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ON SOME SPECIES OF THE FAMILIES NIPHARGIDAE AND GAMMARIDAE FROM CROATIA AND BOSNIA AND HERZEGOVINA
(Contribution to the knowledge of the Amphipoda 283)

Abstract

New data of the genus *Niphargus* Schiödte, 1849 (Amphipoda, Niphargidae) from Croatia are presented. *Niphargus radzai* G. Kar., 2014, known from Ravno Vrdovo on Dinara Mt., is discovered in Mareljina Jama Cave near Golubinka Cave, Biteljić Donji (Croatia), and some new data of this species are presented.

The new subspecies *Niphargus zagorae sterilis*, ssp. n. from four caves in Vrdovo region (Croatia) is described and figured, and its relation to the nominal subspecies, *N. zagorae zagorae* Švara et al., 2015 is discussed.

New data of the *Gammarus balcanicus* Schäferna, 1922 and *Echinogammarus veneris* (Heller, 1865) (Amphipoda, Gammaridae) from Croatia and Bosnia and Herzegovina are given.

Keywords: taxonomy, Amphipoda, *Niphargus radzai sterilis*, new, *Gammarus balcanicus*, *Echinogammarus veneris*, Croatia, Bosnia and Herzegovina

O NEKIM VRSTAMA FAMILIJA NIPHARGIDAE I GAMMARIDAE IZ HRVATSKE I BOSNE I HERCEGOVINE
(283. Prilog poznavanju Amphipoda)

Sažetak

Prezentirani su novi podaci o rodu *Niphargus* Schiödte, 1849 (Amphipoda, Niphargidae) iz Hrvatske: *Niphargus radzai* G. Kar., 2014, poznat iz lokaliteta Ravno

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Vrdovo na planini Dinara, otkriven je sada i u špilji Mareljina Jama kod Golubinka špilje, Biteljić Donji, i dati su neki novi podaci o toj vrsti.

Nova podvrsta, *Niphargus zagorae sterilis*, ssp. n., opisana je i ilustrovana iz četiri špilje u regionu Vrdovo (Hrvatska), i analiziran je njen odnos prema nominalnoj podvrsti, *N. zagorae zagorae*, Švara et al., 2015.

Dati su novi podaci o vrstama *Gammarus balcanicus* Schäferna, 1922 i *Echinogammarus veneris* (Heller, 1865) (Amphipoda, Gammaridae) iz Hrvatske i Bosne i Hercegovine.

Ključne riječi: taksonomija, Amphipoda, *Niphargus radzai sterilis*, nova, *Gammarus balcanicus*, *Echinogammarus veneris*, Hrvatska, Bosna i Hercegovina

INTRODUCTION

The subterranean fauna of Amphipoda in Croatia was studied intensively during over one century by various authors (A. Jurinac, A. Schellenberg, S. Karaman, S. Gottstein, B. Sket, G. Karaman, C. Fišer, etc.) and numerous new or known taxa in this region have been discovered and described, supporting the fact that the fauna of the subterranean Amphipoda in this region is very rich and still only partially known. The specific and various geomorphologic events and geological history, presence of large karstic regions with its numerous phenomena, presence of numerous rivers and lakes, etc. in Croatia were excellent grounds for existence on very rich and various fauna of Amphipoda with numerous endemic taxa.

The speleologists Tonči Rađa from Split, and Mg. Sci. Roman Ozimec from Zagreb visited recently numerous caves in Croatia collecting cave fauna, gave us collected Amphipoda at disposition for study. The result of study of part of this material is presented in this work.

MATERIAL AND METHODS

The studied material was preserved in 70% ethanol. Collected specimens were dissected using a WILD M^20 microscope and drawn using a camera lucida. All appendages were temporarily submersed in a mixture of glycerine and freshwater for study and drawing. The body-length of examined specimens was measured from the tip of head to the end of the telson using a camera lucida. All illustrations were manually drawn in ink. After the end of the study, dissected body-parts were submerged in Liquid of Faure and covered by thin cover glass to dry.

Some morphological terminology and seta formulae follow Karaman`s terminology (Karaman G., 1969, 2012 b): for the last mandibular palpus [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 slender serrate spines; M= facial setae; R= sub-

corner spine on inner face]. Terms „setae" and „spines" are used based on shape, not origin. The studies are provided based on morphological, ecological and zoogeographical data.

TAXONOMIC PART

Family NIPHARGIDAE

NIPHARGUS RADZAI G. Karaman, 2014

Niphargus radzai G. Karaman, 2014 a: 586, figs. 1–8.

MATERIAL EXAMINED: CROATIA:

S-7210= spring above PD (=planinarski dom) Sv Jakov, Ravno Vrdovo, Dinara Mt., Croatia, 25. 10. 2013, 6 exp. (paratypes) (leg. T. Rađa);

TR-107= Mareljina Jama Cave near Golubinka Cave by Buljana, Biteljič Donji, Vrdovo reg., Croatia, 2. 6. 2015, 5 exp. (leg. T. Rađa).

LOC. TYP.: Spring above „P. D. Sv. Jakov", Ravno Vrdovo, Dinara Mt., Croatia.

DISTRIBUTION: CROATIA (see sub material examined).

REMARKS.

The specimens from Mareljina Jama Cave agree with specimens from locus typicus.

Male 10.0 mm:

Antenna 1 nearly 2/5 of the body-length. Metasomal segments 1–3 with 3–4 dorso-posterior moderately long setae.

Epimeral plates 1–2 subrounded; epimeral plate 3 poorly angular, with slightly convex posterior margin and with 2 subventral spines.

Urosomal segment 1 with 1 seta on each dorsolateral side; urosomal segment 2 with 2 spines on each dorsolateral side, urosomal segment 3 naked.

Maxilla 1 inner plate with 1–2 setae, outer plate with 7 spines (6 spines with 1 lateral tooth, 1 spine with 3–4 lateral small teeth), palpus with 6–7 setae. Maxilliped inner plate with 3–4 spines, palpus article 4 at inner margin with 1–2 setae near basis of the nail.

Gnathopods 1–2 like these in holotype: propodus of gnathopod 1 with 1 S spine accompanied laterally by 3 slender L-spines, as well as with 1 R-spine and 4–5 M-setae.

Propodus of gnathopod 2 with 1 S-spine accompanied laterally by 2 L-spines, as well as with 1 R spine and 4–5 M-setae.

Dactylus of pereopods 3–4 at inner margin with 2–3 strong spines, at outer margin with 1 median plumose seta. Dactylus of pereopods 5–7 with 1 spine at inner margin near basis of the nail, and with 1 median seta at outer margin.

Uropod 1: peduncle with dorsoexternal row of spines and dorsointernal row of setae (except distal spine); inner ramus is only slightly longer than outer one (ratio: 100:76).

Uropod 2 inner ramus is slightly longer than outer one (ratio: 100:77).

Uropod 3 long, outer ramus with second article of outer ramus only slightly shorter than first article.

Lobes of telson with 3–4 distal spines, one spine at inner margin and one strong facial spine.

NIPHARGUS ZAGORAE STERILIS ssp. n.

Figures 1–6

MATERIAL EXAMINED: CROATIA:

TR-102= Vrdovo, Jama 50 m from Stipanjkuša Cave, 19. 4. 2015, 9 exp. (leg. T. Rađa);

TR-104= Tičarica Cave, Vrdovo, 2. 11. 2014, 7 exp. (leg. T. Rađa) (holotype and paratypes);

TR-105= Vrdovo, Jama II towards Štuka, 12. 4. 2015, 8 exp. (leg. T. Rađa);

TR-106= Vrdovo, Vunena Jama Cave, 24. 5. 2015, 2 exp. (leg. T. Rađa).

