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**FURTHER INVESTIGATIONS OF THE SUBTERRANEAN GENUS
NIPHARGUS SCHIÖDTE, 1849 (FAM. NIPHARGIDAE) IN SERBIA
(CONTRIBUTION TO THE KNOWLEDGE OF THE AMPHIPODA 264)**

SUMMARY

Based on the recent studies of the genus *Niphargus* Schiödte, 1849 (Amphipoda, fam. Niphargidae) from the subterranean waters in Serbia, one new subspecies, *Niphargus bozanae omnivagus*, ssp. n., from the springs of Pusta Reka River (left tributary of Južna Morava River, on Radan Mt., Serbia) is described and figured, and its taxonomical position within the genus *Niphargus* is analyzed.

Keywords: Amphipoda, Niphargidae, taxonomy, spring, *Niphargus bozanae omnivagus*, new taxon, Serbia

INTRODUCTION

Serbia has in its karstic regions numerous caves, and very rich karstic subterranean fauna, mainly represented by various members, mainly belonging to the genera *Niphargus* Schiödte, 1849, *Niphargopsis* Chevreux, 1922 and *Bogidiella* Hertzog, 1933.

The fauna of Amphipoda was partially studied in Serbia by various authors: Borza et al. (2010); Karaman, S. (1934; 1937; 1943; 1950, 1950A, 1950B, 1950C, 1954, 1960, etc.); Karaman, G. (1973; 1974; 1977; 1983, 1998, 1999, 2001, 2002; 2009; 2011; etc.); Pljakić (1962, 1965, 1965a), etc.

Regarding the genus *Niphargus*, over 20 taxa (species and subspecies), mainly endemic, were discovered from the springs, caves and other subterranean waters of Serbia.

Recently we have studied two samples of *Niphargus* specimens, from the springs of Pusta Reka River [= left tributary of Južna Morava river, between Niš and Leskovac], collected by Živić, I. from Belgrade. These specimens are rather similar to the species *Niphargus bozanae* Karaman, G., 2009, known from the Rakovica village, Jama Jamina Cave, 990 m. a. s. l., Zlatibor Mt. in Serbia. The specimens from Pusta Reka differ slightly from these of Jamina Cave by several characters, based on which we establish the specimens from Pusta Reka as a distinct subspecies, *Niphargus bozanae omnivagus*, ssp. n. The scarce material known of *B. bozanae* (2 females only, males unknown) does not permit to establish the limits of variability of *N. bozanae* and its more detailed relationship to the ssp. *omnivagus*.

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MATERIAL AND METHODS

The collected *Niphargus* material was sent to me preserved in 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 (50: 50) for study and drawing. Later all appendages has been transferred permanently into Liquid of Faure. 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. We used some letters to recognize some taxonomically important spines and setae.

Within the genus *Niphargus*, the number of corner **strong S-palmar spine** on propodus of gnathopods 1-2 is always only one, except in some aberrant specimens, where on one of the gnathopods can be attached 2 **S**-spines.

Number of slender **short serrate L-spines** sitting near the **S**-spine, vary usually between 2 and 3. But, the number of these **L**-spines is often different in other species [up to 5 **L**-spines in *N. steueri steueri* Schell, 1935; 4 **L**-spines in *N. croaticus* (Jurinac, 1887); *N. podgoricensis* S. Karaman, 1934). The position of these **L**-spines is different in various *Niphargus* species [**L**-spines are sitting behind **S**-spine in gnathopod 2 of *N. arbiter* G. Karaman, 1984; sitting partially behind **S**-spines [in gnathopod 2 of *N. vjetrenicensis kusceri* S. Karaman, 1950] or **L**-spines are sitting laterally of **S**-spine [on gnathopod 1 of *N. podgoricensis* S. Kar. 1934], etc.

The number of **subcorner R-spine**, sitting on inner surface of the propodit of gnathopods 1-2 below the **S**-spine, is usually only one, but in some species appear 2-3 **R**-spines on propodus of gnathopods 1 and 2 (*N. kenki* S. Karaman, 1952)].

Number of **facial M-setae** sitting on the outer face of propodus below the palmar margin and right of **S**-spine, usually vary between 3-6 , but in some species the number of these **M**-setae can be remarkably elevated [14-15 facial **M**-setae on gnathopod 1 of *Niphargus spinulifemur* S. Karaman, 1954].

RESULTS AND DISCUSSION

NIPHARGUS BOZANAE OMNIVAGUS, ssp. n.

Figs. from 1 to 7

MATERIAL EXAMINED: SERBIA: S-6562= Springs of Pusta Reka River [= left tributary of Južna Morava River, between Niš and Leskovac, on Radan Mt.], 2.5.2001, 13 exp. (leg. Ivana Živić) [holotype and paratypes];

S-6156= Springs of Pusta Reka, 29.5.1998, 10 juv. spec. [leg. I. Strahinić].

Holotype and paratypes are deposited in KARAMAN's Collection in Podgorica, Crna Gora (Montenegro).

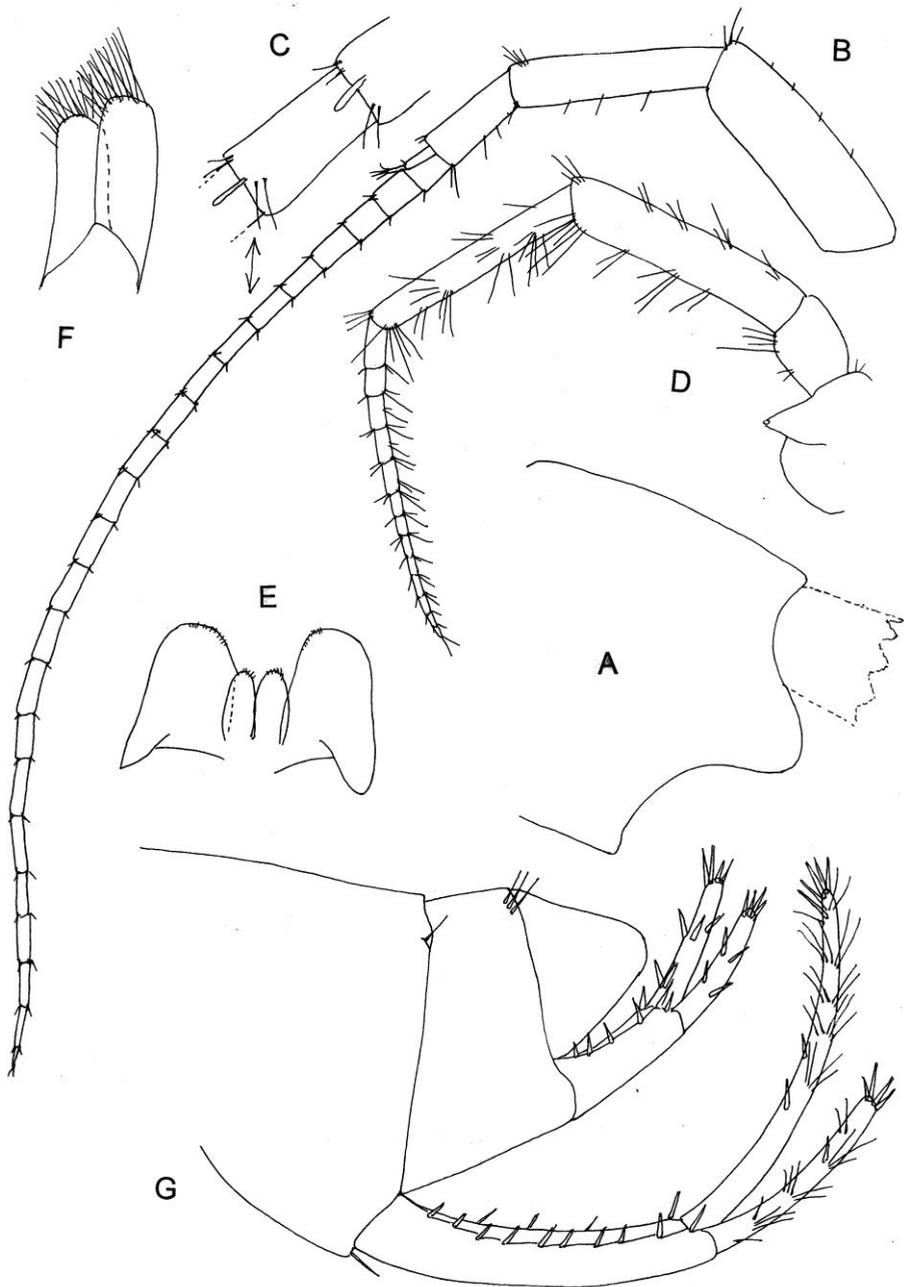


Fig. 1. *Niphargus bozanae omnivagus*, ssp. n., Pustra Reka, male 15.5 mm (holotype): A= head; B= antenna 1; C= aesthetascs on antenna 1; D= antenna 2; E= labium; F= maxilla 2; G= urosome with uropods 1-2.

