New data of the subterranean Gammaridean fauna of western Balkan peninsula (Contribution to the knowledge of the Amphipoda 285)

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Abstract

Two species of subterranean Amphipoda from the fresh waters of western Dinarid Mountains on Balkan Peninsula are treated in this work: *Niphargus bosniacus* described from Mračna pećina Cave in Bosnia and Herzegovina by Stanko Karaman (1943) and known from this locality only, was collected again from the type-locality and redescribed and figured in detail, and its relationship to some other taxa of genus *Niphargus* are treated.

The species *Typhlogammarus mrazeki* Schäferna, 1906, known from several localities in Montenegro, Herzegovina, southern and central Croatia, was discovered now in the Tunel Sv. Ilija near village Zagvozd on Biokovo Mt. above Makarska (Croatia).

Key words: taxonomy, Amphipoda, *Niphargus bosniacus*, redescription, *Typhlogammarus*, Croatia, Bosnia & Herzegovina.

Introduction

The subterranean fauna of Amphipoda (Crustacea, Malacostraca) on Balkan Peninsula was studied over one and half century, and numerous taxa of several families (Bogidiellidae, Gammaridae, Hadziidae, Melitidae, Niphargidae, Pseudoniphargidae, Salentinellidae, Typhlogammaridae) have been discovered and described. Among them, the family Niphargidae was with the most numerous number of taxa (over 150). More intensive recent speleological research of the subterranean fauna in this region provided by various expeditions and single scientists, remarkably elevated number of known subterranean species of the family Niphargidae, especially in the region of Dinarids, where the old Tertiary fauna has been preserved during the Glacial period.

During recent investigations provided by international speleo-diving expedition “Abyss Kovači-Spring of Ričina 2015, organized by Speleological Society “Mijatovi Dvori” Tomislavgrad (Bosnia and Herzegovina), various material of Amphipoda has been collected. One part of this material has been studied and presented in this work.

The taxon *Niphargus stygius bosniacus* was described in 1943 by Stanko Karaman from Mračna pećina Cave in Bosnia and Herzegovina and figured by several figures only, and later this taxon was never neither collected nor redescribed, although it was mentioned later as a distinct species (G. Karaman, 2009). Discovery and description of numerous taxa similar to *Niphargus stygius*-Complex by various authors (*N. stygius likanus* S. Kar., 1952, *N. stygius kenki* S. Kar., 1952, *N. stygius brachytelson* S. Kar., 1952, *N. stygius podpecanus* S. Kar., 1952, *N. ozimeci* G. Kar., 2011, etc.), usually very poorly described and figured, require

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the necessity for much more detailed redescriptions of many already known species and subspecies in order to better recognizing of single taxa. For this reason we redescribed and figured in detail the taxon *Niphargus stygius bosniacus* S. Karaman, 1943, supporting our previous elevation of this taxon on the species level (Karaman, G., 2009). The species *Typhlogammarus mrazeki* Schäferna, 2006, known from several localities in Montenegro, Herzegovina, southern and central Croatia, is discovered now in the cave on Biokovo Mt., Dalmatia.

**Material and Methods**

The material was collected by hand-net and preserved in the 70% ethanol. The specimens were dissected using a WILD M20 microscope and drawn using camera lucida attachment. All appendages were temporarily submersed in the mixture of glycerine and water for study and drawing. Later, all appendages have been transferred to Liquid of Faure on permanent slides. The body-length of examined specimens were measured by tracing individual’s mid-trunk lengths (from tip of head to end of telson) using camera lucida. All illustrations were inked manually.

Some morphological terminology and setae formulae follow G. Karaman’s terminology (Karaman, G., 1969; 2012) regarding the last mandibular palpus article [A= setae on outer face; B= setae on inner face; C= additional setae on outer face; D= lateral marginal setae; E= distal long setae] and propodus of gnathopods 1 and 2 [S= corner spine; L= lateral slender serrate spines; M= facial setae; R= subcorner spine on inner face]. Terms “setae” and “spines” are used based on its shape, not origin.