DIAGNOSIS

Inner plate of maxilla 1 with 2 setae, inner plate of maxilliped with 2 spines, palpus of maxilliped at inner margin with 2–4 setae. Telson with distal, lateral and facial spines. Dactylus of pereopods 3–7 with one spine near basis of the nail. Basipodit of pereopods 5–7 not lobed. Pleopods 1–3 with 2 retinacula. Uropod 1 in males with inner ramus longer than outer one. Uropod 3 second article of outer ramus elongated in males, short in females. Urosomal segment 3 naked.

DESCRIPTION

MALE 10.2 mm (holotype). Head with short rostrum, lateral cephalic lobes subrounded, eyes absent (fig. 1A). Body moderately slender, mesosomal articles smooth, metasomal articles 1–3 with 3–4 short dorsoposterior setae each (fig. 5B).

Epimeral plates 1–2 obtusely subrounded, with slightly convex posterior margin bearing 4–6 setae (fig. 5B). Epimeral plate 3 obtusely angular with posterior margin poorly convex bearing 4–5 setae. Epimeral plate 2 with 1 subdistal spine, epimeral plate 3 with 3 subdistal spines (fig. 5B).

Urosomal segment 1 on each dorsolateral side with 1 seta; urosomal segment 2 on each dorsolateral side with 2 spines; urosomal segment 3 naked. Urosomal segment 1 at each ventroposterior corner with 1 short spine (fig. 3E).

Antenna 1 not reaching half of body (ratio: 45:102), peduncular articles 1–3 scarcely setose, progressively shorter (ratio: 67:47:23) (fig. 1B); main flagellum with 19 articles (most of them with 1 short aesthetasc); accessory flagellum, 2-articulated, shorter than last peduncular article (fig. 1B).

Antenna 2 remarkably more setose than antenna 1; peduncular article 3 short, at ventral margin with one bunch of setae (fig. 1C); peduncular articles 4–5 of the same length, both along ventral margin with bunches of setae longer than diameter of the articles themselves (fig. 1C), along dorsal margin with 4 bunches of short setae. Flagellum slender, slightly longer than last peduncular article (ratio: 72:63), and provided with short setae (fig. 1C). Antennal gland cone short (fig. 1C).

Mouthparts. Labrum broader than long, with convex distal margin (fig. 1D). Labium broader than long, inner lobes well developed, outer lobes entire distally (fig. 1E).

Mandibles with triturative molar. Left mandible: incisor with 5 teeth, lacinia mobilis with 4 teeth. Right mandible: incisor with 4 teeth, lacinia mobilis bifurcate, with several teeth. Palpus of both mandibles equal, 3-articulate: first article naked, short (fig. 1F), second article with 10 setae; third article slightly longer than second one (ratio: 66:59), with 22–23 D-setae, 5–6 E-setae, on outer face with one bunch of 5 A-setae, on inner face with 3 bunches of B-setae (2–1-1) (fig. 1F).

Maxilla 1: inner plate with 2 setae; outer plate with 7 spines (6 spines with 1 lateral tooth, 1 spine with 4–5 lateral teeth); palpus 2-articulated, not reaching tip of outer plate spines and provided with 8 setae (fig. 5A).

Maxilla 2: both plates with distolateral marginal setae.

Maxilliped: inner plate short, not exceeding outer tip of the palpus and provided with 2 distal spines and several setae (fig. 1G); outer plate not reaching outer tip of palpus article 2 and provided with row of distolateral smooth spines; palpus 4-articulated, article 3 along outer margin with one median and one distal bunch of setae; palpus article 4 (dactylus) along outer margin with one median seta, along inner margin with 3–4, rarely only 2 setae near basis of the nail (fig. 1G).

Coxae relatively short. Coxa 1 broader than long (high) (ratio: 50:40), with broadly subrounded ventroanterior corner and provided with 8 short setae (fig. 2A). Coxa 2 nearly as long as broad, with 9 marginal setae (fig. 2D). Coxa 3 hardly broader than long (ratio: 59:56), with 7 marginal setae (fig. 3A). Coxa 4 hardly broader than long (ratio: 59:55) (fig. 3C), along margin with 8 setae, ventroposterior lobe is not developed.

Coxa 5 broader than long (ratio: 70:40), anterior lobe only poorly shorter than coxa 4, posterior lobe subrounded (fig. 4A).

Coxa 6 shorter than coxa 5, broader than long (ratio: 61:37), anterior lobe subrounded (fig. 4C). Coxa 7 entire, broader than long (ratio: 54:30) (fig. 4E).

Gnathopods 1–2 of moderate size, with propodus nearly as large as corresponding coxa. Gnathopod 1: article 2 stout, along anterior and posterior margin with numerous long setae (fig. 2A); article 3 at posterior margin with 1 bunch of setae. Article 5 shorter than propodus (ratio: 30:60), along anterior margin with 1 distal bunch of setae (fig. 2A). Propodus trapezoid, slightly longer than broad (ratio: 90:74), along posterior margin with 7 transverse groups of setae (fig. 2B). Palm inclined up to 1/3 of propodus-length, defined on outer face by 1 corner S-spine accompanied laterally by 3 serrate L-spines and 5 facial M-setae, on inner face by 1 R-spine (fig. 2C). Dactylus reaching posterior margin of propodus, along outer margin with row of 8–9 mainly single setae (fig. 2B).

Gnathopod 2: article 2 along anterior and posterior margin with numerous long setae (fig. 2D); article 3 at posterior margin with 1 bunch of setae. Article 5 shorter than propodus (ratio: 38:52), along anterior margin with distal bunch of setae. Propodus trapezoid, slightly longer than broad (ratio: 95:90), along posterior margin with 9 transverse rows of setae (fig. 2E); palm inclined up to 1/3 of propodus-length, defined on outer face by 1 strong S-spine accompanied laterally by 2 serrate L-spines and 5 facial M-setae, on inner face by 1 R-spine (fig. 2F). Dactylus reaching posterior margin of propodus, along outer margin with 8 mainly single setae (fig. 2E), along inner margin with several short setae.

Pereopods 3–4 moderately slender, rather similar to each other. Pereopod 3: article 2 along anterior margin with row of several short setae in distal part and 2–3 long setae in proximal part (fig. 3A). Articles 4–6 of different length (ratio: 50:35:38), article 2 with long setae along proximal part of both margins; article 4 along posterior margin with 4 bunches of setae. Articles 5–6 along posterior margin with single spines accompanied by setae. Dactylus short and strong, much shorter than article 6 (ratio: 15:40), along inner margin with 1 strong spine near basis of the nail, along outer margin with 1 median plumose seta (fig. 3B), nail slightly shorter than peduncle (ratio: 25:34).

Pereopod 4: article 2 along anterior margin row of shorter setae in distal part and long setae in proximal part (fig. 3C), along posterior margin with numerous long setae; articles 4–6 of different length (ratio: 50:30:38), along anterior margin with bunches of shorter setae. Article 4 along posterior margin with 4 bunches of setae (fig. 3C). Article 5 at posterior margin with 3 strong spines and single short setae; article 6 along posterior margin with 4 single or paired short spines. Dactylus much shorter than article 6 (ratio: 13:38), along inner margin with one strong spine near basis of the nail, along outer margin with 1 median plumose seta (fig. 3D), nail shorter than pedestal (ratio: 27:32).

Pereopods 5–7 moderately stout. Pereopod 5 remarkably shorter than pereopods 6 and 7; article 2 dilated, slightly longer than broad (ratio: 76:53), along anterior margin with row of 7–8 slender spines, along posterior poorly convex margin with nearly 12 short setae (fig. 4A), ventroposterior dilatation developed, but not forming the lobe. Articles 4–6 of unequal length (ratio: 43:47:45), along both margins with bunches of short spines and single short setae (fig. 4A) (anterior margin of article 4 with setae only). Dactylus strong and stout, much shorter than article 6 (ratio: 16:45), along inner margin with one strong spine near basis of the nail, along outer margin with one median plumose seta (fig. 4B), nail shorter than pedestal (ratio: 19:37).

