Interdisciplinary Pathways to Sustainability

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Agriculture, Environment, and Rural Development

Edited by

Monika Stojanova, Gordan Karaman, Dragutin A. Djukic and Leka Mandic

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All papers included in this special edition were originally presented at the 7th International Conference on Modern Trends in Agricultural Production, Rural Development, and Environmental Protection (June 19–20, 2025, Vrnjačka Banja, Serbia), organized by the Balkan Scientific Center of the Russian Academy of Natural Sciences, Belgrade, Serbia. The initial versions of these papers were published in the official Conference Proceedings.

For this edition, all contributions have been substantially revised and expanded, and each manuscript underwent a double-blind peer review process conducted by independent experts. The editorial team, composed of scholars from Serbia, Montenegro, and North Macedonia, selected the papers based on scientific quality, originality, and relevance.

This publication adheres to ethical guidelines: none of the papers have been published elsewhere in the same form, all authors have confirmed the originality of their work, and they have declared no conflicts of interest.

The inclusion of revised versions in this publication has been approved by the Editor and Publisher, in accordance with ethical and copyright standards.

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Sustainable agriculture is the key to feeding the world without destroying it.

~ Wangari Maathai

PREFACE

It is with great honor and enthusiasm that we present this special selection of scientific papers from the *7th International Conference on Modern Trends in Agricultural Production, Rural Development, and Environmental Protection*, held under the title *Interdisciplinary Pathways to Sustainability: Agriculture, Environment, and Rural Development*. The conference took place on June 19–20, 2025, in Vrnjačka Banja, Serbia, and was organized by the Balkan Scientific Center of the Russian Academy of Natural Sciences, Belgrade, Serbia.

Over the years, this conference has evolved into a vital forum for scholars, practitioners, and decision-makers committed to tackling some of the most pressing and complex challenges of our time – challenges closely tied to the future of agriculture, rural communities, and environmental sustainability.

This special edition features a curated selection of the highest-quality papers that were originally presented at the conference and published in the official *Conference Proceedings*. The included contributions were selected by the editors of this volume – academics from Serbia, Montenegro, and North Macedonia – based on their scientific merit, originality, and relevance. Each paper has been substantially revised, extended, and subjected to double-blind peer review, ensuring compliance with the highest academic and ethical standards.

Our aim in preparing this special edition is twofold: to promote the latest interdisciplinary research in the domains of agriculture, environmental protection, and rural development, and to enhance international visibility through publication by a prestigious London-based academic publisher, Cambridge Scholars Publishing. We are confident that the knowledge and insights presented in this volume will contribute meaningfully to both scientific advancement and practical applications in pursuit of sustainable development.

Agriculture remains a cornerstone of human civilization, supplying food, fiber, and livelihoods to billions. Yet, the sector stands at a crossroads. The growing global population, shifting dietary preferences, and accelerating

urbanization are increasing demand for food production. Simultaneously, agriculture faces unprecedented challenges – climate change, soil degradation, water scarcity, biodiversity loss, and socioeconomic disparities in rural areas. The urgency for sustainable, resilient, and inclusive agricultural systems has never been greater.

This conference – and the resulting collection of research papers – responds to that urgency by fostering interdisciplinary dialogue and collaboration. The topics explored in this volume span a wide range of themes, including innovations in crop and livestock production, the application of emerging technologies such as digitalization and nanotechnology, sustainable resource management, and the socio-economic dimensions of rural development. Together, these contributions offer a comprehensive view of the multifaceted nature of sustainable agriculture and rural livelihoods in the 21st century.

A defining feature of this volume is its commitment to bridging theory and practice. The included studies do not merely advance scientific knowledge; they also offer practical solutions to real-world problems encountered by farmers, rural communities, and policy-makers. For instance, research on digital agriculture demonstrates how precision farming tools and data analytics can optimize input use and increase productivity while minimizing environmental impact. Likewise, investigations into nanotechnology reveal how novel materials and techniques can enhance crop protection and soil health – achievements that were scarcely imaginable a decade ago.