**Taxonomical part**

**Family Niphargidae**

*Niphargus bosniacus* S. Karaman, 1943

Figures 1-8


**Material examined**

OR-246= Mračna pećina Cave near Prolog, Bosnia & Herzegovina, 30.8.2015, 15 specimens (leg. R Ozimec);
Sp. 486= Mračna pećina-cave, 2 specimens (leg. Klimesch);
Sp. 581= Mračna pećina-cave, 12.7.1914, 2 paratypes (leg.?).

**Description**

**Male 18.0 mm.** Body moderately slender, metasomal segments 1-3 with 4 dorsoposterior short setae each (fig. 3E).

Epimeral plates 1-2 broadly subrounded, with marked ventroposterior corner slender spine and convex posterior margin bearing 4-5 setae (fig. 3E). Ventral margin of epimeral plate 1 is straight or poorly concave, that of epimeral plate 3 is distinctly convex. Epimeral plate 3 with subangular ventroposterior corner defined by slender corner spine, and with distinctly convex ventral and posterior margin; posterior margin is provided with 5-6 short setae (fig. 3E). Epimeral plates 2 and 3 with 2 subventral spines each.

Urosomal segment 1 on each dorsolateral side with 1 seta (fig. 1F); urosomal segment 2 on each dorsolateral side with 3 spine-like setae; urosomal segment 3 naked. Urosomal segment 1 on each ventroposterior corner with 1 short spine near basis of uropod 1 peduncle (fig. 1F).

Head with short rostrum and short subrounded lateral cephalic lobes, eyes absent (fig. 1A).
Antenna 1 hardly shorter than half of body-length (ratio: 51:108); peduncle scarcely setose, peduncular articles 1-3 progressively shorter (ratio: 60:47:22), article 3 short, with very short single lateral and distal setae (fig. 1B); main flagellum consisting of 23 articles (most of them with 1 short aesthetasc (fig. 1C). Accessory flagellum 2-articulated, much shorter than last peduncular article of antenna 1 (fig. 1B).

Antenna 2 moderately setose (fig. 1D). Peduncular article 3 short, with numerous distoventral setae not exceeding the diameter of article itself. Peduncular article 4 slightly longer than article 5 (ratio: 80:70), at ventral margin with 3 bunches of setae nearly as long as diameter of article itself, along dorsal margin with 5 bunches of setae shorter than diameter of article itself; some bunches of short setae appear on lateral sides of the article (fig. 1D). Flagellum slender, longer than last peduncular article (ratio: 93:70), consisting of 11 moderately setose articles (fig. 1D). Antennal gland cone short (fig. 1D).

Mouthparts. Labrum broader than long, with almost straight distal margin (fig. 5A).

Labium much broader than long, with small inner lobes and large subrounded outer lobes (fig. 5B).

Mandible: molar triturative. Left mandible: incisor with 5 teeth, lacinia mobilis with 4 teeth accompanied by rakers. Right mandible: incisor with 4 teeth, lacinia mobilis bifurcate, with several unequal teeth accompanied by rakers. Mandible palpus 3-articulated: first article naked; second article with 16 lateral setae (fig. 5E); third article subfalciform, as long as second article, bearing 28 D-setae and 6 distal E-setae, on outer face appears one bunch of 5 A-setae (fig. 5E), on inner face are attached 3 groups of B-setae (2-3-1) (fig. 5F).

Maxilla 1: inner plate short, with 2 distal setae (fig. 5C), outer plate with 7 spines (6 spines with 1 lateral tooth, 1 spine with 3 small teeth); palpus 2-articulated, not exceeding distal tip of outer plate spines, and provided with 9 distal setae (fig. 5C).

Maxilla 2: both plates with distolateral setae only (fig. 5D).

Maxilliped: inner plate short, with 3 distal smooth spines accompanied by setae (fig. 1E); outer plate not reaching distal tip of palpus article 2 and bearing a row of distolateral pointed smooth spines; palpus article 3 at outer margin with 2 median lateral bunches of setae (fig. 1E); palpus article 4 (dactylus) at outer margin with one median seta, at inner margin with 3 distal setae near the basis of the nail.