Pereopod 6: article 2 longer than broad (ratio: 87:57), along anterior convex margin with row of 7–8 slender spines (fig. 4C), along posterior poorly convex margin with nearly 2 short setae, ventroposterior dilatation without distinct lobe. Articles 4–6 of unequal length (ratio: 55:70:75), along both margins with bunches of spines and single short setae (fig. 4C). Dactylus short and strong, much shorter than article 6 (ratio: 23:75), along inner margin with one strong spine near basis of the nail, at outer margin with one median plumose seta; nail shorter than pedestal (ratio: 37:48) (fig. 4D).

Pereopod 7: article 2 longer than broad (ratio: 94:60), along anterior convex margin with row of 6 slender spines, along convex posterior margin with 12–13 short setae, ventroposterior lobe not developed (fig. 4E). Articles 4–6 of unequal length (ratio: 47:66:90), along anterior and posterior margin with bunches of strong short spines (fig. 4E, F). Dactylus much shorter than article 6 (ratio: 30:90), along inner margin with one strong spine near basis of the nail, along outer margin with one median plumose seta (fig. 4G), nail shorter than pedestal (ratio: 30:55).

Uropod 1: peduncle with dorsoexternal row of spines and dorsointernal row of setae (except distal spine) (fig. 3E); inner ramus nearly as long as peduncle, with short spines in distal part accompanied by 2 bunches of setae. Outer ramus reaching 2/3 of inner ramus, bearing 2 bunches of lateral spines accompanied by single seta (fig. 3E) and with distal bunch of short spines.

Uropod 2: peduncle as long as inner ramus (fig. 3F); inner ramus with 1 lateral and 5 distal strong spines; outer ramus slightly shorter than inner ramus, with 2 lateral and 4–5 distal short spines (fig. 3F).

Uropod 3 long. Peduncle nearly 2 times longer than broad, with 4 groups of short setae along outer margin (fig. 3G). Inner ramus scale-like, much shorter than peduncle, bearing 1 lateral and 2 distal spines (fig. 3G). Outer ramus 2-articulated: first article long, along both margins with 5 bunches of short spines (fig. 3G), plumose setae absent; second article reaching half of first article, bearing scarce number of short lateral setae and one bunch of distal short setae (fig. 3G).

Telson incised 2/3 of its length, nearly as long as broad; each lobe with 3 distal spines, 0–1 spine along outer margin, 1 spine along inner margin and with

1 facial spine (fig. 1H). A pair of short plumose setae sitting near the middle of each lobe (fig. 1H).

Coxal gills 1–6 ovoid, of moderate size, not exceeding distal margin of corresponding basipodit (figs. 2D; 3A, 3C; 4A, 4C).

FEMALE 10.0 mm (paratype): Rather similar to the male. Mesosomal and metasomal segments like these in male. Epimeral plates 1–2 with marked ventroposterior corner and slightly convex posterior margin bearing 5–7 short setae. Epimeral plate 3 obtusely angular, with distinct ventroposterior corner and hardly sinusoid posterior margin bearing 7–8 setae. Epimeral plate 2 with 2 subventral spines, epimeral plate 3 with 3 subventral spines (fig. 6G).

Urosomal segment 1 on each dorsolateral side with 1 seta; urosomal segment 2 on each dorsolateral side with 2 spines; urosomal segment 3 naked. Urosomal segment 1 at ventroposterior corner of each side with 1 spine near basis of the uropod 1 peduncle (fig. 5F).

Antenna 1 slightly shorter than half of body (ratio: 43:100), scarcely setose. Mandible like that in male.

Maxilla 1: inner plate with 2 setae (fig. 7E), outer plate with 7 spines (6 spines with 1 lateral tooth, 1 spine with 2–3 lateral teeth); palpus 2-articulated, bearing 6 setae. Maxilla 2 and maxilliped like these in male.

Coxae 1–4 slightly longer than these in male. Coxa 1 slightly broader than long (ratio: 48:42), with row of marginal setae (fig. 6A). Coxa 2 longer than broad (ratio: 57:48), with 8 marginal setae (fig. 6B). Coxa 3 remarkably longer than broad (ratio: 66:50), with 9 marginal setae (fig. 6C). Coxa 4 is rather longer than broad (ratio: 65:55), along ventral margin with 9 setae (fig. 6D). Coxa 5 much shorter than coxa 4, like that in male, coxa 7 entire (fig. 6H).

Gnathopods 1–2 like these in males. Gnathopod 1 propodus trapezoid, slightly longer than broad (ratio: 88:72), along posterior margin with 7 transverse groups of setae. Palm inclined up to 1/3 of propodus-length, defined on outer face by 1 corner S-spine accompanied laterally by 3 serrate L-spines and 5 facial M-setae, on inner face by 1 R-spine. Dactylus reaching posterior margin of propodus, along outer margin with row of 6–7 mainly single setae.

Gnathopod 2 propodus trapezoid, along posterior margin with 9 transverse rows of setae. Palm inclined 1/3 of propodus-length, defined on outer face by 1 S-spine accompanied laterally by 2 serrate L-spines and 5 facial M-setae, on inner face by 1 R-spine. Dactylus reaching posterior margin of propodus, along outer margin with 6–7 mainly single setae, along inner margin with several short setae.

Pereopods 3–4 like these in male, with strong dactylus bearing at inner margin one strong spine near basis of the nail, along outer margin with 1 median plumose seta; nail shorter than pedestal (ratio: 20:30) (fig. 6F).

Pereopods 5–7 mainly like these in males. Dactylus of pereopods 5–6 short and strong, along inner margin with 1 spine, along outer margin with one median plumose seta.

Pereopod 7: Basipodit dilated, longer than broad (ratio: 87:56), along anterior margin with row of 6–7 long slender spine-like setae (fig. 6H), along posterior margin with nearly 14 short setae, ventroposterior lobe not fully developed (fig. 6H). Articles 4–6 of unequal length (ratio: 48:65:87), along both margins with short spines accompanied often with single short setae (fig. 6H). Article 6 as long as article 2. Dactylus short and strong, along inner margin with one strong spine near basis of the nail, along outer margin with one median plumose seta (fig. 6I); nail shorter than pedestal (ratio: 27:54).

Uropod 1: peduncle longer than inner ramus (ratio: 107:81), bearing dorsoexternal row of strong spines and dorsointernal row of 1–2 setae (except distal spine). Inner ramus is slightly longer than outer one (ratio: 81:73), bearing 3–4 strong lateral and 4–5 distal short spines and 2 bunches of lateral simple setae (fig. 5F). Outer ramus bearing 2 lateral spines accompanied by 2 bunches of simple setae and 4 distal short spines.

Uropod 2: peduncle with dorsal spines. Inner ramus is distinctly longer than outer one (ratio: 52:47), bearing median and distal group of strong spines (fig. 5G), outer ramus with single lateral and 4–5 distal spines (fig. 5G).

Uropod 3 shorter than that in male. Peduncle remarkably longer than broad (ratio: 47:24), bearing 2 lateral and several distal short spines (fig. 5H). Inner ramus short, scale-like, much shorter than peduncle of uropod 3, bearing 2 distal spines (fig. 5H). Outer ramus 2-articulated: first article along outer margin with 5 bunches of short spines, along inner margin with 4 bunches of 1–2 longer spines, accompanied by single plumose setae (fig. 5H). Second article of outer ramus much shorter than first article (ratio: 30:125), along both margins and tip with short simple setae (fig. 5H).

Telson nearly as long as broad, incised nearly 2/3 of telson-length (fig. 5I), each lobe with 3 distal long spines, one long facial spine, and along inner margin with one short spine (fig. 5I). A pair of short plumose setae appears near the middle of each lobe.

Coxal gills like these in male. Oostegites large, with marginal setae.

VARIABILITY.