DIAGNOSIS: Body slender, up to 15.5 mm long, epimeral plate 3 angular, coxal plates 1-4 in males shallow, broader than long. Urosomite 1 in males with setae only. Maxilla 1 inner plate with 1-2 setae, outer plate with 7 spines (6 of them with one lateral tooth only). Gnathopods 1-2 with remarkably unequal propodites, trapezoid, bearing a row of numerous strong setae along outer margin of its dactylus, propodus with one R-spine.

Pereopods 5-7 with basipodit (article 2) bearing ventroposterior short lobe. Dactylus of pereopods 3-7 short but slender: dactylus of pereopod 7 with 1-2 spines along inner margin, dactylus of pereopods 3-6 with one spine along inner margin. Pleopods with 2 retinacula, peduncles scarcely setose. Uropod 1 with inner ramus remarkably longer than outer one in males and females. Inner ramus of uropod 2 slightly longer than outer one of both sexes. Uropod 3 elongated, second article of outer ramus elongated in males and females. Telson deeply incised, lobes with numerous distal, marginal and facial spines.

DESCRIPTION: Male 15.5 mm (holotype): Body slender; head with short rostrum and subrounded ventroanterior lobe and excavated ventroanterior margin (fig. 1A), eyes missing.

Metasomal segments 1-3 with 2-4 dorsoposterior marginal setae only (fig. 3G). Urosomite 1 on each side with one dorsolateral strong seta; urosomite 2 with one group of 3-5 dorsolateral setae on each side, urosomite 3 naked (fig. 1G). Ventroposterior corner of urosomite 1 near basis of uropod 1 peduncle with one spine-like seta (fig. 1G).

Epimeral plates 1-2 with marked ventroposterior corner and with convex posterior margin bearing a row of short posterior marginal setae. Epimeral plate 3 with well-marked ventroposterior corner and nearly straight posterior margin bearing a row of short marginal setae (fig. 3G). Epimeral plate 2 with 2 subventral spines, epimeral plate 3 with 3 subventral spines (fig. 3G).

Antenna 1 hardly shorter than half of body [ratio: 70: 155], peduncular articles 1-3 scarcely setose, progressively shorter towards article 3 [ratio of articles: 66: 56: 27] (fig. 1B). Main flagellum consisting of 23 articles [most of them with one short aesthetasc] (fig. 1C). Accessory flagellum 2-articulate (fig. 1B), much shorter than peduncular article 3.

Antenna 2 slender (fig. 1D); peduncle article 3 short, with lateral and distal bunch of short setae (fig. 1D); peduncle article 4 slightly longer than peduncle article 5 [ratio: 67: 61], both articles along outer (dorsal) and inner (ventral) margin with 3-4 lateral bunches of setae not exceeding the width of articles themselves (fig. 1D). Flagellum slender, slightly longer of last peduncle article, consisting of 13 articles bearing marginal setae as long as or slightly longer than the diameter of articles themselves (fig. 1D). Antennal gland cone short (fig. 1D).

Mouthparts basic. Mandibles with molar triturative. Left mandible: incisor with 5 teeth, lacinia mobilis with 4 teeth (fig. 5A). Right mandible: incisor with 4 teeth, lacinia mobilis bifurcate, with several unequal teeth (fig. 5B).

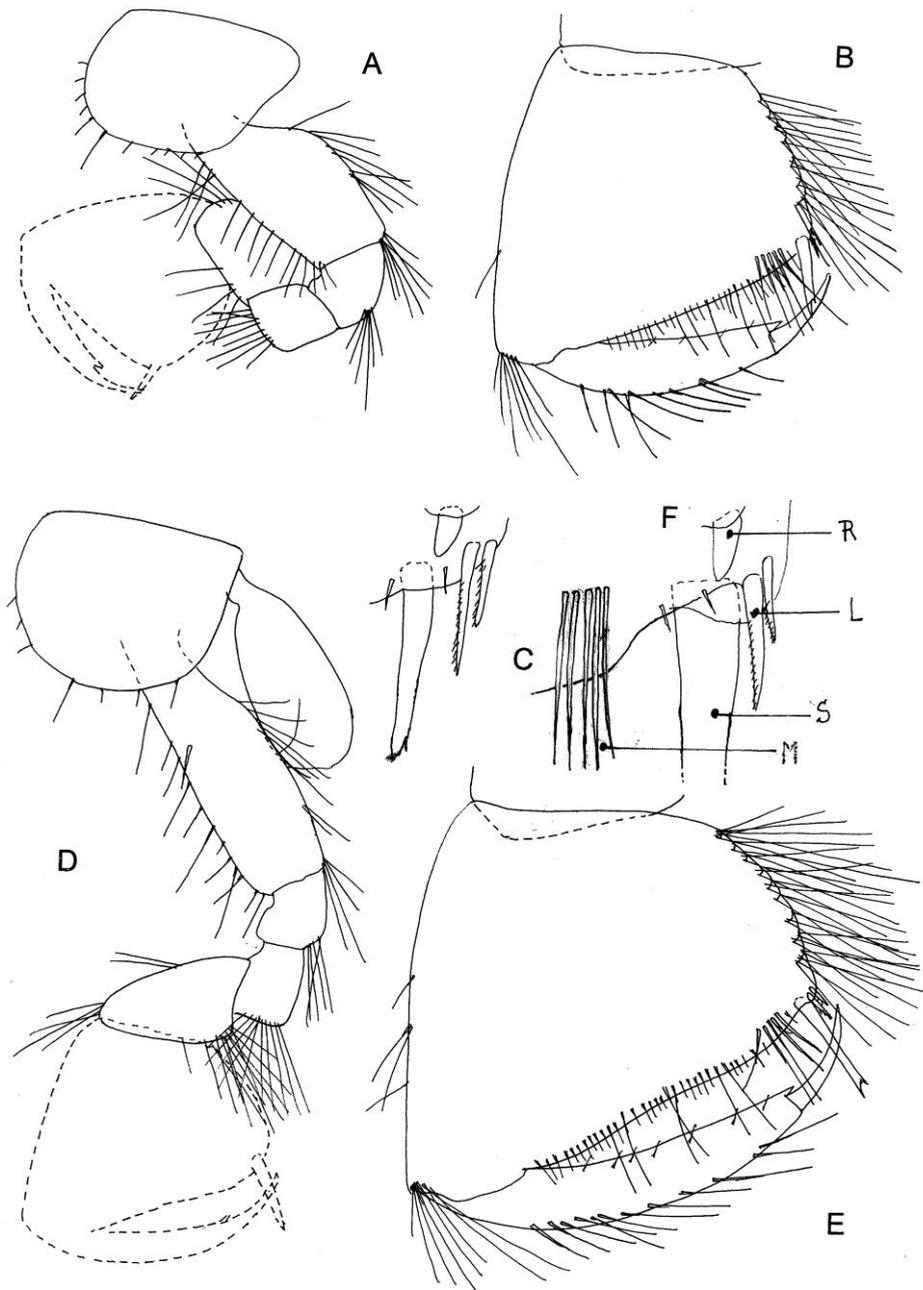


Fig. 2. *Niphargus bozanae omnivagus*, ssp. n., Pustra Reka, male 15.5 mm (holotype): A= gnathopod 1; B= propodus of gnathopod 1, outer face; C= tip of propodus in gnathopod 1, inner face; D= gnathopod 2; E= propodus of gnathopod 2, outer face; F= tip of propodus in gnathopod 2, inner face.