Coxae 1-4 of moderate size, coxae 1 and 2 nearly as large as corresponding propodus of gnathopods 1 and 2. Coxa 1 slightly broader than long (ratio: 45:33), with subrounded ventroanterior corner bearing 8 marginal setae (fig. 2A). Coxa 2 slightly broader than long (ratio: 50:45), along ventral margin with 8 moderately long setae (fig. 2D). Coxa 3 broader than long (ratio: 56:50), along ventral margin with 8 setae (fig. 3A). Coxa 4 slightly broader than long (ratio: 58: 48), without posterior lobe and bearing 7 short marginal setae (fig. 3C).

Coxa 5 broader than long (ratio: 70:40), anterior lobe subrounded, with 2-3 setae, posterior lobe subrounded, with 3 short setae (fig. 4A). Coxa 6 smaller than coxa 5, broader than long (ratio: 59:36), anterior lobe subrounded, with 0-2 setae, posterior lobe subrounded, with 2 setae (fig. 4C). Coxa 7 broader than long (ratio: 55:24), convex ventrally, entire, with one marginal seta (fig. 4E).

Gnathopods 1 and 2 of moderate size. Gnathopod 1 rather smaller than gnathopod 2, with article 2 stout, along anterior and posterior margin with numerous long setae (fig. 2A); article 3 at posterior margin with one bunch of setae; article 5 shorter than article 6 (propodus) (ratio: 31:48), along anterior margin with one distal bunch of setae (fig. 2A). Propodus trapezoid, longer than broad (ratio: 90:82), along posterior margin with 9 transverse groups of setae (fig. 2B). Palm inclined nearly half of propodus-length, poorly convex, defined on outer face by one S-spine accompanied laterally by 4 slender L-spines and with 5 facial M-setae (fig. 2C), on inner face by one subcorner R-spine (fig. 2C); dactylus reaching posterior margin of propodus, along outer margin with row of 9 setae, along inner margin with row of 8-9 very short setae (fig. 2B).

Gnathopod 2: article 2 along anterior and posterior margin with row of long setae (fig. 2D); article 3 at posterior margin with one bunch of setae; article 5 shorter than article 6 (ratio: 45:50), along anterior margin with distal bunch of setae. Propodus trapezoid, as long as broad, along posterior margin with 11 transverse rows of setae (fig. 2E). Palm poorly convex, inclined half of propodus-length, defined on outer face by one corner S-spine accompanied laterally by 3 L-spines and with 5 facial M-setae, on inner face by one subcorner R-spine (fig. 2F); dactylus reaching posterior margin of propodus, at outer margin with 7 single median setae, at inner margin with row of 8-10 short setae (fig. 2E).

Pereopods 3 and 4 rather similar to each other. Pereopod 3: article 2 along anterior and posterior margin with row of setae, setae are longer in proximal part of article and shorter in distal half of article (fig. 3A). Articles 4-6 of different length (ratio: 54:37:40); article 4 along anterior and posterior margin with
setae; article 5 with single short spines and setae; article 6 at posterior margin with 3-4 bunches of short spines, along anterior margin with 3 groups of short setae. Dactylus strong, much shorter than article 6 (ratio: 16:40), at inner margin with one spine and seta near basis of the nail (fig. 3B), at outer margin with one median plumose seta; nail rather shorter than pedestal (ratio: 26:36).

Pereopod 4: proximal part of article 2 at both margins with long setae, and with shorter setae in distal part; articles 4-6 of unequal length (ratio: 50:35:40), article 4 at both margins with setae not exceeding the diameter of the article itself (fig. 3C). Article 5 at anterior margin with setae, at posterior margin with 3 bunches of short spines; article 6 at anterior margin with 3 bunches of short setae, at posterior margin with 3 groups of short spines and one group of short setae. Dactylus much shorter than article 6 (ratio: 15:50), at inner margin with one spine and seta near basis of the nail, at outer margin with one median plumose seta (fig. 3D); nail shorter than pedestal (ratio: 20:30).

Pereopod 5 is remarkably shorter than pereopods 6 and 7 (fig. 4A), with article 2 longer than broad (ratio: 70:45), along anterior margin with 6 bunches of spine-like setae, along posterior margin with 14 short setae, ventroposterior lobe not fully developed (fig. 4C). Articles 4-6 of unequal length (ratio: 53:68:75), along margins with short spines and setae of short spines. Article 6 is slightly shorter than article 2 (ratio: 50:70), at anterior margin with 3 bunches of spines, along posterior margin with setae. Dactylus much shorter than article 6 (ratio: 17:50), moderately strong, along inner margin with one median spine and seta, along outer margin with one median plumose seta (fig. 4B), nail shorter than pedestal (ratio: 35:27).