The stable characters are the absence of additional spines along inner margin of dactylus of pereopods 3–7, maxilla 1 inner plate with 2 setae, inner plate of maxilliped with 2 distal spines; distal article of maxilliped palpus near basis of the nail usually with 3–4 setae, rarely only 1 seta; urosomal segment 3 on each dorsolateral side naked.

LOCUS TYPICUS: Tičarica Cave, Vrdovo, CROATIA.

DERIVATIO NOMINIS. The name „*sterilis*" arrives from the Latin word „sterile", adequate word „sterile" in English.

HOLOTYPE: Male 10.2 mm. Holotype and paratypes are deposited temporarily in Karaman`s Collection in Podgorica, Montenegro.

DISTRIBUTION: Croatia.

REMARKS AND AFFINITIES.

The specimens from Tičarica Cave are very similar to the species *Niphargus zagorae* Švara et al., 2015 described from Golubinka Cave under Barišinovci, near Čvrljevo, vicinity of Šibenik (locus typicus) and cited also from Kevina jama-Cave near Radošić and Tomina jama-Cave near Labin dalmatinski (both in vicinity of Split, Croatia).

N. zagorae zagorae differs from ssp. *sterilis* by: – Metasomal segments 1–3 with 8 (5–10) dorsoposterior setae [3–4 in ssp. *sterilis*];

– Epimeral plate 3 in female with convex posterior margin [slightly concave in ssp. *sterilis*];

– „Urosomal segments 1–3 on each dorsolateral side with 1–2–1 spines" [US 1 with 1 seta, US 2 with 2 spines, US 3 naked in female and male, in ssp. *sterilis*];

– Urosomal segment 1 with ventroposterior strong seta on each side [spine in ssp. *sterilis*];

– Mx 1 „inner plate with 4 setae (2–4)" [2 setae in ssp. *sterilis*];

– Propodus of gnathopods 1 and 2 broader and with more inclined palm [more narrow and with less inclined palm in ssp. *sterilis*];

– Propodus of gnathopods 1 and 2 with 2 M-setae (3 figured on fig. 6a) [5 M-setae in ssp. *sterilis*];

– Dactylus of gnathopods 1 and 2 with 4–6 setae along outer margin [8–9 setae in ssp. *sterilis*];

– Dactylus of pereopods 3–4 with 1 seta near basis of the nail [1 spine in ssp. *sterilis*];

– Dactylus of pereopods 5–7 „with 2 tiny setae or 1 seta and 1 tiny spine near basis of the nail" [always 1 strong spine and 1 tiny seta in ssp. *sterilis*];

– Uropod 1 rami: „endopodite: exopodite lengths as 1:1.08" [Inner ramus is slightly longer than outer one, ratio: 81:73 in ssp. *sterilis*];

– Uropod 2 rami: „endopodite: exopodite lengths as 1:1.14" [Inner ramus is distinctly longer than outer one, ratio: 52:47, in ssp. *sterilis*];

– Uropod 3 „distal article of outer ramus very short, apical article of exopodite with no [0–1] setae laterally" [with several lateral and distal setae in ssp. *sterilis*];

– „Second article of uropod 3 outer ramus much shorter than first article of exopodite as 0.14 (0.13–0.20) of first article (females)" [longer, ratio: 30:125 in ssp. *sterilis;*

– Telson less spinose than that in ssp. *sterilis*.

The specimens of ssp. *sterilis* are also very similar to the species *N. radzai* G. Kar., 2014 a described from spring above PD (=planinarski dom) Sv Jakov, Ravno Vrdovo, Dinara Mt., Croatia [see above] by numerous characters, but differ from *N. radzai* mainly by absence of additional spines at inner margin of dactylus in pereopods 3–7, less spinose telson, epimeral plates, etc. in all specimens in hands. As these characters were observed in 3 different caves of Vrdovo region, it seems that these differences are stable within the specimens from these caves.

The problem is how deep we will go in recognition of the morphological and genetically/molecular characters and differences between these two group of populations. The further molecular/genetic study of these population will put some more data (but not absolute conclusions) regarding taxonomic level of these populations and can help to understand the situation, and will not resolve automatically the problem, because at the subspecific level the subjectivity of the authors is always present, and many other scientific data must be taken in consideration for final decision.

In any case, *N. zagorae sterilis*, based on morphological characters is very close to *N. zagorae*, *N. radzai* and *N. boskovici* S. Karaman, 1952, although *N. boskovici* has telson poorly spinose (Karaman, S., 1952; Karaman, G., 2014 b), and the additional studies must be provided to resolve their taxonomical relations. We cannot exclude the possibility that *N. zagorae sterilis* can be one variety of *N. zagorae* or *N. radzai*, but at the present our knowledge of the variability of these species, and only limited number of known localities of these taxa, we consider *sterilis* as a distinct taxon.

Family GAMMARIDAE

GAMMARUS BALCANICUS Schäferna, 1922 (sensu auct.)

Gammarus balcanicus Schäferna, 1922: 3, pl. 1 fig. 7, text figs 1–2; Karaman & Pinkster, 1987: 211, figs. 1–3; G. Karaman, 1993: 108, figs. 49–51; Žganec, Gottstein & Đurić, 2010: 144, fig. 1 (numerous synonyms omitted].

CROATIA:

OR-240= Spring above church in Mlinište, Metković reg. (Croatia), 11. 11. 2014, 11 exp. (leg. R. Ozimec);

OR-241= ibid. 10 exp. (leg. R. Slapnik & A. Kovačević).

BOSNIA & HERZEGOVINA

S-7270= Blidinje village, Masna Luka, Jasle spring (Tomislavgrad reg.), 29. 8. 2015, many exp. (leg. G. & B. Karaman);

S-7246= Bosansko Grahovo, Bašinac, 23. 10. 2014, 15 exp. (leg. D. Marić);

S-7247= Spring of Peći, Bosansko Grahovo reg., 13 exp. (leg. D. Marić);

S-7254= Zvornik, Pilica Cave, 9. 1. 2014, 2 exp. mixed with *Niphargus* sp. (leg. N. Stevanović).

REMARKS

Gammarus balcanicus was described from Kolašin in Crna Gora (Montenegro) by Schäferna (1922) and later cited for numerous localities of Balkan, N. Italy, Poland, and some other adjacent eastern regions by numerous authors. On the other hands, numerous samples from various localities, similar to *G. balcanicus*, have been described as a distinct taxa (*Gammarus pavlovici* S. Karaman, 1929, *G. klisanus* S. Karaman, 1931 a; *G. spinicaudatus* Schäferna, 1922, *G. konjicensis istrianus* S. Karaman, 1931 b; *Gammarus tauricus* Martynov, 1931, etc.), and later, in the second half of last century, during the" fusionist`s period", there were fused with *G. balcanicus* as synonyms (G. Karaman, 1977; G. Karaman & Pinkster, 1977 a, 1977 b, 1987; G. Karaman, 2003, etc.).

The recent genetic/ molecular studies of various populations of *Gammarus balcanicus* sensu auct. is providing by various authors (Grabowski, M., etc), indicating probability of existence of numerous distinct species morphologically very similar to each other, but molecular/genetically recognized.

ECHINOGAMMARUS VENERIS (Heller, 1865) (sensu auct.)

Gammarus veneris Heller, 1865: 981;

Echinogammarus veneris Stock, 1968: 33, figs. 7–10; G. Karaman, 1969: 62, figs. 13–23; Pinkster, 1993: 118, fig. 51;

?Gammarus beieri S. Karaman, 1930: 283, fig. 1 (loc. typ.: Kaligoni-Levkas, Greece) (numerous synonyms omitted).

MATERIAL EXAMINED:

CROATIA

OR-246= Spring of Ljuta Konavoska, Gruda, Konavle, 17. 1. 2015, 4 exp. mixed with *Niphargus* sp. (leg. R. Ozimec);

OR-248= ibid, 15. 1. 2015, 2 exp. mixed with *Niphargus* sp. (leg. R. Ozimec);

OR-249= Spring in Orašac, Dubrovnik region, 17. 1. 2015, 8 exp. (leg. R. Ozimec).

