotype), Ravno Vrdo: A= labrum; B= labium; C= mandible palp, inner face; D= mandible palp distal article, outer face; E= right incisor; F= right lacinia mobilis; G= left incisor; H= left lacinia mobilis; I= maxilliped; J-L= peduncle of pleopods 1-3. Female, 8.0 mm (paratype): M= labium; N= maxilla 1.

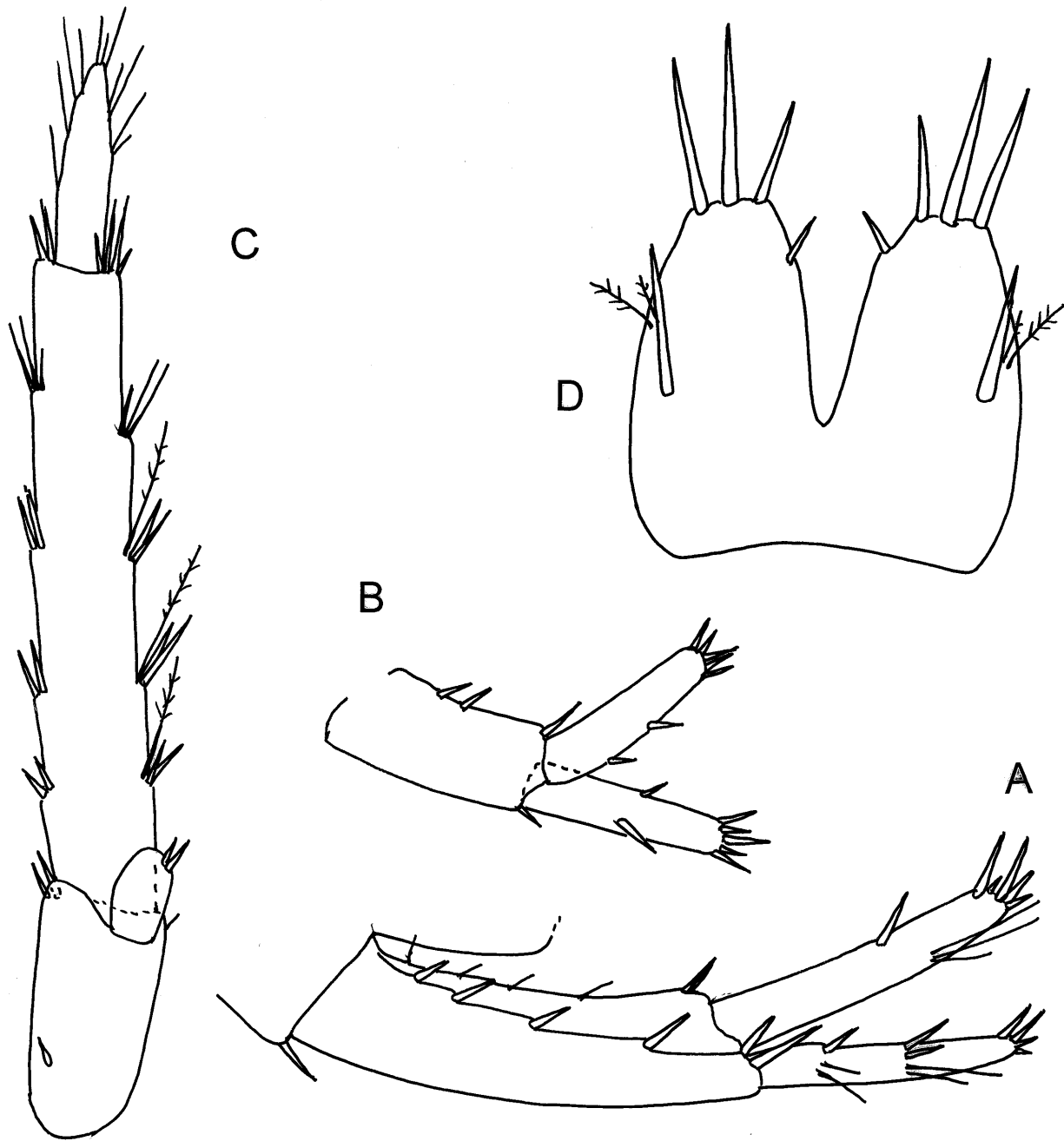




**FIGURE 6.** *Niphargus radzai*, sp. n., female 8.0 mm (paratype), Ravno Vrdo: A= antenna 2; B= coxa 1 and proximal part of gnathopod 1; C= coxa 2 and proximal part of gnathopod 2; D= pereopod 3; E= coxa 4 and proximal part of pereopod 4; F= epimeral plates 1-3.