Pereopod 6: article 2 elongated, remarkably longer than broad (ratio: 85:50), along anterior margin with 7-8 single spine-like setae, along posterior poorly convex margin with 14 short setae, ventroposterior lobe not fully developed (fig. 4C). Articles 4-6 of unequal length (ratio: 53:68:75), along margins with short spines and setae of short spines. Article 6 shorter than article 2 (ratio: 75:85), along anterior margins with 4 bunches of short spines, along posterior margin with 5 bunches of short spines. Dactylus much shorter than article 6 (ratio: 23:75), along inner margin with one spine and seta near basis of the nail, along outer margin with one median plumose seta (fig. 4D); nail is shorter than pedestal (ratio: 28:51).

Pereopod 7: article 2 elongated, much longer than broad (ratio: 90:50), along anterior margin with 8 single or paired spine-like setae, along posterior margin with 12 short setae, ventroposterior lobe poorly developed (fig. 4E). Articles 4-6 of unequal length (ratio: 48:69:91), along margins with short single setae and groups of short spines; article. Article 6 nearly as long as article 2, along anterior margin with 5 bunches of short spines and setae, along posterior margin with 4 median single spines and distal bunch of spines and setae (fig. 4F). Dactylus moderately slender, much shorter than article 6 (ratio: 27:91), at inner margin with strong spine and seta near basis of the nail, along outer margin with one median plumose seta (fig. 4G); nail is shorter than pedestal (ratio: 32:63).

Pleopods 1-3 with 2 retinacula each. Peduncle of pleopods 1 and 2 at anterior margin with 1 subdistal seta (fig. 5G, H); peduncle of pleopod 3 along posterior margin with 3 median setae (fig. 5 I).

Uropod 1 long, peduncle with dorsoexternal row of spines and dorsiosternal row of setae (except distal spine) (fig. 1F); inner ramus as long as peduncle, slightly recurved, bearing 2 median and 4-5 distal short spines, as well as 4 median bunches of simple setae. Outer ramus slightly exceeding half of inner ramus, bearing 3 median and 4 distal short spines, as well as 3 median bunches of simple setae (fig. 1F).

Uropod 2: peduncle with dorsal row of spines; outer ramus is distinctly shorter than inner ramus, bearing 3 lateral and 4 distal short spines (fig. 1F); inner ramus with one median and 4 distal short spines.

Uropod 3 very long; peduncle slightly elongated, longer than broad (ratio: 42:20), bearing 2 lateral and 2-3 distal short spines (fig. 3F). Inner ramus very short, scale-like, with one lateral seta and 3 distal short setae and one spine (fig. 3F). Outer ramus elongated, first article is not dilated, along inner margin with 5 bunches of short spines and single plumose setae, along outer margin with 4 groups of short spines and 3 groups of short simple setae; second article very narrow, slightly shorter than first article (ratio: 126:144), along both margins and tip provided with single or bunches of short simple setae (fig. 3F).

Telson nearly as long as broad, slightly gapping, each lobe with 3 distal and one facial spine; one spine is attached at outer and inner margin of each lobe (fig. 5J); a pair of short plumose setae is attached near the middle of each lobe.