REMARKS

Echinogammarus veneris was described from spring Venus near Paphos, Cyprus island by Heller (1865) and later cited by numerous authors from numer-

ous localities in the Mediterranean region and Balkan peninsula under the same or different names [S. Karaman, 1930; Stock, 1968; G. Karaman, 1969 F: 62, fig. 13–23; Pinkster, 1993).

This species is morphologically very variable, and often the variability of taxonomic characters within specimens of one locality is higher than the differences between distinct species. By this way, probably under the name *Echinogammarus veneris* sensu auct. exist several distinct species, morphologically hardly to distinct, but based on genetic/molecular studies probably well distinguishable. The further studies will help to resolve this problem.

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REFERENCES

[1] HELLER, C. 1865. Kleine Beiträge zur Kenntnis der Süsswasser-Amphipoden. – Verhandlungen der Kaiserlich-koniglichen zoologisch-botanischen Gesellschaft in Wien, 15: 979–984, pl. 17.

[2] KARAMAN, G. 1969. XXVII. Beitrag zur Kenntnis der Amphipoden. Arten der Genera *Echinogammarus* Stebb. und *Chaetogammarus* Mart. an der jugoslawischer Adriaküste. – Glasnik Republičkog zavoda za zaštitu prirode i Prirodnjačke zbirke u Titogradu, 2: 59–84.

[3] 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.

[4] KARAMAN, G. & PINKSTER, S. 1977 a. Freshwater *Gammarus* species from Europe, North Africa and adjacent regions of Asia (Crustacea – Amphipoda). Part. I. *Gammarus pulex*-group and related species. – Bijdragen tot de Dierkunde, Amsterdam, 47 (1): 1–97.

[5] KARAMAN, G. & PINKSTER, S. 1977 b. Freshwater *Gammarus* species from Europe, North Africa and adjacent regions of Asia (Crustacea-Amphipoda). Part. II. *Gammarus roeseli*-group and related species. – Bijdragen tot de Dierkunde, Amsterdam 47 (2): 165–196.

[6] KARAMAN, G. & PINKSTER, S. 1987. Freshwater Gammarus species from Europe, North Africa and adjacent regions of Asia (Crustacea-Amphipoda). Part. III. *Gammarus balcanicus*-group and related species. – Bijdragen tot de Dierkunde, Amsterdam, 57 (2): 207–260.

[7] KARAMAN, G. 1993. Crustacea Amphipoda di acqua dolce. – Fauna d`Italia, vol. XXXI: 1–337, Edizione Calderini Bologna, Italia.

[8] KARAMAN, G. 2003. On some interesting Amphipoda (Crustacea) from Albania and Bjelasica (Crna Gora) (Contribution to the Knowledge of the Amphipoda **243**). – Biodiversity of Biogradska Gora National park, Monographs **1**: 53–64, Podgorica.]
[9] KARAMAN, G. 2012. Further investigations of the subterranean genus *Niphargus* Schiödte, 1849 (fam. Niphargidae) in Serbia. (Contribution to the Knowledge of the Amphipoda 264). – Agriculture and Forestry, Podgorica, 58 (2): 45–64.
[10] KARAMAN, G. 2014 a. New member of the family Niphargidae from Croatia, *Niphargus radzai*, sp. n. (Contribution to the Knowledge of the Amphipoda **273**). – Zootaxa, 3811 (4): 585–598.
[11] KARAMAN, G. 2014 b. New data on *Niphargus boskovici* S. Karaman, 1952 and some other Gammaridean amphipods from western Balkan (Contribution to the Knowledge of the Amphipoda **279**). – Biologia Serbica 36 (1–2): 39–54.
[12] KARAMAN, S. 1929. II. Beitrag zur Kenntnis der Amphipoden Jugoslaviens. – Glasnik Zemaljskog muzeja u Bosni i Hercegovini, Sarajevo, 41 (1): 83–100, figs. 1–9.
[13] KARAMAN, S. 1930. Crustacea Amphipoda, in: Beier, M.: Zoologische Forschungsreise nach den Jonischen Inseln und dem Peloponnes, XI. Teil. – Sitzungsberichte der Akademie der Wissenschaften in Wien, Mathem.-naturw. Klasse, Abt. 1, 139 (3–4): Bd. 139, math. naturw. Klasse 1930, 283–290, figs. 1–2.
[14] KARAMAN, S. 1931 a. III. Beitrag zur Kenntnis der Amphipoden Jugoslaviens, sowie einiger Arten aus Griechenland. – Prirodoslovne Razprave, Ljubljana, 1: 31–66, figs. 1–11, 1 pl.
[15] KARAMAN, S. 1931 b. 4. Beitrag zur Kenntnis der Süsswasser-Amphipoden. – Glasnik Skopskog Naučnog Društva, Odelenje Prirodnih Nauka, Skoplje, 9 (3): 93–107, figs. 1–6.
[16] KARAMAN S. 1952. Prilozi poznavanju nifarga Hercegovine i južne Dalmacije [Beiträge zur Kenntnis der *Niphargus*-Arten der Hercegowina und Suddalmatiens]. – Prirodoslovna istraživanja, Odjel za prirodne I medicinske nauke, Jugoslavenska Akademija znanosti i umjetnosti Zagreb. 25: 45–55.
[17] MARTYNOV, A. 1931. Zur Kenntnis der Amphipoden der Krim. – Zoologische Jahrbücher, Abteilung für Systematik, Ökologie und Geographie der Tiere, 60 (5–6): 573–606, 44 figs.
[18] PINKSTER, S. 1993. A revision of the genus *Echinogammarus* Stebbing, 1899 with some notes on related genera (Crustacea, Amphipoda). – Memorie Museo civico di Storia Naturale (II. serie), sezione Scienze della vita (A. Biologia), 10: 1–185.
[19] SCHÄFERNA, K. 1922. Amphipoda balcanica, with notes about other freshwater Amphipoda. – Vestnik Královské. české Spolecnosti nauk, trida matematičko-prirodovedecká, Praha, 1921–1922, 2: 1–111, 31 figs., 2 pls.
[20] STOCK, J. H. 1968. A revision of the European species of the *Echinogammarus pungens*-group (Crustacea, Amphipoda). – Beaufortia, saer. of Miscellaneous public. – Zoologisch Museum, Universiteit van Amsterdam, 16 (211): 13–78, 35 figs.
[21] ŠVARA, V., DELIĆ, T. RAĐA, T. & FIŠER, C. 2015. Molecular phylogeny of *Niphargus boskovici* (Crustacea: Amphipoda) reveals a new species from epikarst. – Zootaxa 3994 (3): 354–376.
[22] ZGANEC, K., GOTTSTEIN, S. & DJURIĊ, P. 2010. Distribution of native and alien gammarids (Crustacea: Amphipoda) along the course of the Una river. – Natura Croatica, Zagreb, 19 (1): 141–148.