**FIGURE 7.** *Niphargus radzai*, sp. n., female 8.0 mm (paratype), Ravno Vrdovo: A= gnathopod 1 propodus; B= gnathopod 2 propodus; C–D= left and right dactylus of pereopod 3; E= pereopod 4 dactylus; F–G= pereopod 5; H–I= pereopod 6; J–K= pereopod 7.



**FIGURE 8.** *Niphargus radzai*, sp. n., female 8.0 mm (paratype), Ravno Vrdovo: A= uropod 1; B= uropod 2; C= uropod 3; D= telson.

Uropod 1: peduncle longer than inner ramus (ratio: 124: 93), with one dorsoexternal row of spines and dorsointernal row of strong setae (fig. 1E); inner ramus elongated, bearing lateral and distal bunches of simple setae and single spines; outer ramus slightly exceeding half of inner ramus, bearing lateral simple setae and single spines, as well as distal short spines (fig. 1E);

Uropod 2: outer and inner ramus nearly equal, with single lateral and bunch of 4–5 distal short spines each (fig. 1F).

Uropod 3 elongated; peduncle longer than broad (ratio: 42: 20) (fig. 3G); inner ramus short, scale-like, with distal short spine and 2–3 setae; outer ramus 2-articulated: first article along outer ramus with 5 groups of simple setae (fig. 3G), along inner ramus with 5 groups of short spines and simple setae accompanied by single long plumose setae; second article almost as long as first article (ratio: 120: 130), along both margins with single short simple setae and with one group of apical setae (fig. 3G).

Telson gaping, slightly broader than long (ratio: 72: 67), incised less than 2/3 of telson-length; each lobe with 3 distal short spines, along inner and outer margins are settled 2 spines, as well as one facial spine (fig. 1G); a pair of short plumose setae are attached near the middle of each lobe (fig. 1G).

Coxal gills relatively large, gills on gnathopod 2 elongated, exceeding distal tip of basis (fig. 2D), gill on pereopod 3 is ovoid, shorter than that on gnathopod 2 (fig. 3C); coxal gill on pereopod 4 is ovoid, larger than that of pereopod 3 (fig. 3E). Coxal gill on pereopods 5 and 6 are ovoid but shorter, not reaching ventral tip of corresponding basis; coxal gill on pereopod 6 is smaller than that on pereopod 5 (fig. 4A, D).

**Female** 8.0 mm with setose oostegites (paratype). Rather similar to the male, epimeral plates 1–3 with subrounded ventroposterior corner and convex posterior margin bearing a row of short setae (fig. 6F). Epimeral plate 2 with 2 subventral spines, epimeral plate 3 with 3 subventral spines (fig. 6F).

Urosomite 1 on each dorsolateral side with 1 seta, urosomite 2 with one spine and one seta on each dorsolateral side; urosomite 3 naked.

Head like that in male. Antenna 1 reaching half of body-length, main flagellum of antenna 1 consisting of 22 articles. Antenna 2: peduncular article 3 along ventral margin with one distal bunch of long setae (fig. 6A); peduncular article 4 is longer than article 5 (ratio: 56: 48), both articles along ventral margin with bunches of long setae (the longest setae are much longer than the diameter of the articles themselves), along dorsal margin with bunches of short setae (fig. 6A). Flagellum slender, longer than last peduncular article, composed of 10 articles (fig. 6A); antennal gland cone short.

Mouthparts similar to these in male. Labium with subrounded outer and inner lobes (fig. 5M).

Maxilla 1: inner plate with 2–3 setae, outer plate with 7 spines [5 spines with one lateral tooth, one spine with 2 lateral teeth, one spine with 4 lateral teeth]; palpus 2-articulated, not reaching distal tip of outer plate spines, and provided with 6 setae (fig. 5N).

Mandible and maxilliped like these in male.