Coxal gills on gnathopod 2 almost reaching ventral tip of article 2 (fig. 2D), these in pereopods 3-6 are shorter (figs. 3A, C; 4A, C).
**Figure 1.** *Niphargus bosniacus* S. Kar., 1943, Mračna pećina Cave near Prolog, male 18.0 mm: **A** head; **B** antenna 1; **C** aesthetasc; **D** antenna 2; **E** maxilliped; **F** urosome with uropods 1-2.
**Figure 2.** *Niphargus bosniacus* S. Kar., 1943, Mračna pećina Cave near Prolog, male 18.0 mm: **A-B** gnathopod 1, outer face; **C** distal corner of gnathopod 1 propodus, inner face [S corner spine; L lateral spines; R subcorner spine]; **D-E** gnathopod 2, outer face; **F** distal corner of gnathopod 2 propodus, inner face [S corner spine; L lateral spines; R subcorner spine].
Figure 3. Niphargus bosniacus S. Kar., 1943, Mračna pećina Cave near Prolog, male 18.0 mm: A-B pereopod 3; C-D pereopod 4; E epimeral lates 1-3; F uropod 3.
Figure 4. Niphargus bosniacus S. Kar., 1943, Mračna pećina Cave near Prolog, male 18.0 mm: A-B pereopod 5; C-D pereopod 6; E-F-G pereopod 7.
Figure 5. *Niphargus bosniacus* S. Kar., 1943, Mračna pećina Cave near Prolog, male 18.0 mm: A labrum; B labium; C maxilla 1; D maxilla 2; E mandible palpus, outer face; F distal palpus article of mandible, inner face; G-H-I peduncle of pleopods 1-3; J telson. Female 10.8 mm: K telson.
Female 10.8 mm, with 28 eggs in marsupium: Mainly similar to males. Metasomal segments 1-3 with 4 dorsoposterior setae each (fig. 8F). Epimeral plates 1-3 like these in males; epimeral plates 1-2 subrounded, epimeral plate 3 poorly angular, with marked ventroposterior spine-like seta and convex ventral and posterior margin (fig. 8F); epimeral plates 2 and 3 with 2 subventral spines each.

Urosomal segment 1 on each dorsolateral side with one seta; urosomal segment 2 on each dorsolateral side with 2 spines; urosomal segment 3 naked. Urosomal segment 1 on each ventroposterior corner with one slender spine near basis of the uropod 1 peduncle.

Antenna 1 slightly shorter than half of body-length (ratio: 51:108), peduncle and flagellum like these in male, main flagellum consisting of 23 articles (most of them bearing 1 aesthetasc each).

Mouthparts mainly like these in males. Mandible palpus article 2 with 14 setae; palpus article 3 subfalciform, nearly as long as second article, provided with D-setae and E-setae like these in male, on outer face with row of 4 A-setae, on inner face with 4 groups of B-setae (1-2-1-1).

Maxilla 1: inner plate with 2 distal setae, outer plate with 7 spines (6 spines with one lateral tooth, one spine with several lateral small teeth), palpus with 7 distal setae.

Inner plate of maxilliped with 2-3 spines; palpus article 3 at outer margin with one median and one distal group of setae, dactylus at inner margin with 2 distal setae near basis of the nail.

Coxa 1 poorly broader than long (ratio: 41:36), with subrounded ventroanterior corner bearing 7 marginal setae (fig. 6A). Coxa 2 is longer than broad (ratio: 51:45), along ventral margin with 10 setae (fig. 6D). Coxa 3 is longer than broad (ratio: 60:50), along ventral margin with 10 short and long setae (fig. 7A). Coxa 4 longer than broad (ratio: 62:47), along ventral margin with 7 setae, ventroposterior lobe is not developed (fig. 7C).

Coxa 5 shorter than coxa 4, broader than long (ratio: 65:44), with anterior lobe subrounded and larger than subrounded posterior lobe, along ventral margin of coxa appears row of 6-7 setae (fig. 8A). Coxa 6 smaller than coxa 5, broader than long (ratio: 50:35), anterior lobe subrounded, ventral margin of coxa 6 with 2-4 setae only (fig. 8C). Coxa 7 missing.

Gnathopods 1 and 2 with propodus nearly as large as corresponding coxa. Gnathopod 1 is rather smaller than gnathopod 2, with article 2 along anterior margin with row of 8-9 long setae, along posterior margin with nearly 9-10 long setae; article 3 at posterior margin with one bunch of setae only. Article 5 rather shorter than article 6 (propodus) (ratio: 33:41), along anterior margin with one distal bunch of setae (fig. 6A). Propodus trapezoid, slightly longer than broad (ratio: 90:75), along posterior margin with 7 transverse rows of setae (fig. 6B). Palm poorly convex, inclined poorly over half of propodus-length, defined on outer face by one corner S-spine accompanied laterally by 3 slender serrate L-spines and 4 long facial M-setae (fig. 6B), on inner face by one short subcorner R-spine (fig. 6C). Dactylus reaching posterior margin of propodus, along outer margin with row of 9 single median setae, along inner margin with several short setae (fig. 6B).