Palpus of both mandibles equal, 3-articulate: first article naked, short (fig. 5C); second article with 13-14 lateral setae; palpus article 3 falciform, as long as palpus article 2 (fig. 5C), provided along inner (ventral) margin with 25-26 short marginal D-setae and 8-9 distal long E-setae; on outer face appears one bunch of 8 A-setae, (fig. 5C), on inner face 7-8 long single or paired simple B-setae (fig. 5D); C-setae absent.

Labrum broader than long, with subrounded distal margin (fig. 3A).

Labium with well-developed small inner lobes and entire subrounded large outer lobes (fig. 1E).

Maxilla 1: inner plate with 1-2 setae (fig. 6K); outer plate bearing 7 spines [6 spines with one lateral tooth each, one spine with 3 lateral teeth (fig. 6K)]; palpus 2-articulated, not reaching tip of spines of outer plate, and provided with 9-10 distal spines (fig. 6K).

Maxilla 2: both plates with marginal setae only (fig. 1F).

Maxilliped: inner plate short, with 4-5 distal smooth spines and several setae (fig. 3B); outer plate reaching nearly half of second palpus article and bearing a row of marginal spines; palpus article 3 with one median groups of outer marginal setae; palpus article 4 with one median seta along outer margin, and with one seta at inner margin; nail much shorter than pedestal (fig. 3B).

Coxae 1-4 distinctly broader than long, with row of short ventral marginal setae each. Coxa 1 with subrounded ventroanterior corner, coxa 4 with very shallow posterior excavation. The ratio length (=high): width of coxa 1 is 35: 47, of coxa 2 is 45: 55; of coxa 3 is 50: 59; of coxa 4 is 50: 61 (figs. 2A, D; 3C, E). Coxae 5 and 6 with anterior lobe much longer than posterior one (fig.4A, C); coxa 7 entire (fig. 4F).

Gnathopods 1-2 of moderate size, gnathopod 2 is distinctly larger than gnathopod 1, both with propodus slightly larger than corresponding coxae (fig. 2A, D).

Gnathopod 1: article 2 along anterior margin with row of strong setae, along posterior margin with bunches of setae (fig. 2A); articles 3 and 4 along posterior margin with one bunch of setae; article 5 shorter than 6 (fig. 2A). Propodus (article 6) trapezoid, as long as broad, with 7 transverse rows of setae along posterior margin (fig. 2B). Palm nearly straight, inclined nearly half of propodus-length and defined on outer face by one long strong corner S-spine accompanied laterally by 2 short slender serrate L-spines, as well as with 5 long facial M-setae (fig. 2B); on inner face defined with one short subcorner R-spine (fig. 2C). Dactylus reaching or almost exceeding posterior margin of propodus, provided along outer margin a row of 10 strong single or paired setae, along inner margin with several short marginal setae (fig. 2B).

Gnathopod 2: article 2 along anterior margin with row of nearly 12 strong setae as well as one facial seta (fig. 2D), along posterior margin with single and bunches of slender setae (fig. 2D); articles 3-4 with one bunch of posterior marginal setae each; article 5 shorter than article 6, bearing one median seta along anterior margin (fig. 2D).

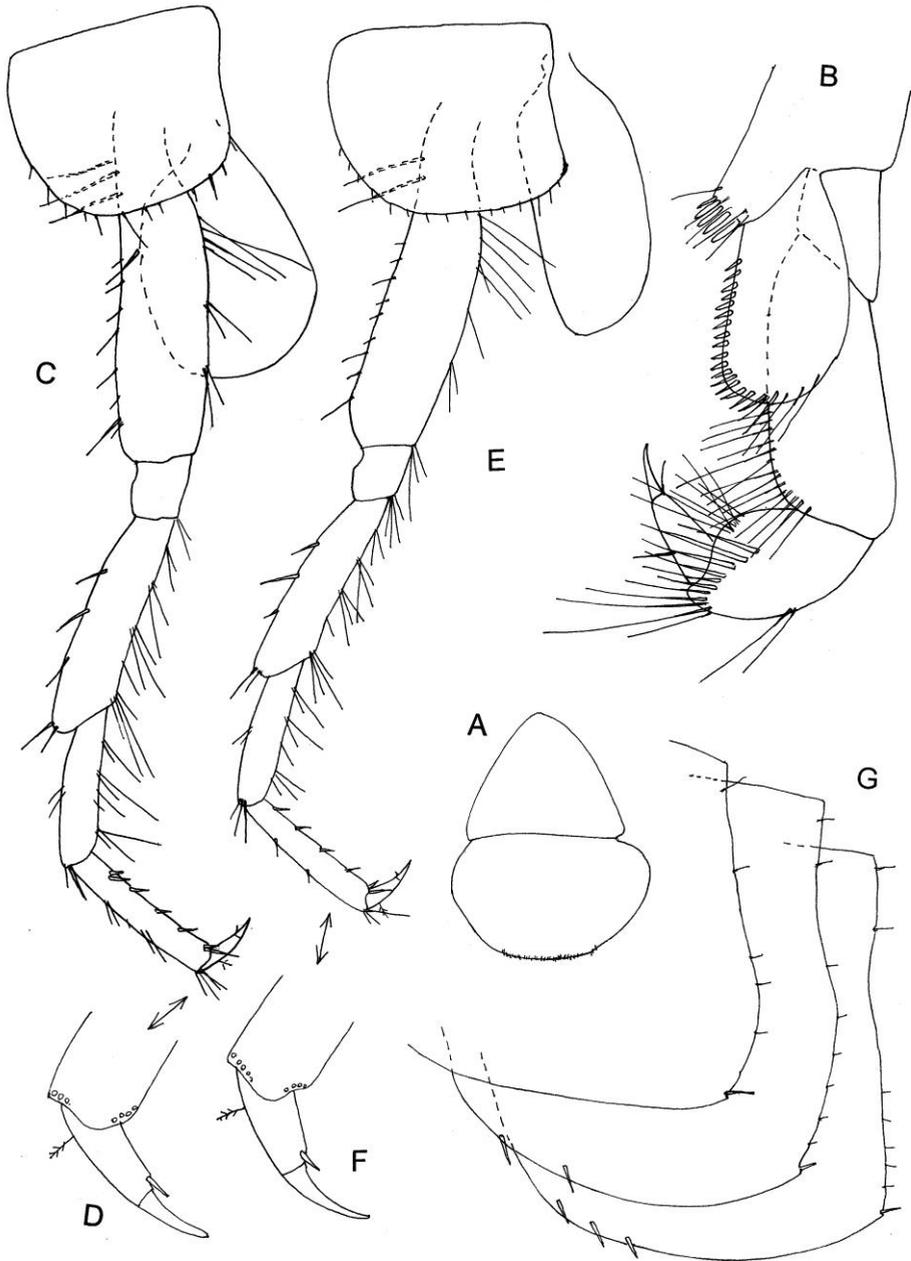


Fig. 3. *Niphargus bozanae omnivagus*, ssp. n., Pustra Reka, male 15.5 mm (holotype): A=labrum; B= maxilliped; C-D= pereopod 3; E-F= pereopod 4; G= epimeral plates 1-3.

Propodus (article 6) trapezoid, hardly broader than long [ratio: 105: 102], bearing 9 transverse rows of setae along posterior margin (fig. 2E). Palm inclined hardly over half of propodus-length, slightly concave in the middle, defined by one strong corner S-spine accompanied laterally by 2 slender short serrate L-spines (fig. 2E) and 5 facial M-setae; on inner face by one short subcorner R-spine (fig. 2F). Dactylus reaching or hardly exceeding posterior margin of propodus, bearing along outer margin a row of single of paired 12 strong setae, along inner margin with several sort marginal setae (fig. 2E).