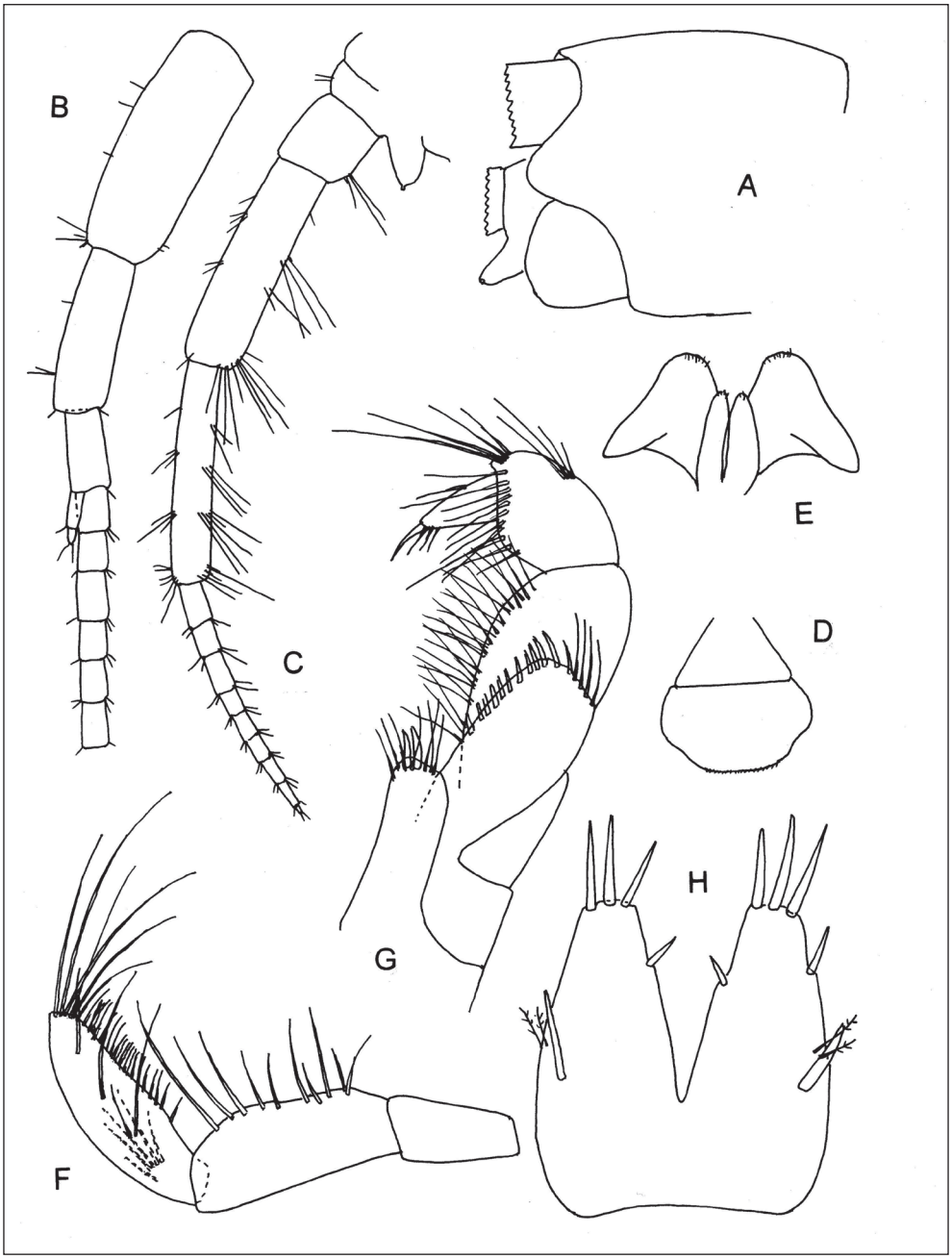

Fig. 1. *Niphargus zagorae sterilis*, ssp. n., Tičarica Cave, Croatia, male 10.2 mm: A= head; B= antenna 1 (distal part cutted); C= antenna 2; D= labrum; E= labium; F= mandible palpus, inner face; G= maxilliped; H= telson.

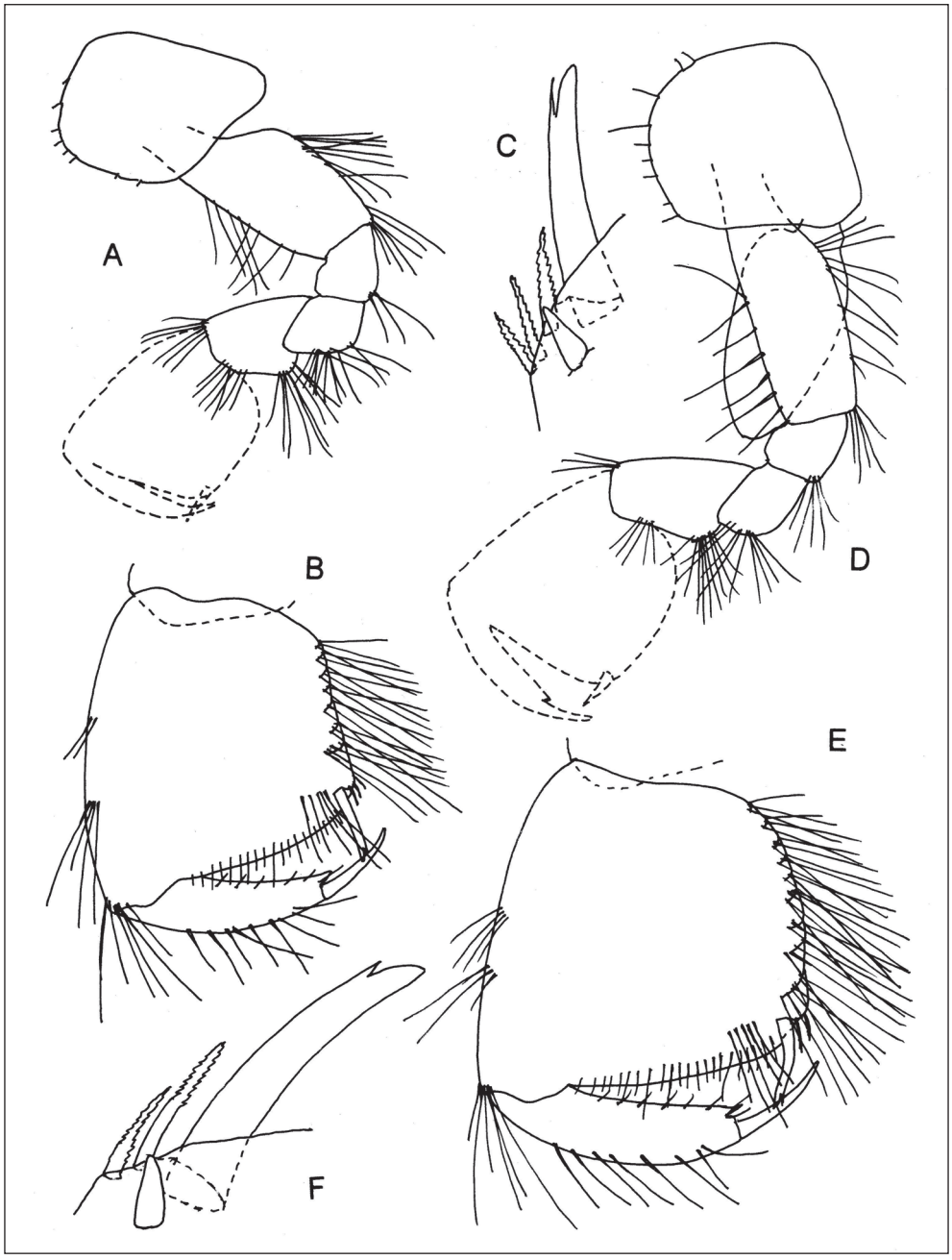

Fig. 2. *Niphargus zagorae sterilis*, ssp. n., Tičarica Cave, Croatia, male 10.2 mm: A-B= gnathopod 1, outer face; C= distal corner of gnathopod 1 propodus, inner face; D-E= gnathopods 2, outer face; F= distal corner of gnathopod 2 propodus, inner face.