Coxa 1 broader than long (ratio: 40: 37), with subrounded ventroanterior corner bearing a row of setae (fig. 6B). Coxa 2 slightly longer than broad (ratio: 49: 45) (fig. 6C). Coxa 3 slightly longer than broad (ratio: 54: 50) (fig. 6D). Coxa 4 almost as long as broad (ratio: 53: 51) (fig. 4E). Coxa 5 broader than long (ratio: 61: 46), with broad anterior lobe (fig. 7G). Coxa 6 shorter than coxa 5, longer than broad (ratio: 50: 35) (fig. 7H); coxa 7 shallow, entire, much broader than long (high) (ratio: 51: 25) (fig. 7J).

Gnathopods 1–2 of moderate size, like these in male. Gnathopod 1: propodus slightly trapezoid, longer than broad (ratio: 86: 77), along posterior margin with 6 transverse rows of setae (fig. 7A); palm inclined nearly 2/5 of propodus-length, poorly convex, defined on outer face by one corner S-spine accompanied laterally by 2–3 slender serrate L-spines and a row of 3–4 facial M-setae, on inner face by one short subcorner R-spine; dactylus reaching posterior margin of propodus and provided along outer margin with row of 6 median setae (fig. 7A).

Gnathopod 2: propodus only poorly trapezoid, almost as long as broad (ratio: 90: 88), along posterior margin with 8–9 transverse rows of setae (fig. 7B); palm slightly convex, defined on outer face by one corner S-spine accompanied laterally by 2–3 slender serrate L-spines and row of 3–4 facial M-setae, on inner face by one short subcorner R-spine; dactylus along outer margin with 5–6 median setae (fig. 7B).

Pereopods 3 and 4 like these in male (fig. 6D). Dactylus of pereopod 3 short and strong, along inner margin with 2 single spines (fig. 7C) or one pair of 2 spines and 1 single spine (fig. 7D), along outer margin with one median plumose seta (fig. 7C, D), nail slightly shorter than pedestal (ratio: 23: 25, or 22: 26).

Dactylus of pereopod 4 short and strong, along inner margin with 2 strong spines, along outer margin with one median plumose seta (fig. 7E); nail slightly shorter than pedestal (ratio: 20: 25).

Pereopods 5–7 progressively longer, with basis bearing short but distinct ventroposterior lobe. Pereopod 5: basis slightly longer than broad (ratio: 61: 44), along anterior convex margin with a row of strong spine-like setae (fig. 7G), along posterior margin with 10 short setae; dactylus short and strong, along inner margin with one strong spine near basis of the nail, and with one median plumose seta at outer margin (fig. 7F); nail shorter than pedestal (ratio: 28: 20).

Pereopod 6: basis longer than broad (ratio: 74: 51), along convex anterior margin with a row of spine-like setae, along posterior margin with nearly 11 short setae (fig. 7H); dactylus longer than that of pereopod 5, strong, along inner margin with one strong spine near basis of the nail, along outer margin with one median plumose seta (fig. 7I); nail shorter than pedestal (ratio: 46: 27).

Pereopod 7: basis longer than broad (ratio: 80: 50), with remarkably convex anterior and posterior margin,

along anterior margin with row of spine-like setae, along posterior margin with nearly 10 short setae (fig. 7J); merus, carpus and propodus progressively longer (ratio: 45: 70: 73), bearing mainly short spines along both margins; dactylus almost as long as that of pereopod 6, strong, along inner margin with one strong spine near basis of the nail, along outer margin with one median plumose seta; nail shorter than pedestal (ratio: 53: 28) (fig. 7K).

Pleopods 1–3 with 2 retinacula each; pilosity of pleopods 1–3 peduncles like that in male.

Uropod 1: peduncle longer than inner ramus (ratio: 94: 62), with one row of dorsoexternal spines and one row of dorsointernal setae (except distal spine) (fig. 8A); inner ramus only slightly longer than outer ramus, both rami with lateral and distal spines and 1–2 bunches of facial simple setae (fig. 8A).

Uropod 2: both rami of nearly equal length, with single lateral and 5 distal spines each (fig. 8B).