Pereopods 3-4 relatively slender, pereopod 3 hardly longer than 4 (fig. 3C, E). Pereopod 3: article 2 along anterior margin with row of strong setae, along posterior margin with bunches of slender setae (fig. 3C); articles 4-5 along posterior margin with 3-4 bunches of setae longer than the diameter of articles themselves (fig.3C); article 6 along posterior margin with 5 single or paired short spines and /or single short seta. Dactylus moderately slender, with one spine along inner margin and one median plumose seta at outer margin; nail shorter than pedestal (fig. 3D).

Pereopod 4: similar to pereopod 3 but the setae along posterior margin of articles 4-5 are slightly shorter (fig. 3E). Dactylus similar to that of pereopod 3, with one spine along inner margin and one plumose seta at outer margin (fig. 3F).

Pereopods 5-7 moderately slender, pereopod 5 remarkably shorter than pereopods 6-7 (fig. 4A, C, F). Pereopod 5: article 2 (basipodit) dilated, remarkably longer than broad [ratio: 75: 47], with dilated but unlobed ventroposterior corner; strong setae are settled along anterior margin (fig. 4A) and short and numerous (up to 16) short setae along posterior straight margin (fig. 4A). Articles 4-5 along anterior margin mainly with bunches of short setae, along posterior margin mainly with spines; segment 6 along both margins with bunches of short spines (fig. 4A); dactylus short, slender, with one spine at inner margin and one plumose seta at outer margin (fig. 4B); nail remarkably shorter than pedestal (ratio: 25: 39).

Pereopod 6: article 2 nearly twice longer than broad [ratio: 90: 53], with visible short ventroposterior lobe (fig. 4C); anterior margin with row of stronger setae, along slightly concave posterior margin with up to 19 short setae (fig. 4C); articles 4-6 progressively longer [ratio: 62: 82: 88], along both margins with bunches of short spines and/or setae (fig. 4C, D). Dactylus short and relatively slender, along inner margin with one spine, along outer margin with one plumose median seta; nail much shorter than pedestal [ratio: 29: 55] (fig. 4D, E).

Pereopod 7 slightly longer than pereopod 6: article 2 narrowed, almost twice as long as broad [ratio: 99: 52], with visible short ventroposterior lobe and slightly convex posterior margin provided with up to 18 short setae (fig. 4F), along anterior margin with several strong setae; articles 4-6 progressively longer [ratio: 61: 84: 101], along both margins with bunches of short spines and /or setae (fig. 4F, D). Dactylus short but slender, along inner margin with 2 spines, along outer margin with 1 plumose seta; nail much shorter than pedestal [ratio: 32: 67] [measured always along outer margin] (fig. 4H).

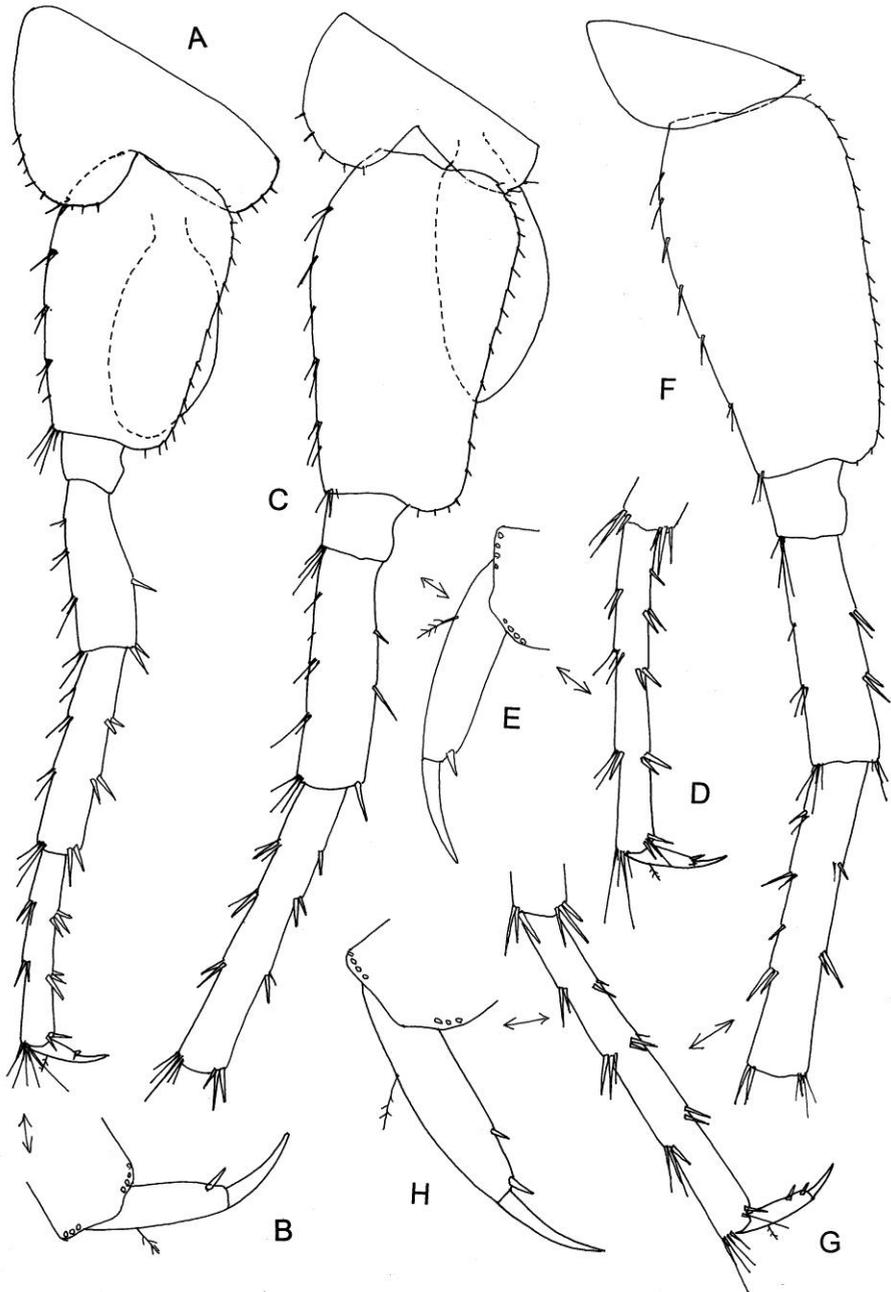


Fig. 4. *Niphargus bozanae omnivagus*, ssp. n., Pustra Reka, male 15.5 mm (holotype): A-B= pereopod 5; C-E= pereopod 6; F-H= pereopod 7.

Pleopods 1-3 with 2 retinacula each. Peduncle of pleopod 1 along anterior margin [in lateral view] with 4 setae, posterior margin naked (fig. 5E). Peduncle of pleopod 2 with one distal seta along anterior margin only (fig. 5F); peduncle of pleopod 3 with 3 setae along posterior margin (fig. 5G).

Uropod 1 elongated: peduncle slender, with dorsoexternal row of numerous short spines and with one dorsointernal row of setae (fig. 1G), distal tubercle on peduncle missing. Both rami slender: inner ramus twice longer than outer one, with several marginal spines and bunches of setae (fig. 1G); Outer ramus with single lateral and distal short spines, as well as bunches of setae (fig. 1G).

Uropod 2: peduncle with dorsal row of spines; inner ramus slightly longer than outer ramus, both rami with lateral and distal short spines (fig. 1G).

Uropod 3 missing.

Telson short, nearly as long as broad [ratio: 84: 86], incised 2/3 of telson-length (fig. 5H). Each lobe with 3-4 distal spines, as well as with single outer and inner lateral spines, as well as with one group of facial spines (fig. 5H); a pair of short plumose setae appears near the external middle of each lobe (fig. 5H).

Coxal gills of moderate size, not reaching ventral tip of corresponding article 2 (figs. 2D; 3C, E; 5A, C).

FEMALE 11.8 mm, with setose oostegites (paratype). Rather similar to the males with some differences. Body slender, antenna 1 nearly half of body-length [ratio: 60: 118].

Epimeral plates 1-3 distinctly angular, with slightly convex posterior margin bearing a row of short setae each; epimeral plates 2-3 with 3 submarginal spines each (fig. 7A).