Moreover, the volume underscores the central role of rural development in achieving sustainable agriculture. Rural regions, home to a significant portion of the global population, are stewards of vital natural resources. Strengthening rural economies, improving infrastructure, and expanding access to social services are key to ensuring that agricultural advancement leads to better livelihoods and reduced poverty. The papers on rural policy, community engagement, and socio-economic innovation offer valuable perspectives on how inclusive development can be pursued.

Environmental protection forms another cornerstone of both the conference and this collection. Since agriculture both depends on and impacts the environment, sustainability must be grounded in a balance between productivity and conservation. The contributions herein discuss strategies for mitigating greenhouse gas emissions, preserving biodiversity, managing water resources effectively, and adapting to climate variability. These

efforts are essential not only for the future of agriculture, but also for the resilience of global ecosystems.

The volume also benefits greatly from the diversity of its contributors, who represent various countries and regions. Their unique experiences and insights enrich the academic discourse and foster cross-cultural learning. This diversity is essential for developing context-specific solutions that respect local ecological, economic, and social realities while contributing to global sustainability goals.

The preparation of this special edition involved a rigorous and collaborative editorial process. Each manuscript was carefully reviewed by subject-matter experts to ensure scientific soundness, relevance, and clarity. Authors revised their papers based on reviewer feedback, resulting in a polished and coherent body of work that meets the high editorial standards of Cambridge Scholars Publishing.

We extend our sincere gratitude to all the authors whose original and dedicated research made this volume possible. We are equally thankful to the peer reviewers for their thoughtful assessments and constructive suggestions, which significantly enhanced the quality of the final papers. Special appreciation goes to the conference's organizing committee for their tireless efforts in facilitating this important platform for knowledge exchange. Lastly, we acknowledge Cambridge Scholars Publishing for their support, professionalism, and commitment to academic excellence.

This volume is more than a collection of scientific papers – it is a dynamic platform for knowledge exchange, innovation, and future collaboration. We hope it will serve as an enduring source of inspiration and a valuable resource for researchers, practitioners, and policy-makers working toward sustainable agricultural and rural development. In an era where global challenges are increasingly interconnected and complex, interdisciplinary and inclusive efforts such as this are indispensable for building a resilient, equitable, and sustainable future.

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Acad. Prof. Dr. Dragutin A. Djukic
Prof. Dr. Leka Mandi

NEW DATA OF NIPHARGUS SMEDEREVANUS S. KARAMAN, 1950 (FAM. NIPHARGIDAE) WITH REMARKS ON ENDEMIC NIPHARGUS SPECIES OF SERBIA (CONTRIBUTION TO THE KNOWLEDGE OF THE AMPHIPODA 343)

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Abstract: *The fauna of Amphipoda in Serbia is rich due to its specific geological history, geographical position, suitable climate, and the presence of numerous rivers, springs, caves, and subterranean waters. This fauna includes nearly 51 known epigean and subterranean species and subspecies.*

The epigean (surface-dwelling) amphipod fauna comprises 4 families (Corophiidae, Gammaridae, Pontogammaridae, Talitridae) with nearly 18 species, but only a small number of endemic species.

The subterranean amphipod fauna in Serbia, although consisting of only 3 families (Bogidiellidae Hertzog, 1936; Crangonyctidae Bousfield, 1973; Niphargidae G. Karaman, 1962 [sensu Bousfield, 1977: 303; 1982: 267]), is represented by nearly twice as many species and subspecies—around 33 in total.

The continuous discovery of new taxa of subterranean amphipods necessitates the description of increasingly detailed morphological features, both for new and previously known species, in order to better understand their taxonomic relationships.

For this reason, the subterranean endemic species of the family Niphargidae, Niphargus smederevanus S. Karaman, 1950a, is redescribed and illustrated based on male and female specimens from the type locality—

a fountain spring near Smederevo, Serbia—and its taxonomic relationship to other similar taxa of the genus Niphargus Schiødte, 1849 is discussed.

The locus typicus of this species no longer exists due to urban expansion, but the species is likely still present in other subterranean waters near the town.

Keywords: *taxonomy, Amphipoda, Senticaudata, Niphargus smederevanus, subterranean, Serbia, endemic.*

Introduction

The freshwater epigean and subterranean fauna of Amphipoda in Serbia is rich, because of its geographical position, geological history and climate, existing of many caves, springs and water streams belonging mainly to the Black Sea drainage system. This fauna is consisting of nearly 7 families, 11 genera and 51 species and subspecies, more or less well described based on males and females or by one of them, when one sex was collected or known only.