Uropod 3 relatively short; peduncle longer than broad (ratio: 52: 25) with single distal spines; inner ramus scale-like, with 2 distal short spines (fig. 8C). Outer ramus 2-articulated: first article along outer and inner margin with 5 bunches of spines, and along inner margin with 4 long single plumose setae (fig. 8C); second article much shorter than first one (ratio: 40: 130), with simple setae along both margins and tip (fig. 8C).

Telson gaping, slightly broader than long (ratio: 78: 72), incised nearly 3/5 of telson length (fig. 8D); each lobe with 3 distal spines and one spine along inner margin; one facial spine is attached near the middle of each lobe (fig. 8D); a pair of short plumose setae is attached in upper half of each lobe.

Coxal gill on gnathopod 2 exceeding ventral tip of basis (fig. 6C), coxal gill on pereopod 3 ovoid (fig. 6D); coxal gills on pereopod 4 reaching ventral tip of basis (fig. 6E). Coxal gills on pereopods 5 and 6 are short (fig. 6C, D).

Oostegites large, with several marginal setae each (fig. 6C, D, E).

**Variability.** The absence of additional spines along inner margin on pereopods 5–7 dactylus is stable character. Outer plate of maxilla 1 usually with 6 spines bearing one lateral tooth (occasionally one of them with 2 lateral teeth), and 1 spine with 2–3 lateral teeth. Dactylus of pereopods 3–4 with 2 median spines along inner margin, rarely one spine is replaced with a bunch of 2 spines).

**Derivatio nominis.** The species is named after the speleologist Tonči Radža from the Speleological Association Špiljar in Split, Croatia, who studied numerous caves on Balkan and collected important biological samples for scientific studies, including Amphipoda.

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

**Remarks and affinities.** *Niphargus radzai* is peculiar among congeneric species in having the dactylus of pereopods 3–4 armed with additional spines and the dactylus of pereopods 5–7 without additional spines near basis of the nail.

By this way, *N. radzai* is very similar to *Niphargus smederevanus* S. Karaman, 1950, described and known from the spring in Smederevo (Serbia) by some other characters also (2 retinacula on pleopods, pilosity of gnathopods 1–2, elongated inner ramus of uropod 1 in males and elongated distal article of uropod 3 outer ramus in males, etc). But, *N. smederevanus* differs from *N. radzai* by distinctly acute or angular epimeral plates, slightly broader propodus of gnathopods 1–2, by more narrowed telson bearing higher number of facial spines, inner plate of maxilla 1 with 2 setae, etc.

Some other species with additional spines along inner margin of dactylus of pereopods are present in western part of Balkan: *N. illidzensis* Schäferna, 1922 [loc. typ.: springs in Ilidža near Sarajevo, Bosnia], *N. dalmatinus* Schäferna, 1922 [loc. typ.: spring Biba at coast of Vransko jezero Lake near Šibenik, Croatia], *N. zavalanus* S. Karaman, 1950 [loc. typ.: spring of torrent Lukavac near Vjetrenica cave, Zavala, Herzegovina], *N. slovenicus* S. Karaman, 1932 [loc. typ.: Stražišče near Kranj, Slovenia]; *N. stankoi* G. Karaman, 1974 [loc. typ.: spring near village Bukovo on road Resen-Ohrid, Macedonia]. But, all these species differ clearly from *N. radzai* by presence of additional spines on all pereopods 3–7.

*Niphargus castellanus* S. Karaman, 1960 known from the coastal zone of Croatia [loc. typ.: spring above Kaštel Stari near Split, Croatia] is also rather similar to *N. radzai* (telson, uropod 3, number of retinacula, elevated number of setae on gnathopods 1–2 dactylus, etc.). S. Karaman mentioned (1960) certain variability in the number of spines on the dactylus of pereopods 3–7. But, it differs from *N. radzai* by the slightly acute epimeral plates 1–3, the dactylus of pereopods 3–7 usually with 2 or more spines along the inner margin, and by a more quadrate propodus of gnathopod 2.

S. Karaman created subgenus *Supraniphargus* (1950, 1960) (type species: *Niphargus illidzensis* Schäferna, 1922) based on elevated number of spines on the dactylus of pereopods 3–7 and the absence of a distal tubercle on

the peduncle of uropod 1 in males. The discovery of various recent new species having these characters combined with some other different or peculiar taxonomic characters, puts in question the validity of this subgenus based on these characters only. The further genetic studies of these species will maybe clear up this problem.

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