Urosomite 1 on each dorsolateral side with one strong seta (fig. 7J). Urosomite 2 on each dorsolateral side with 1 spine and 1 short seta (fig. 7J), urosomite 3 naked. Urosomite 1 with one ventroposterior spine near basis of uropod 1-peduncle (fig. 7J).

Mouthparts like these in males, but inner plate of maxilla 1 with 1-2 setae.

Maxilliped: inner plate with 4 distal spines accompanied by single setae; palpus article 3 along outer margin with 3 groups of setae (fig. 6G); palpus article 4 along outer margin with one median seta, and 3 setae along inner margin near the basis of the nail (fig. 6G).

Coxae 1-4 slightly longer than these in males. Coxa 1 as long as broad, subrounded ventroanterior corner (fig. 6A); coxa 2 slightly longer than broad [ratio: 53: 46] (fig. 6B); coxa 3 longer than coxa 2, and longer than broad [ratio: 62: 58] with subrounded ventral margin bearing several longer marginal setae (fig. 6C). Coxa 4 only slightly longer than broad [ratio: 62: 58], with slightly excavated posterior margin (fig. 6D).

Gnathopods 1-2 of remarkably unequal size. Gnathopod 1 propodus trapezoid, slightly longer than broad [ratio: 71: 67], with 8 transverse row of setae along posterior margin (fig. 6H).

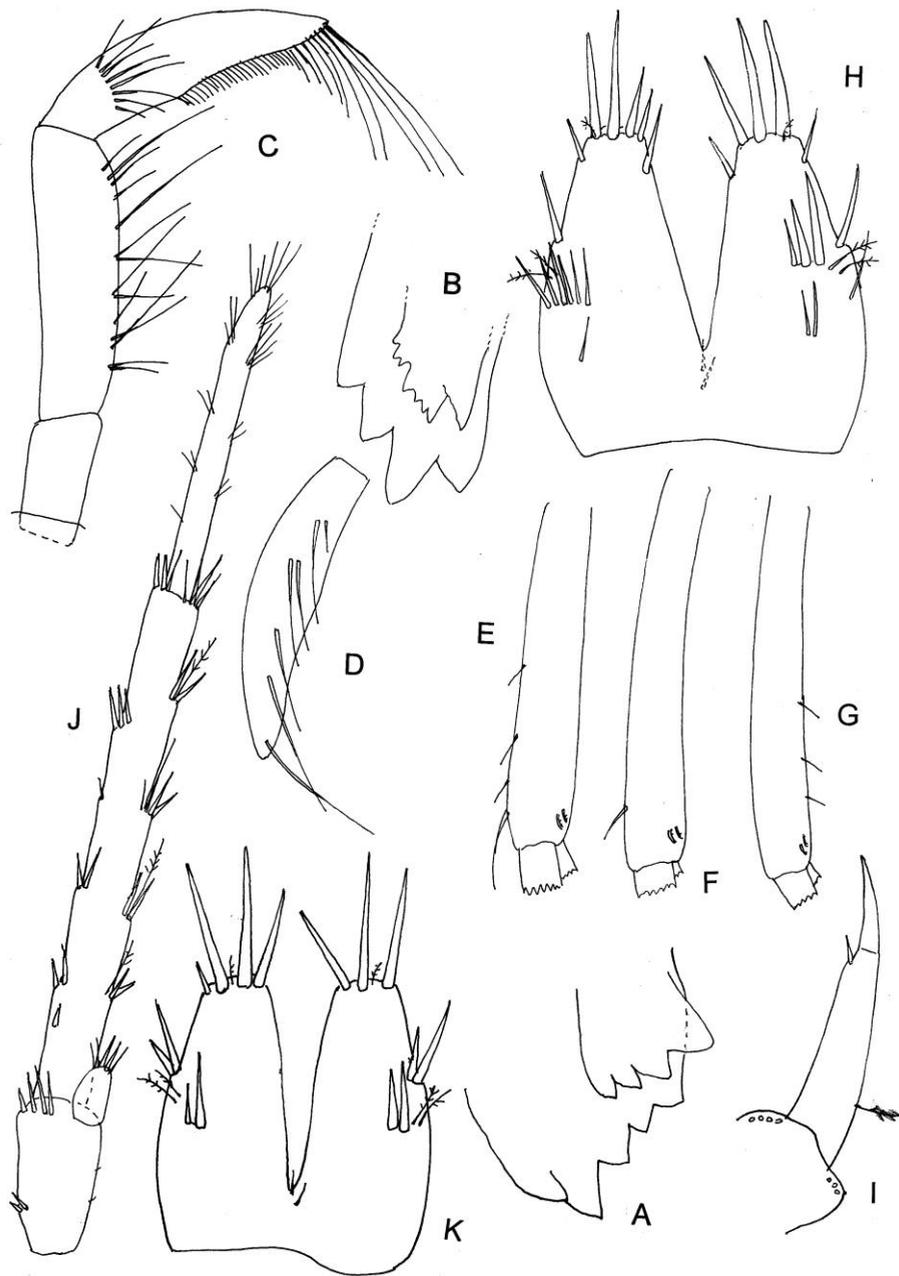


Fig. 5. *Niphargus bozanae omnivagus*, ssp. n., Pustra Reka, male 15.5 mm (holotype): A= left incisor and lacinia mobilis; B= right incisor and lacinia mobilis; C= mandible palpus, outer face; D= tip of mandible palpus, inner face; E-G= peduncle of pleopods 1-3; H= telson. I= dactylus of pereopod 7, male 10.4 mm; J= uropod 3, male 10.4 mm; K= telson, male 10.4 mm.

Palm straight, inclined half of propodus-length, defined on outer face by one strong corner S-spine accompanied laterally by 3 slender serrate L-spines (fig. 6H) and 4 facial M-setae, on inner face by one short subcorner R-spine. Dactylus distinctly reaching or hardly exceeding posterior margin of propodus, with row of 7 single or paired long setae along outer margin, and several short setae along inner margin (fig. 6H).

Gnathopod 2 much larger than gnathopod 1. Propodus trapezoid, slightly broader than long [ratio: 86: 82], with 11 transverse rows of setae along posterior margin. Palm straight, inclined more than half of propodus-length (fig. 6 I), defined on outer face by one strong corner S-spine accompanied laterally by 3 short serrate L-spines and 5 facial M-setae (fig. 6 I), on inner face by one short subcorner R-spine. Dactylus slightly exceeding posterior margin of propodus, with row of 8 strong setae along outer margin and several short setae along inner margin (fig. 6 I).

Pereopods 3-4 like these in males. Posterior margin of articles 4-5 with bunches of long and short setae (fig. 6C). Posterior margin of article 6 along posterior margin with 5 bunches of short spines and short setae (fig. 6C). Dactylus of pereopods 3-4 short but slender, along inner margin with one spine, along outer margin with one median plumose seta (fig. 6E, F); nail distinctly shorter than pedestal (fig. 6E, F).

Pereopods 5-7 slightly shorter than these in males. Pereopod 5 longer than broad [ratio: 70: 45], with almost parallel lateral margins and hardly visible short ventroposterior lobe (fig. 7B); anterior margin of article 2 with 5 bunches of longer setae, along posterior margin with row of short setae; articles 4-6 progressively longer [ratio: 44: 50: 60]. Along anterior margin of article 4 appear setae, both margins of articles 5-6 with bunches of short spines and setae. Dactylus short and slender, with one spine at inner margin and one sort plumose median seta at outer margin (fig. 7C); nail much shorter than pedestal [ratio: 23: 37].

Pereopod 6: article 2 dilated, hardly narrowed ventrally, with well visible ventroposterior short lobe (fig. 7D) and row of short marginal setae, along anterior margin with long strong setae. Articles 4-6 of unequal length [ratio: 60: 72: 93]; setae and spines on articles 4-6 like these in pereopod 5. Dactylus short and slender, with one spine along inner margin and one plumose median seta along outer margin; nail much shorter than pedestal [ratio: 18: 51] (fig. 7E).