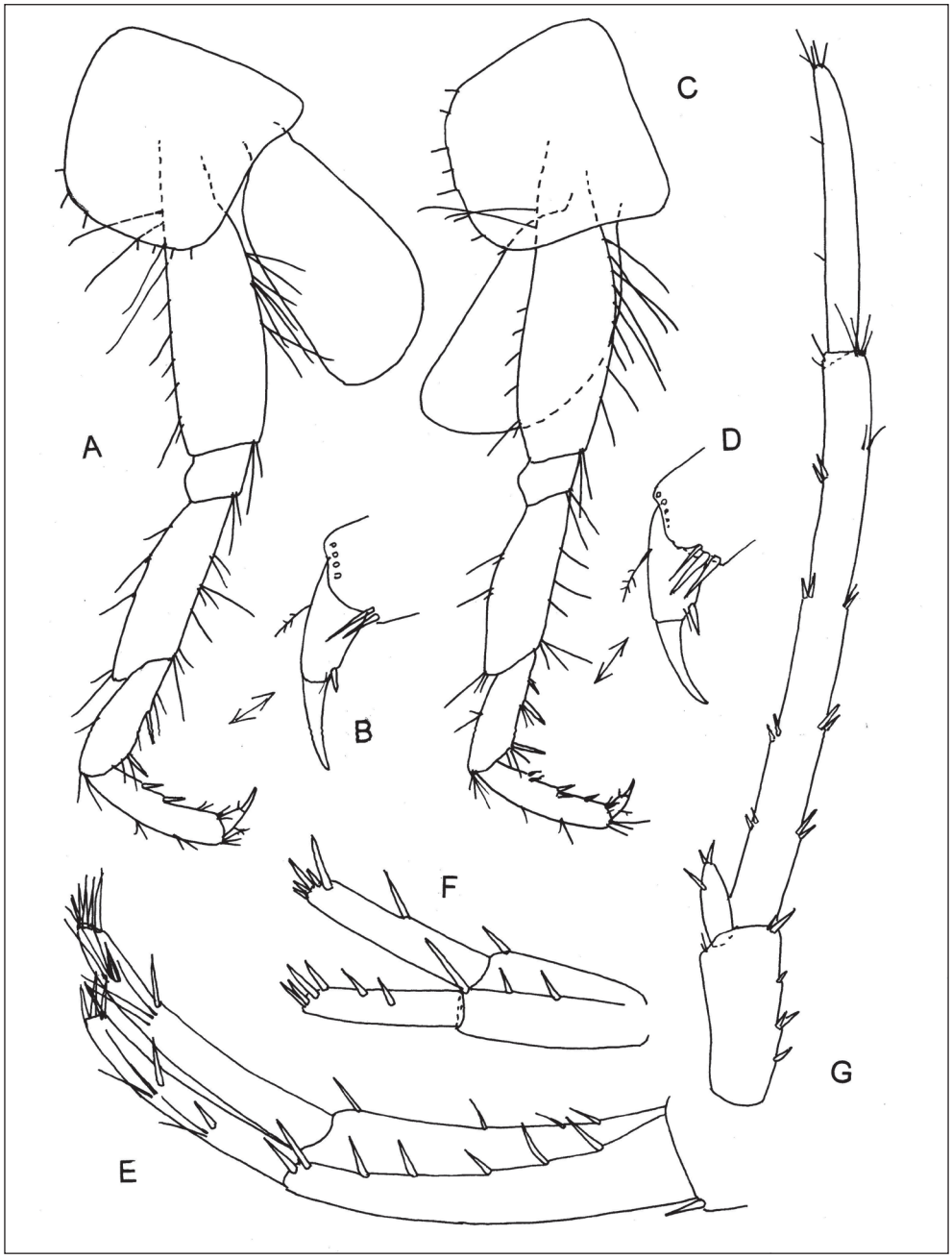

Fig. 3. *Niphargus zagorae sterilis*, ssp. n., Tičarica Cave, Croatia, male 10.2 mm: A-B= pereopod 3; C-D= pereopod 4; E= uropod 1; F= uropod 2; G= uropod 3.

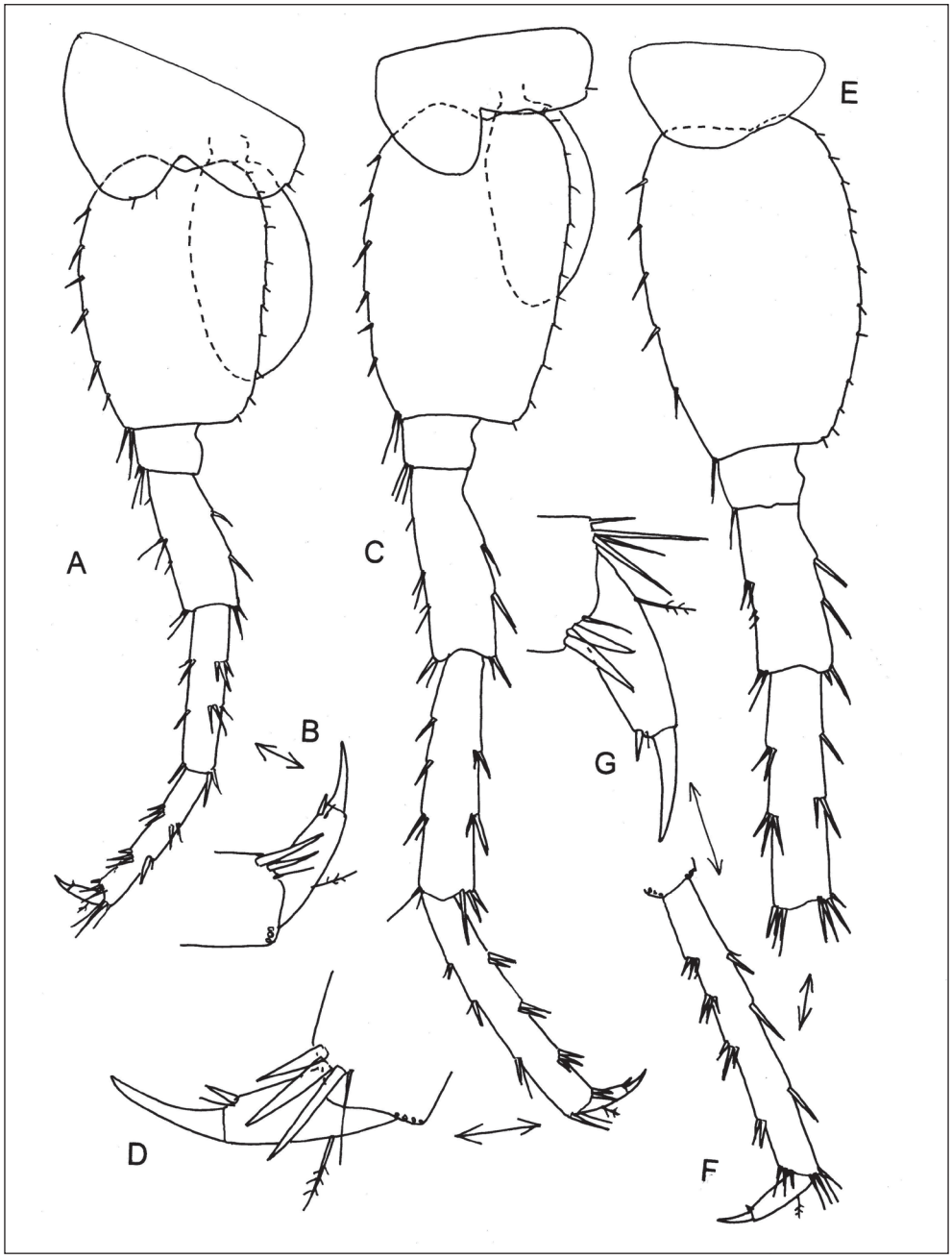

Fig. 4. *Niphargus zagorae* sterilis, ssp. n., Tičarica Cave, Croatia, male 10.2 mm: A-B= pereopod 5; C-D= pereopod 6; E-G= pereopod 7.