Among them, 4 families are epigean (Corophiidae, Gammaridae, Pontogammaridae, Talitridae) with nearly 18 species.

The subterranean fauna in Serbia is consisting of 3 families: Bogidiellidae, Crangonyctidae and y Niphargidae, with nearly 33 species and subspecies, i.e. almost twice more than number of epigean species.

The most numerous species belong to the family Niphargidae is genus *Niphargus* (with subgenera) with 29 known species and subspecies. Among them, 14 species have distribution also in adjacent regions out of Serbia: *Niphargus* (*Jovaniphargus*) *bajuvaricus* Schellenberg, 1932, *Niphargus biljanae* G. Karaman, 1998, *Niphargus* (*Niphargopsis*) *casparyi* (Pratz, 1866), *Niphargus hrabei* S. Karaman, 1932, *Niphargus illidzensis* Schäferna, 1922, *Niphargus minor* Sket, 1956, *Niphargus (Jovaniphargus) multipennatus* Sket, 1956, *Niphargus pannonicus* S. Karaman, 1950b, *Niphargus (Karamaniella) parapupetta* G. Karaman, 1984; *Niphargus pecarensis* S. Karaman & G. Karaman, 1959, *Niphargus petrosani* Dobreanu & Manolache, 1933, *Niphargus remus* G. Karaman, 1992, *Niphargus* (*Jovaniphargus*) *serbicus* S. Karaman, 1960, *Niphargus* (*Phaenogammarus*) *valachicus* Dobreanu & Manolache, 1933.

The present number of endemic *Niphargus* species and subspecies from Serbia is 15, nearly as high as non- endemic.

Niphargus adbiptus G. Karaman, 1973b
Niphargus bogdani G. Karaman, 2009
Niphargus bozanae G. Karaman, 2009
Niphargus deelemanae deelemanae G. Karaman, 1973a
Niphargus *deelemanae grex* G. Karaman 2013
Niphargus deelemanae latellai G. Karaman 2021
Niphargus euserbicus G. Karaman, 2012b
Niphargus ivokaramani G. Karaman, 1994
Niphargus jugoslavicus G. Karaman, 1982
Niphargus kragujevensis S. Karaman, 1950c
Niphargus luka G. Karaman, 2012a
Niphargus mirocensis Petković et al., 2015
Niphargus ravanicanus S. Karaman, 1943
Niphargus remyi S. Karaman, 1934
Niphargus smederevanus S. Karaman, 1950a

The recent taxonomic investigations requires a description and figures with an increasing number of morphological details, usually not mentioned in older descriptions of the taxa. In parallel with discovery and description of the numerous new taxa, more and more morphological characters of each species must be described and figured, necessary to recognize this species.

Niphargus smederevanus was described by my father Stanko Karaman from Smederevo where he was during the Second Word War. We redescribed *Niphargus smederevanus*, including previously not figured females, because in meantime various other similar new *Niphargus* species are described.

Materials and Methods

The collected *Niphargus* material was preserved in 70% ethanol. Specimens were dissected using a WILD M20 microscope and drawn using camera lucida attachment. All appendages were submersed in a mixture of glycerin and water (50:50) for study and drawing. Later, all appendages were transferred permanently on slides into Liquid of Faure and covered by glass. All illustrations were inked manually. Letters were used to indicate taxonomically important spines and setae. Terminology used for major spines and setae on propodus of gnathopods 1-2 and mandibular palpus, is sensu Karaman, G. (1969; 1993; 2012b).

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

In References are mentioned the presence and number of figures in various papers, what is very important and helpful in taxonomical determination of this species.

Taxonomic Part

Order AMPHIPODA Latreille, 1816

Suborder SENTICAUDATA Lowry & Myers, 2013

Family NIPHARGIDAE G. Karaman, 1962 (sensu Bousfield, 1977: 303; 1982: 267)

Genus *NIPHARGUS* Schiödte, 1849

NIPHARGUS SMEDEREVANUS S. Karaman, 1950a

Figures 1-8

Niphargus smederevanus S. Karaman, 1950a: 1, figs. 1-14; G. Karaman, 1972: 6; G. Karaman, 1974b: 25; G. Karaman, 1983: 70; Barnard, J.L. & Barnard, C.M., 1983::695; G. Karaman & Ruffo, 1986: 531; G. Karaman, 1995: 324; G. Karaman, 1999: 168; G. Karaman, 2011b: 151; Petkovič, M. et al., 2020: 438; Petković, M., 2023: 70.