Pereopod 7 slightly longer than 6; article 2 ovoid, much longer than broad [ratio: 90: 52], with well-developed ventroposterior lobe and row of short posterior marginal setae (fig. 7F). Articles 4-6 of unequal length [ratio: 53: 73: 94], with spines along both margins, intermixed sometimes with single setae (fig. 7F, G). Dactylus short and slender, with 2 spines at inner margin and 1-2 plumose setae at outer margin (fig. 7H); nail much shorter than pedestal [ratio 24: 62].

Pleopods 1-3 like these in males, its peduncles scarcely setose, with 2 retinacula each.

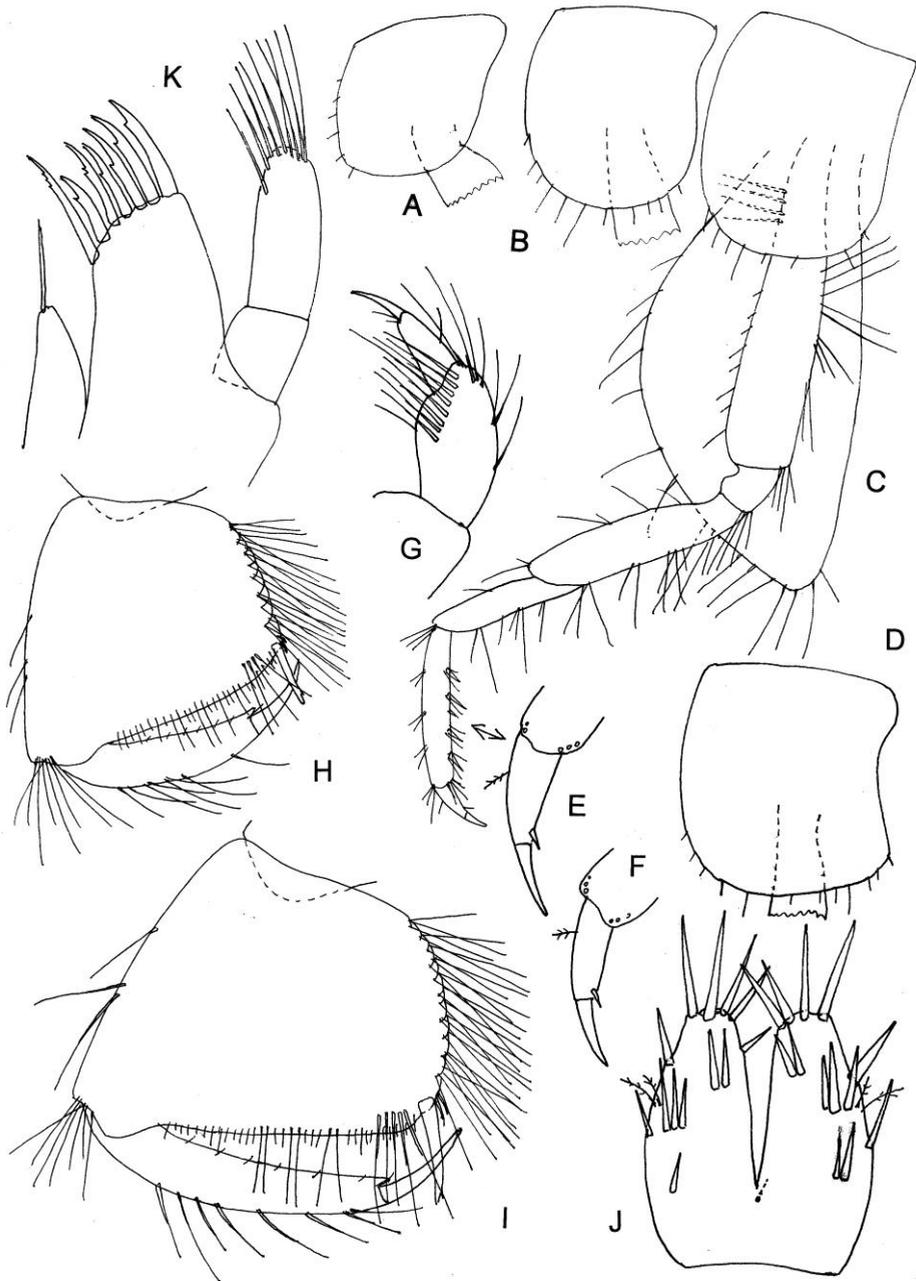


Fig. 6. *Niphargus bozanae omnivagus*, ssp. n., Pusta Reka, female 11.8 mm (paratype): A-D= coxae 1-4; C-E= pereopod 3; F= dactylus of pereopod 4; G= tip of maxilliped palpus; H= propodus of gnathopod 1; I= propodus of gnathopod 2; J= telson; K= maxilla 1, male 15.5 mm.

Uropods slender. Uropod 1: peduncle with dorsoexternal row of spines and dorsointernal row of setae (fig. 7J). Inner ramus slightly longer than outer one [ratio: 60: 56], both rami with lateral and distal short spines and several bunches of setae [fig. 7J).

Uropod 2: inner ramus slightly longer than outer one, both with lateral and distal spines (fig. 7J).

Uropod 3 elongated, peduncle longer than broad, with lateral and distal spines (fig. 7 I); inner ramus scale-like, short, with distal spine and seta; outer ramus 2-articulated: first article along both margins with bunches of spines, accompanied along inner margin of article with single long plumose setae (fig. 7 I); second article elongated, but much shorter than first one [ratio: 54: 150], along both margins and tip with bunches of simple setae (fig. 7 I).

Telson slightly longer than broad [ratio: 70: 60], incised 2/3 of telson-length (fig. 6J); each lobe with 4 distal and single outer and inner marginal long spines; 3 bunches of spines appear on the face of each lobe; a pair of short plumose seta is attached near the external middle of each lobe (fig. 6J).

Coxal gills ovoid, not reaching ventral tip of corresponding article 2 (fig. 7B, D). Oostegites large, with marginal setae (fig. 6C).

VARIABILITY.

Male 10.4 mm: Similar to the holotype, but dactylus of pereopod 7 with one spine at inner margin (fig. 5 I), and one median plumose seta along outer margin; nail remarkably shorter than pedestal [ratio: 7: 60].

Epimeral plates 1-3 distinctly angular; posterior margin of epimeral plates 1-2 with slightly convex posterior margin bearing a row of short setae; posterior margin of epimeral plate 3 straight, with row of short setae; epimeral plates 2-3 with 4 subventral spines each. Urosomite 1 on each dorsolateral side with one seta, urosomite 2 on each dorsolateral side with 2 spines and 0-1 seta. One spine appears on ventroposterior corner of urosomite 1 near basis of uropod 1-peduncle.

Inner plate of maxilla 1 with 2 setae.

Uropod 1 with inner ramus distinctly longer than outer one. Uropod 2: inner ramus hardly longer than outer one.

Uropod 3: peduncle longer than broad, with lateral and distal spines (fig. 5J); inner ramus short, scale-like, with 3-4 distal spines (fig. 5J), outer ramus 2-articulated: first article along both margins with bunches of spines; along inner margin of article 1 appear single long plumose setae; second article elongated, but shorter than first article [ratio: 87: 135], bearing 4-5 bunches of short setae along both margins and tip (fig. 5J).

Telson slightly longer than broad [ratio: 75: 70], incised slightly over 2/3 of telson-length (fig. 5K); each lobe with 3 long distal spines, as well as with one bunch of outer lateral spines and one bunch of facial spines; a pair of short plumose setae appears near the external middle of each lobe (fig. 5K).