Gnathopod 2: article 2 along anterior margin with row of 8 long single setae, along posterior margin with bunches of long setae; article 3 at posterior margin with one bunch of setae; article 5 only slightly shorter than propodus (ratio: 40:45) (fig. 6D). Propodus trapezoid, poorly longer than broad (ratio: 91:87), along posterior margin with 9 transverse rows of setae (fig. 6E); palm inclined nearly half of propodus-length, slightly convex, defined on outer face by one corner S-spine accompanied laterally by 2 slender serrate L-spines and 4 long facial M-setae (fig. 6E), on inner face by one short subcorner R-spine (fig. 6F). Dactylus reaching posterior margin of propodus, along outer margin with 8 single median setae, on inner margin with row of 8-10 short setae (fig. 6E).

Pereopods 3-4 moderately slender. Article 2 with 6-7 anteroproximal long setae and 5-7 short anterodistal short setae, along posterior margin with numerous long setae (fig. 7A). Articles 4-6 of unequal length (ratio: 49:31:37); articles 4 and 5 along both margins with single or bunches of setae (the longest setae slightly exceeding the diameter of articles themselves); article 5 along posterior margin with 2 spines; article 6 along posterior margin with 3-4 bunches of short paired spines. Dactylus moderately strong, much shorter than article 6 (ratio: 13:37), at inner margin with one strong spine and seta near basis of the nail, along outer margin with one median plumose seta (fig. 7B); nail is shorter than pedestal (ratio: 30:35).

Pereopod 4 like pereopod 3, article 2 at anterior margin with 4 proximal long setae and 5 distal short setae, along posterior margin with numerous long setae: the setae are shorter towards distal part of article 2. Articles 4-6 of unequal length (ratio: 45:28:37) (fig. 7C). Article 4 along both margins with setae (the longest setae poorly exceeding the diameter of article itself); article 5 at posterior margin with 2 bunches of short spines and single short setae; article 6 along posterior margin 3-4 single or paired short spines and 1-2 short
setae. Dactylus much shorter than article 6 (ratio: 14:37), along inner margin with one spine and seta near basis of the nail, along outer margin with one median plumose seta (fig. 7D); nail is shorter than pedestal (ratio: 30:35).

Pereopod 5 is distinctly shorter than pereopod 6, with article 2 longer than broad (ratio: 69:41), along poorly convex anterior margin with 7 groups of 1-2 spine-like setae, along posterior margin with 13 short setae (fig. 8A), ventroposterior lobe indistinct. Articles 4-6 of unequal length (ratio: 43:47:47); article 4 at anterior margin with 3 bunches of short setae, along posterior margin with one median and 2-3 distal short spines; articles 5 and 6 along both margins with 3-4 bunches of short spines and single short setae (fig. 8A). Article 6 at distal tip with single long setae and one longer spine. Dactylus is much shorter than article 6 (ratio: 15:47), along inner margin with one short spine and seta near basis of the nail, along outer margin with one median plumose seta (fig. 8B); nail is shorter than pedestal (ratio: 30:40).

Pereopod 6: article 2 remarkably longer than broad (ratio: 83:46), along anterior margin with row of 6 single or paired spine-like setae, along posterior almost straight margin with 12 short setae, ventroposterior lobe not fully developed (fig. 8C). Articles 4-6 of unequal length (ratio: 53:66:73), along both margins with bunches of short setae and spines. Dactylus much shorter than article 6 (ratio: 20:73), along inner margin with one distinct spine and one seta near basis of the nail, along outer margins with one median plumose seta (fig. 8D); nail is shorter than pedestal (ratio: 34:55).

Pereopod 7 missing.

Pleopods 1-3 with 2 retinacula each, peduncle of pleopods 1-3 like these in male.

Uropod 1: peduncle longer than rami, with dorsoexternal row of spines and dorsointernal row of setae, rami almost of the same length, not flattened (fig. 7E). Outer ramus with single lateral and 4-5 distal short spines as well as with 2 lateral bunches of simple setae (fig. 7E). Inner ramus with one median bunch of spines and distal bunch of 4 short spines, as well as with one median bunch of simple setae.