LOCUS TYPICUS: fountain –spring in Smederevo, Serbia.

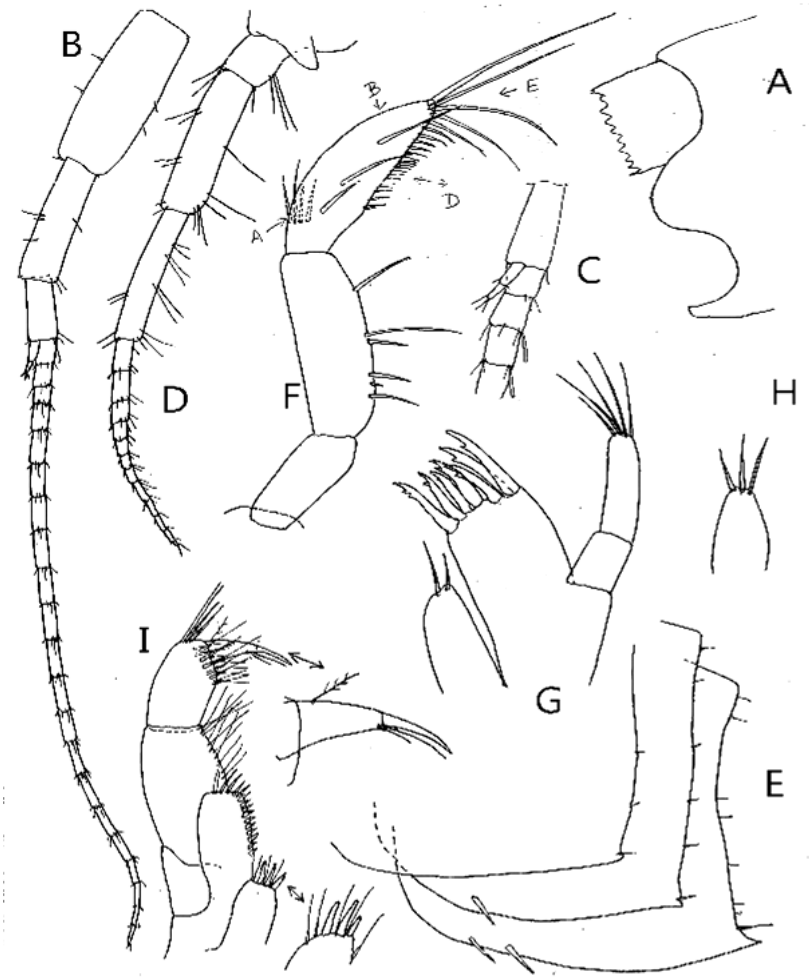

Figure 1. *Niphargus smederevanus* S. Karaman, 1950, Smederevo, male 9.5 mm: A= head; B= antenna 1; C- accessory flagellum; D= antenna 2; E= epimeral plates 1-3; F= mandible palpus, inner face [B= facial B-setae; D= marginal D-setae; E= distal E-setae; F= facial A-setae on outer face; G= left maxilla 1; H= inner plate of right maxilla 1; I= maxilliped.