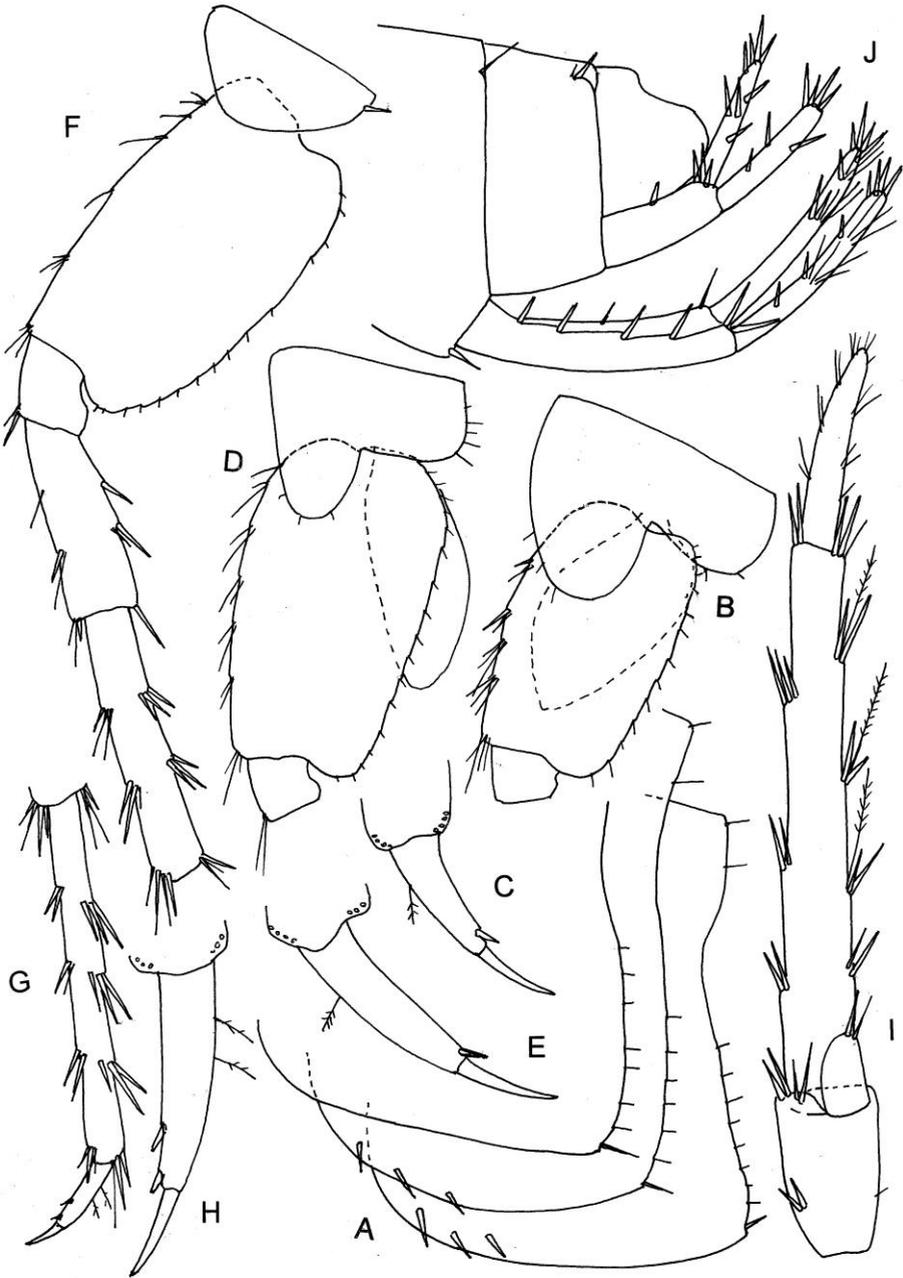


Fig. 7. *Niphargus bozanae omnivagus*, ssp. n., Pusta Reka, female 11,8 mm (paratype): A= epimeral plates 1-3; B-C= pereopod 5; D-E= pereopod 6; F-H= pereopod 7; I= uropod 3; J= urosome with uropods 1-2.

Other paratypes and specimens: The males and females are with 1-2 spines attached on inner margin, and one plumose seta on outer margin of dactylus in pereopod 7. But, always only one spine was observed on dactylus of pereopods 3-6 in males and females.

Often inner plate of left and right maxilliped have a different number of distal spines, here 4 and 5. On palpus article 3 of maxilliped appear 1-2 median external groups of setae. Palm of gnathopods 1-2 straight, only in old specimens can be slightly concave in the middle. Scarce pilosity of peduncle of pleopods 1-3 is visible in all sampled specimens.

The inner ramus of uropod 1 in males and females is distinctly longer than outer one, in males much more visible than in females. Inner ramus of uropod 2 is only slightly longer than outer ramus. Uropod 3 is with elongated second article of uropod 3 in both sexes.

Telson is with rather variable number of distal, facial and lateral spines, but always the spines are present in all there three positions. Coxal gills never reaching ventral tip of article 2 of corresponding gnathopods and pereopods.

CONCLUSIONS

The specimens from Pusta Reka are very similar to the species *N. bozanae* Karaman, G., 2009, described based on 2 females collected from the cave Jama Jamnina near Rakovica village on Zlatibor Mt. (Serbia) by the speleologist S. Ognjenović: slender dactylus of pereopods, shape of gnathopods, pleopods, antennae, pereopods, elongated uropod 3 in females, inner ramus of uropod 1 distinctly longer than outer ramus in females, elevated number of spines on telson, etc.

But, females of *N. bozanae* differ from these of Pusta Reka by absence of additional spine at inner margin of dactylus in pereopod 7, shorter coxae 1-4, slightly more stout dactylus of pereopods, more elongated basipodites of pereopods 5-7, by presence of 3 setae on inner plate of maxilla 1, lower number of spines on telson. All these small differences suggested that the female specimens of Pusta Reka are very close to these of *N. bozanae*. But the scarce number of known specimens of *N. bozanae* and unknown its male and variability of taxonomic characters, as well as the large distance between both localities, suggested temporarily conclusion of different identity of the specimens from springs of Pusta Reka regarding these of the cave Jama Jamnina, and we consider the specimens from Pusta Reka as a distinct subspecies, *N. bozanae omnivagus*, ssp. n. On the other hands, as the range of the variability within the population of *N. bozanae* is still unknown, we cannot exclude the possibility that the specimens from Pusta Reka can be within the external limits of the variability of *N. bozanae*.

Niphargus bozanae omnivagus is very allied also to the species *Niphargus smederevanus* S. Karaman, 1950, known from the subterranean waters of Smeredevo (Serbia), by the elongated inner ramus of uropods 1-2 in males, by general shape of gnathopods 1-2, maxilla 1, elevated number of spines on telson,

elongated outer ramus of uropod 3 with long second article, presence of additional spines on dactylus of some pereopods, pleopods, coxae, etc.

But *N. smederevanus* differs remarkably from our species by stouter dactylus of pereopods 3-7, by presence of additional spine on dactylus of pereopods 3 and 4 only, by more acute epimeral plates, by unlobed basipodit of pereopods 6-7, etc.

In the adjacent regions (Bosnia & Herzegovina, Macedonia, Hungary, Romania, Bulgaria) appear several species with additional spines on dactylus of pereopods 3-7 [*N. stankoi* G. Karaman, 1974, *N. illidzensis* Schäferna, 1922, etc) but these species remarkably differ from ssp. *omnivagus* by numerous characters.

DERIVATIO NOMINIS: The name of this subspecies is named after the Latin word "omnivagus"= unstable, wandered.

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REFERENCES

- BORZA, P., BELA, C. & PAUNOVIĆ, M. 2010. Corophiids (Amphipoda, Corophioidea) of the river Danube. The Results of a Longitudinal Survey. - *Crustaceana*, 83 (7): 839-849.
- FILIPOVIC, D. 1969. Recherches biocenologiques d'un cours d'eau salmonicole de montagne balkanique (Serbie). - *Ekologija*, Beograd, 4 (1): 61-90.
- JURINAC, A. 1887. Prilog Hrvatskoj fauni Ogulinsko-Slunjske okolice i pečina. - *Rad Jugoslovenske Akademije Znanosti i Umjetnosti*, Zagreb, 83: 86-128.
- KARAMAN, G. 1973. Two new Species of Family Gammaridae from Yugoslavia, *Niphargus deelemanae* n. sp. and *Typhlogammarus algor*, n. sp. XLVIII. Contribution to the Knowledge of the Amphipoda. - *Archiv für Hydrobiologie*, Stuttgart, 72 (4): 490-500.
- KARAMAN, G. 1974. XLVI. Contribution to the Knowledge of the Amphipoda. Two subterranean *Niphargus* Species from Yugoslavia, *N. stankoi*, n. sp. and *N. illidzensis* Schäferna (Fam. Gammaridae). - *Glasnik Republičkog zavoda za zaštitu prirode- Prirodnjačkog muzeja Titograd*, 6: 35-57 (1973).
- KARAMAN, G. 1977. Contribution to the Knowledge of the Amphipoda 90. Revision of *Gammarus balcanicus* Schäf. 1922 in Yugoslavia (Fam. Gammaridae). - *Poljoprivreda i šumarstvo*, Titograd, 23 (4): 37-60.
- KARAMAN, G. 1983. *Niphargus serbicus* S. Kar. 1960 in Yugoslavia with remarks to the subterranean amphipods in Serbia (Contribution to the Knowledge of the Amphipoda 129). - *Drugi simpozij o fauni SR Srbije*, Zbornik, Beograd, pp. 67-70.