Uropod 2: peduncle with dorsal median spines. Rami not flattened, outer ramus is slightly shorter than inner one, bearing one median and 4-5 distal short spines (fig. 7F); inner ramus with one lateral and 5 distal short spines (fig. 7F).

Uropod 3 elongated: peduncle longer than broad (ratio: 37:20), with one lateral and 2-3 distal short spines (fig. 8E); inner ramus very short, scale-like, bearing one short lateral simple seta and 2 distal short spines. Outer ramus 2-articulated: first article along outer margin with 4 bunches of short spines and one bunch of short setae, along inner margin with 5 groups of 1-2 spines accompanied by single long plumose setae (fig. 8E); second article more narrow than first one, and remarkably shorter than first article (ratio: 55:123), along both margins and tip with short simple setae (fig. 8E).

Telson relatively short, slightly broader than long (ratio: 77:70), rather gaping, incised over 2/3 of telson-length (fig. 5K); each lobe with 3 distal spines (the longest spine exceeding 1/3 of telson-length) and one facial spine; one spine is attached at subdistal interior margin of each lobe (fig. 5K); a pair of short plumose setae is attaches near the middle of outer margin on each lobe.

Coxal gills seem to be larger than these in male: gills on gnathopod 2 exceeding ventral margin of corresponding article 2 (fig. 6D), gills on pereopods 3 and 4 almost reaching ventral margin of corresponding article 2 (fig. 7A, C); coxal gills on pereopods 5 and 6 are shorter and more ovoid (fig. 8A, C).

Oostegites very large, with setose margins (figs. 6D; 7A, C).

Variability

Maxilla 1 inner plate with 2-3 setae, outer plate with 7 spines: one spine with several lateral very small teeth; other 6 spines with 1 lateral tooth, or 5 spines with 1 tooth and 1 spine with 2 lateral teeth, palpus with 7-9 distal setae. Inner plate of maxilliped with 2-3 distal spines accompanied by single setae. Palpus article 4 of maxilliped with 2-3 setae at ventral margin near basis of the nail.

Telson distally with 3-4 spines on each lobeus, outer and inner distomarginal spines absent or present, facial spine always present in adult specimens.

Epimeral plates nearly similar in males and females, with poorly angular to almost subrounded epimeral plate 3 and distinctly subrounded epimeral plates 1 and 2. Inner spine on dactylus of pereopods 3-7 near basis of the nail is less or more strong.

Uropod 1 in females with inner ramus distinctly longer than outer one; inner ramus of uropod 2 with outer ramus slightly recurved and slightly shorter to almost as long as inner ramus.
Figure 6. *Niphargus bosniacus* S. Kar., 1943, Mračna pećina Cave near Prolog, female 10.8 mm; 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; F distal corner of gnathopod 2 propodus, inner face [S corner spine; L lateral spines; R subcorner spine].
Figure 7. *Niphargus bosniacus* S. Kar., 1943, Mračna pećina Cave near Prolog, female 10.8 mm: A-B pereopod 3; C-D pereopod 4; E uropod 1; F uropod 2.
Figure 8. *Niphargus bosniacus* S. Kar., 1943, Mračna pećina Cave near Prolog, female 10.8 mm: **A-B** pereopod 5; **C-D** pereopod 6; **E** uropod 3; **F** epimeral plate 3.
Male 19.0 mm, superadult (= senile) specimen: Body very elongated, epimeral plates 1-3 almost completely subrounded. Dactylus of gnathopods 1 and 2 remarkably exceeding posterior margin of propodus, but shape of propodus is trapezoid. Article 2 of pereopods 5-7 more narrowed that of pereopod 7 almost linear. Inner ramus of uropod 1 more than 2 times longer than outer one, inner ramus slightly depressed dorsoventrally, with 5-6 median groups of simple setae; uropod 2 inner ramus is almost as long as outer ramus, not depressed. Uropod 3 with peduncle more than twice as long as broad; second article of outer ramus almost as long as first article. Urosomal segments 1 and 2 with 1-2 setae on each dorsolateral side.

Male of 11 mm: urosomal segment 1 with one seta on each dorsolateral side; urosomal segment 2 on each side with 2 setae and one spine, urosomal segment 3 naked.