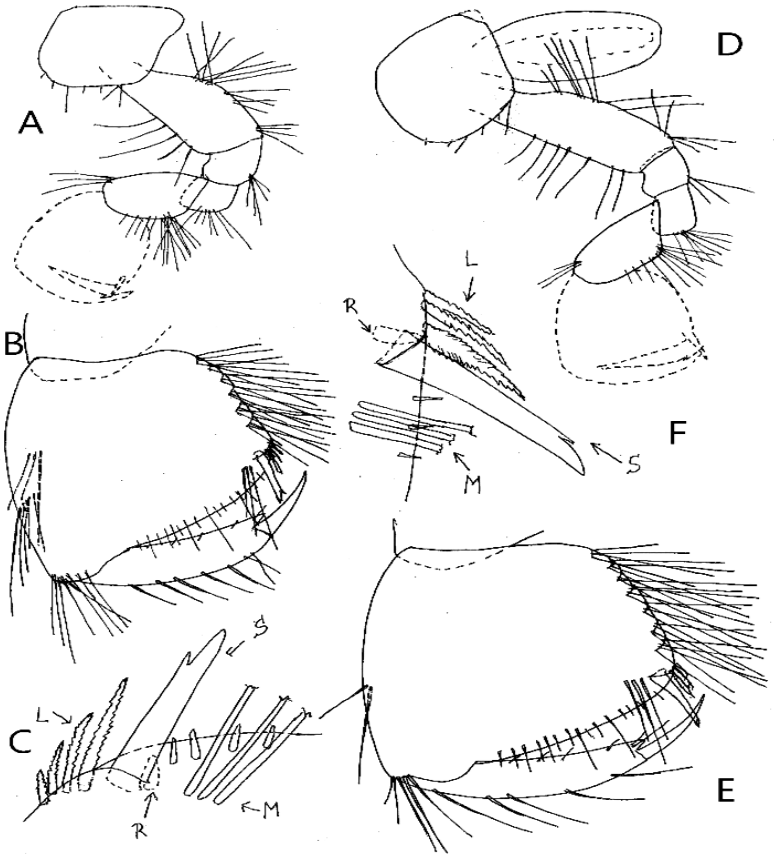

Figure 2. *Niphargus smederevanus* S. Karaman, 1950, Smederevo, male 9.5 mm. A-B= gnathopod 1, outer face; C= distal corner of gnathopod 1-propodus, outer face (S= corner S-spine; L= lateral L-spines; M= corner facial M-setae; R= subcorner R-spine, inner face); D-E= gnathopod 2, outer face; F= distal corner of gnathopod 2-propodus, outer face (S= corner S-spine; L= lateral L-spnes; M= corner facial M-setae; R= ubcorner -spine, inner face).