- 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-Prirodnjačkog muzeja Podgorica, 26: 31-40 (1993).
- KARAMAN, G. 1999. The endemic Amphipoda species (Crustacea) From Serbia And Adjacent Regions (Contribution to the Knowledge of the Amphipoda **236**). - Zbornik Radova Ekološka Istina, Zaječar, VII Naučni skup o privrednim vrednostima i zaštiti životne sredine, Zaječar 9-12. juna 1999, pp. 166-169.
- KARAMAN, G. 2001. Comparative analysis of Amphipoda fauna (Crustacea) from Bor region (Serbia) and Crna Gora (Contribution to the Knowledge of the Amphipoda **240**). – Zbornik radova Ekološka Istina, IX. Naučno-stručni skup o prirodnim vrednostima i zaštiti životne sredine, Donji Milanovac, 3-6. June, 2001, pp. 300-303.
- KARAMAN, G. 2002. New data on Amphipoda fauna from Eastern Serbia and other parts of Balkan Peninsula (Contribution to the Knowledge of the Amphipoda 242) [Novi podaci o fauni Amphipoda istočne Srbije i drugih delova Balkana (**242**. Prilog poznavanju Amphipoda)]. - Ekološka Istina, X. Naučno-Istraživački skup o prirodnim vrednostima i zaštiti životne sredine, Donji Milanovac 5-8. VI. 2002, pp. 21-24.
- KARAMAN, G. 2009. Two new species of the genus *Niphargus* Schiodte, 1849 (Crustacea Amphipoda, Niphargidae) from the caves of Serbia (Contribution to the Knowledge of the Amphipoda 248).- The Montenegrin Academy of Sciences and Arts, Glasnik of the Section of Natural Sciences 18: 71-92, 10 figs.
- KARAMAN, G. 2011. Check List of the Amphipoda (Crustacea, Malacostraca) from Serbia (Contribution to the Knowledge of the Amphipoda 255). - Glasnik Republičkog zavoda za zaštitu prirode, Podgorica, 31/32: 143-161.
- KARAMAN, S. 1934. VI. Beitrag zur Kenntnis jugoslawischer Süßwasseramphipoden.- Zoologischer Anzeiger, Leipzig, 107 (11/12): 325-333, figs. 1-4.
- KARAMAN, S. 1937. Fauna Južne Srbije. - Spomenica dvadesetpetogodišnjice oslobođenja Južne Srbije, Skoplje, pp. 161-179.
- KARAMAN, S. 1943. Über Serbische Niphargiden.- Srpska Kraljevska Akademija, Posebna izdanja, knj. 135, Prirodnjački i matematički spisi, knj. 34, Ohridski Zbornik, Beograd, 3: 1-141-160, figs. 1-31.
- KARAMAN, S. 1950. *Niphargus smederevanus* n. sp. iz Severne Srbije. (= *Niphargus smederevanus* n. sp. aus Nordserbien). - Srpska Akademija Nauka, Posebna Izdanja knj. 158, Odeljenje Prirodno-matematičkih nauka, Beograd, 2: 1-9, 21-25, figs. 1-14.
- KARAMAN, S. 1950A. *Niphargus ilidzensis* Schaeferna i njegovi srodnici u Jugoslaviji. (= *Supraniphargus ilidzensis* Schäferna und seine Nächstverwandten in Jugoslavien). - Srpska Akademija Nauka, Posebna

- Izdanja knj. 158, Odeljenje Prirodno-matematičkih nauka, Beograd, 2: 51-85, figs. 1-40.
- KARAMAN, S. 1950B. Podrod *Orniphargus* u Jugoslaviji. I. Deo. (= Das Subgenus *Orniphargus* in Jugoslavien, Teil I.). - Srpska Akademija Nauka, Posebna Izdanja knj. 158, Odeljenje Prirodno-matematičkih nauka, Beograd, 2: 119-136, 145-156, 160-167, figs. 1-61.
- KARAMAN, S. 1950C. Podrod *Orniphargus* u Jugoslaviji. II Deo. (= Das Subgenus *Orniphargus* in Jugoslavien, Teil II.). - Srpska Akademija Nauka, Posebna Izdanja knj. 158, Odeljenje Prirodno-matematičkih nauka, Beograd, 2: 137-146, 156-159, 168-174, figs. 62-82.
- KARAMAN, S. 1954. Naša podzemna fauna [Über unsere unterirdische Fauna]. - Acta, Musei Macedonici Scientiarum Naturalium, Skopje, 1 (9): 195-216, many figs.
- KARAMAN, S. 1954. Die Niphargiden des slovenischen Karstes, Istriens sowie des benachb. Italiens. - Acta, Musei Macedonici Scientiarum Naturalium, Skopje, 2 (8): 159-180, figs. 1-48.
- KARAMAN, S. 1960. Weitere Beiträge zur Kenntnis der Jugoslavischen Niphargiden. - Glasnik Prirodjačkog Muzeja Beograd, Ser. B, 15: 75-90, figs. 1-19.
- PLJAKIĆ, M.A. 1962. Prilog poznavanju strukture mešovutih populacija amfipoda *Gammarus (R.) balcanicus* i *Gammarus (R.) pulex fossarum*. - Arhiv Bioloških Nauka, Beograd, 14 (1/2): 51-59.
- PLJAKIĆ, M.A. 1965. Distribution und Struktur der Populationen einiger pontokaspischer Amphipoden in der Donau. - Arhiv Bioloških Nauka, Beograd [Archives des Sciences Biologiques], 17 (1-2): 77-82.
- PLJAKIĆ, M.A. 1965A. Distribution und Struktur einiger Donauamphipoden Stromabwärts von Golubac. - Arhiv Bioloških Nauka Beograd,
- SCHÄFERNA, K. 1922. Amphipoda balcanica, with notes about other freshwater Amphipoda. - Vestnik Královské české Společnosti nauk, trida matematičko-prirodovedecká, Praha, 1921-1922, 2: 1-111, 31 figs., 2 pls.
- SCHIÖDTE, J.C. 1849. Bidrag til den underjordiske Fauna. - Det kongelige danske Videnskabernes Selskabs Skrifter. Femte Raekke. Naturvidenskabelig og matematisk Afdeling. Andet Bind. Kjobenhavn, 2 (5):1-39.

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**DALJNA ISTRAŽIVANJA PODZEMNOG RODA *NIPHARGUS*
SCHIÖDTE, 1849 (FAM. NIPHARGIDAE) U SRBIJI
(264. PRILOG POZNAVANJU AMPHIPODA)**

SAŽETAK

Tokom sadašnjih studija roda *Niphargus* Schiödte, 1849 (Amphipoda, fam. Niphargidae) iz podzemnih voda Srbije, otkrivena je i opisana jedna nova podvrsta, *Niphargus bozanae omnivagus*, ssp. n., iz izvora rijeke Pusta Reka (lijeve pritoke Južne Morave, na Radan planini, Srbija). Njen taksonomski položaj unutar roda *Niphargus* je analiziran.

Ključne riječi: Amphipoda, Niphargidae, taxonomija, izvor, *Niphargus bozanae omnivagus*, novi takson, Srbija