Female 9.2 mm with setose oostegites: Uropods 1 and 2 with inner ramus poorly longer than outer one; second article of uropod 3 is short, not exceeding ¼ of first article of outer ramus. Epimeral plate 3 nearly subangular, with almost straight posterior margin. Urosomal segment 1 on each dorsolateral side with 1 seta; urosomal segment 2 on each side with 2 spines. Pereopod 7 similar to that in male.

Holotype. Male 14 mm. Holotype and paratypes are deposited in Karaman`s Collection in Podgorica, Montenegro.

Locus typicus: Mračna pećina Cave near Prolog, Bosnia.

Distribution: Known from type-locality only.

Remarks and affinities
Niphargus bosniacus S. Kar., 1943 belongs to the Niphargus stygius- Complex of taxa based on its morphological and ecological characters (epimeral plates, gnathopods, pereopods, mouthparts, telson, etc.). Numerous taxa are described from this group from western Balkan, often mentioned as subspecies of N. stygius [Niphargus stygius podpecanus S. Kar., 1952, N. stygius kentki S. Kar., 1952, N. stygius likanus S. Kar., 1952, N. stygius brachytelson S. Kar., 1952, N. stygius karamani Schell., 1935, etc.] and some of them were later elevated to the species level (Karaman, G., 2014b; Karaman, G., 2014c, etc.).

On the other hands, many of these taxa were very poorly described and needs the redescription. At the moment, N. bosniacus differs distinctly from all these taxa by the combination of the taxonomical characters. Further mode detailed redescription of other taxa of N. stygius- Complex will show the real taxonomical position of N. bosniacus within genus Niphargus.

Family Typhlogammaridae

Typhlogammarus mrazeki Schäferna, 1906

Figure 9

Gammarus (Typhlogammarus) mrazeki Schäferna, 1906: 1-4, fig. I, pl. 1, figs 1-35;
Typhlogammarus mrazeki Schäferna, 1922: 89; Spandl, 1926: 72, fig. 47; Karaman, G., 2014d: 51 (other synonyms omitted, see Karaman, G., 2014a).

Material examined
Croatia: OR-248: Jama 3, Tunnel Sv. Ilija near village Zagvozd above Makarska on Biokovo Mt., central Dalmatia, 5.9.2015, 3 specimens up to 23.0 mm long, and 1 juv. specimen (leg. B. Jalžić).

Remarks
The specimens from tunnel Sv. Ilija on Biokovo Mt. above Makarska in central Dalmatia agree with known description of this species. Tip of rostrum of the head is acute and poorly removed upward. Mesosomal segments 1-7 dorsally smooth or mesosomal segments 1-5 with visible dorsal low broad elevation (not forming keel). Urosomal segments 1-3 are not elevated dorsally.
*Typhlogammarus mrazeki* as a Tertiary relict is known from several localities in Crna Gora and Herzegovina, southern, central and northern part of Croatia. Discovery of this species on Biokovo Mt above Makarska, show that *T. mrazeki* is distributed more or less continuously along western part of Dinarids, from Montenegro to northern Croatia. Although exists certain variability of various taxonomical characters in some populations, based on which there were attempts to divide this species is different subspecies, for the moment it was not possible to recognize different populations or taxa within this species based on external morphological characters. The further molecular and genetic investigations of this species will show the real degree of heterogeneity of this species.

**Distribution**

**Crna Gora (Montenegro):** Lipska pećina Cave; Njeguši; Obodska pećina Cave; Donja Grbočica Cave above Virpazar; Monastery Morača, spring.

**Croatia:** Spring near Šibenik; spring near Rudnica in Kamenica near Slunj; spring in the cave under waterfall Krčić (spring of Krka River); Cave Miljacka 4, Krka river; Vilina pećina- Cave near Dubrovnik; špilja za Gromačkom Vlakom- Cave (Dubrovnik reg.); Tunnel Sv. Ilija on Biokovo Mt.;

**Bosnia and Herzegovina:** Vjetrenica cave in Popovo polje; Spring of Trebišnjica river near Bileća.

**Locus typicus:** Lipska pećina Cave, Crna Gora (Montenegro).
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