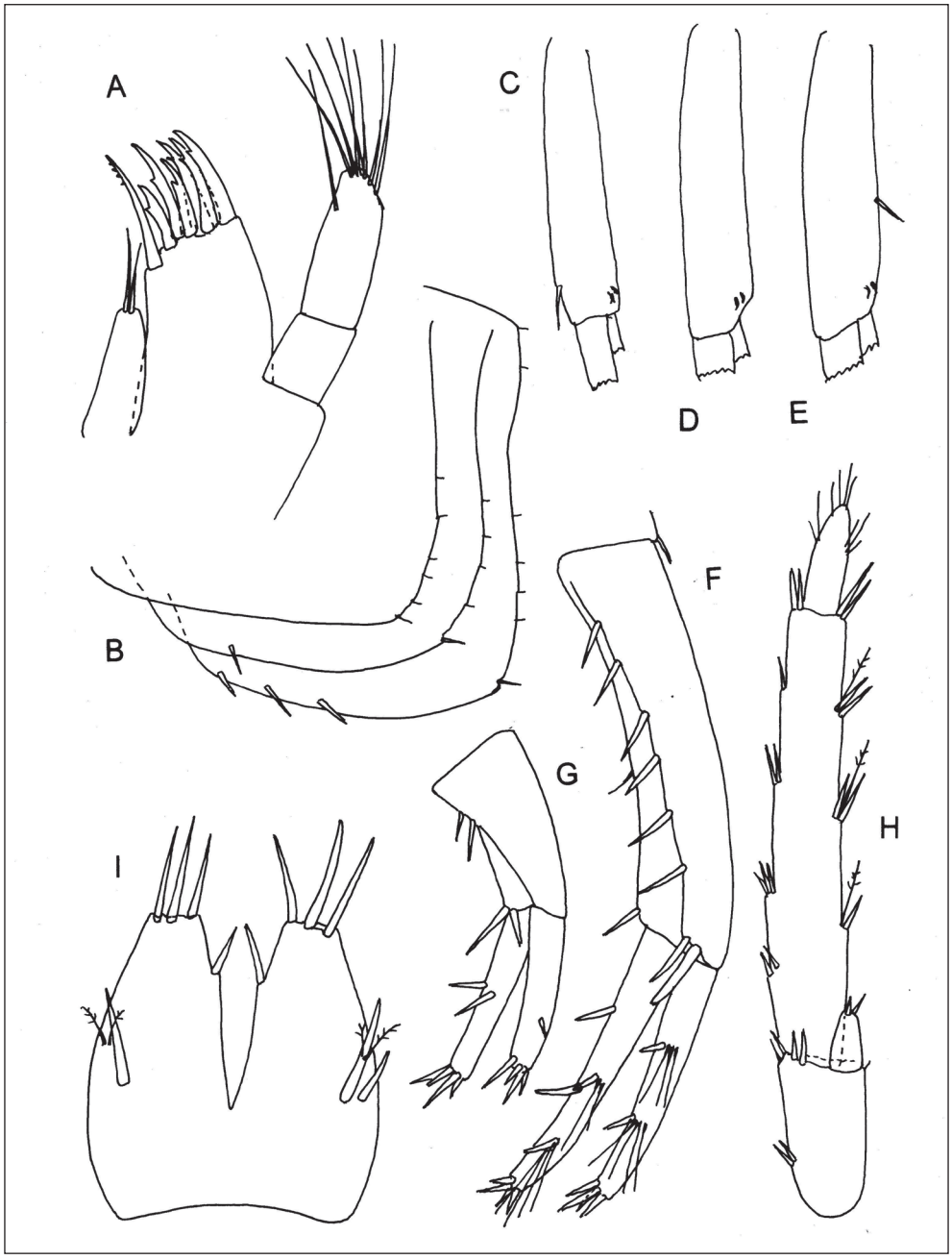

Fig. 5. *Niphargus sterilis*, ssp. n., Tičarica Cave, Croatia, male 10.2 mm: A= maxilla 1; B= epimeral plates 1–3; C-E= peduncle of pleopods 1–3.
FEMALE, 10.0 mm: F= uropod 1; G= uropod 2; H= uropod 3; I= telson.

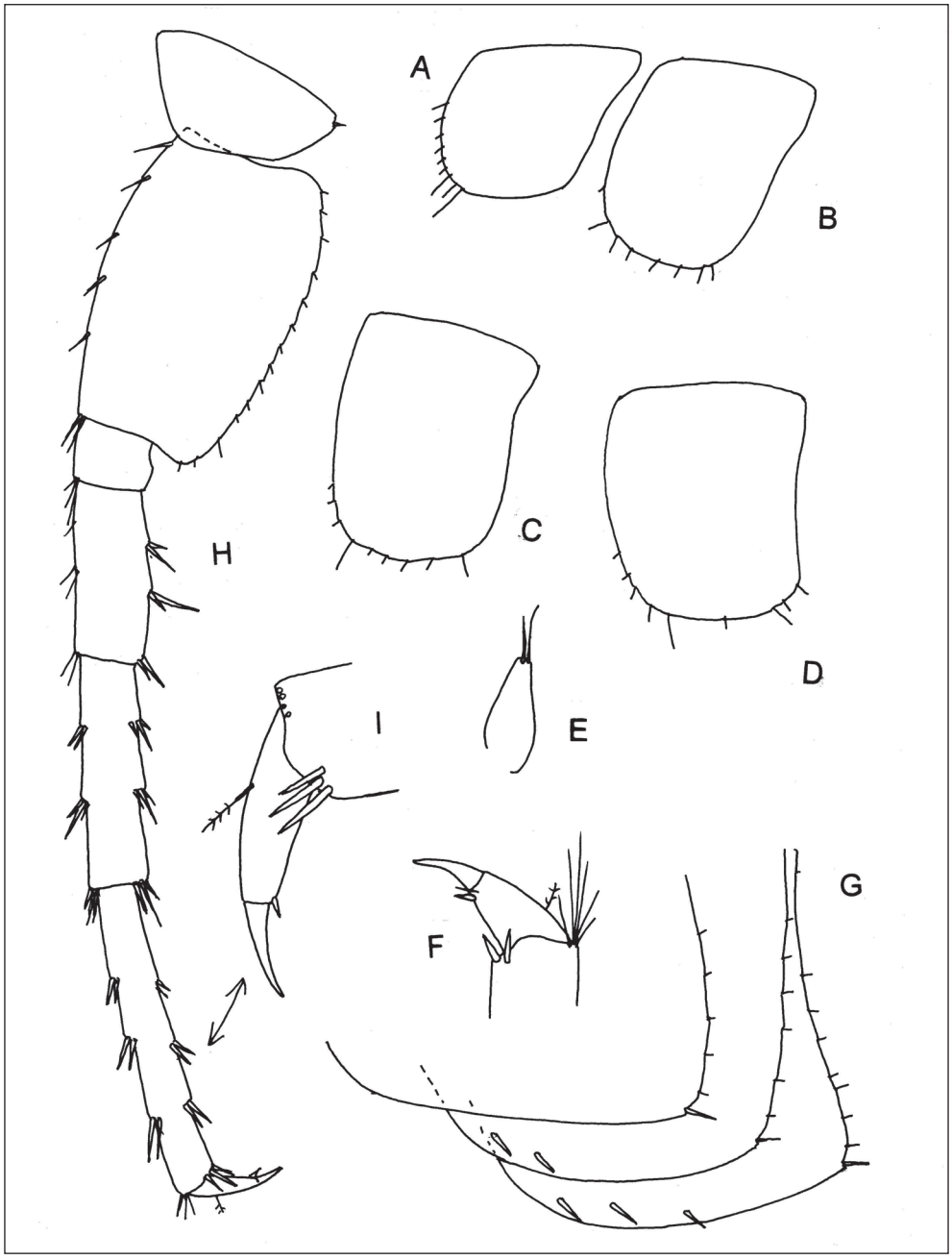

Fig. 6. *Niphargus sterilis*, ssp. n., Tičarica Cave, Croatia, female 10.0 mm: A= coxa 1; B= coxa 2; C= coxa 3; D= coxa 4; E= inner plate of maxilla 1; F= pereopod 3 dactylus; G= epimeral plates 1–3; H-I= pereopod 7.