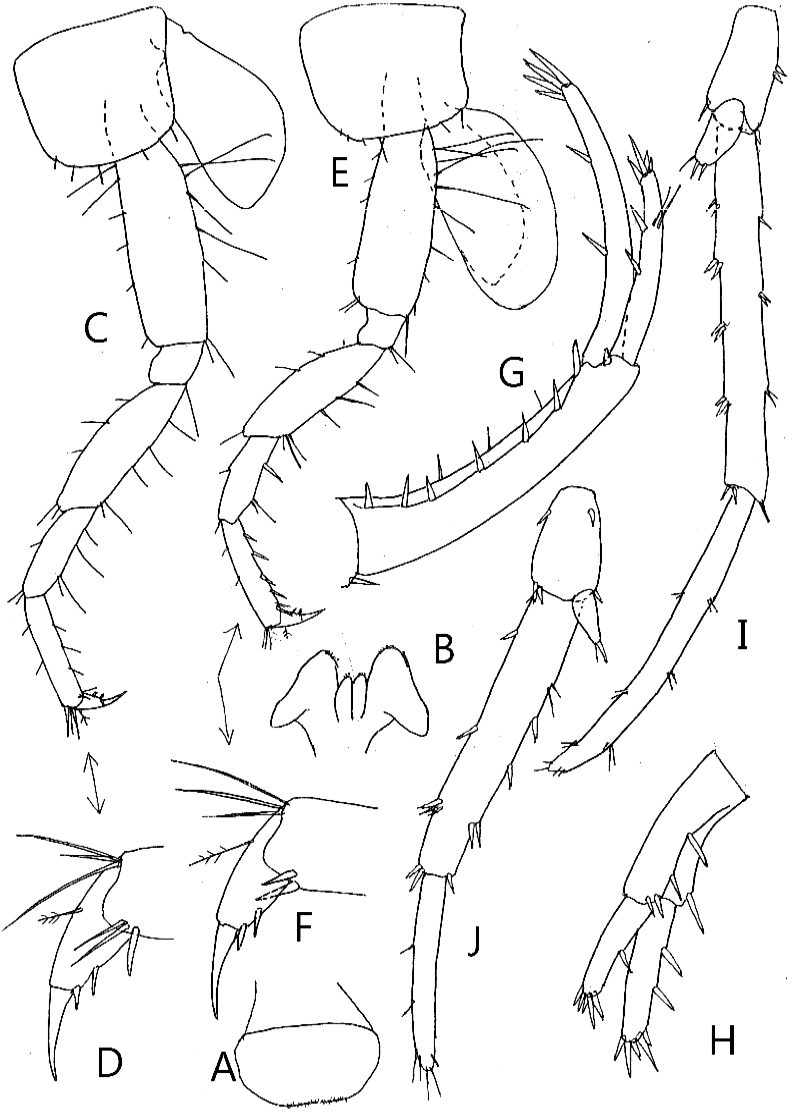

Figure 3.*Niphargussmederevanus* S. Karaman, 1950, Smederevo, male 9.5 mm: A= labrum; B= labium; C-D= pereopod 3; E-F= pereopod 4; G= uropod 1; H= uropod 2; I= uropod 3

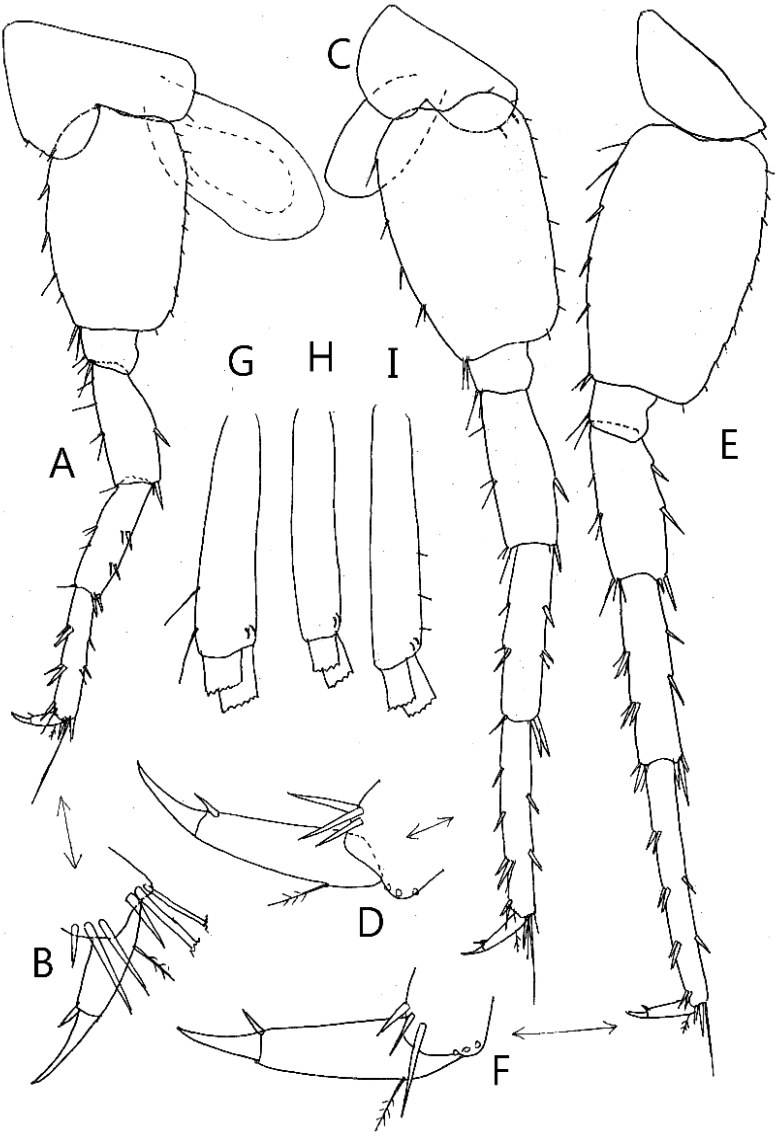

Figure 4.*Nipharguss mederevanus* S. Karaman, 1950, Smederevo, male 9.5 mm: A-B= pereopod 5; C-D= pereopod 6; E-F= pereopod 7; G= pleopod 1-peduncle; H= pleopod 2-peduncle; I= pleopod 3-peduncle

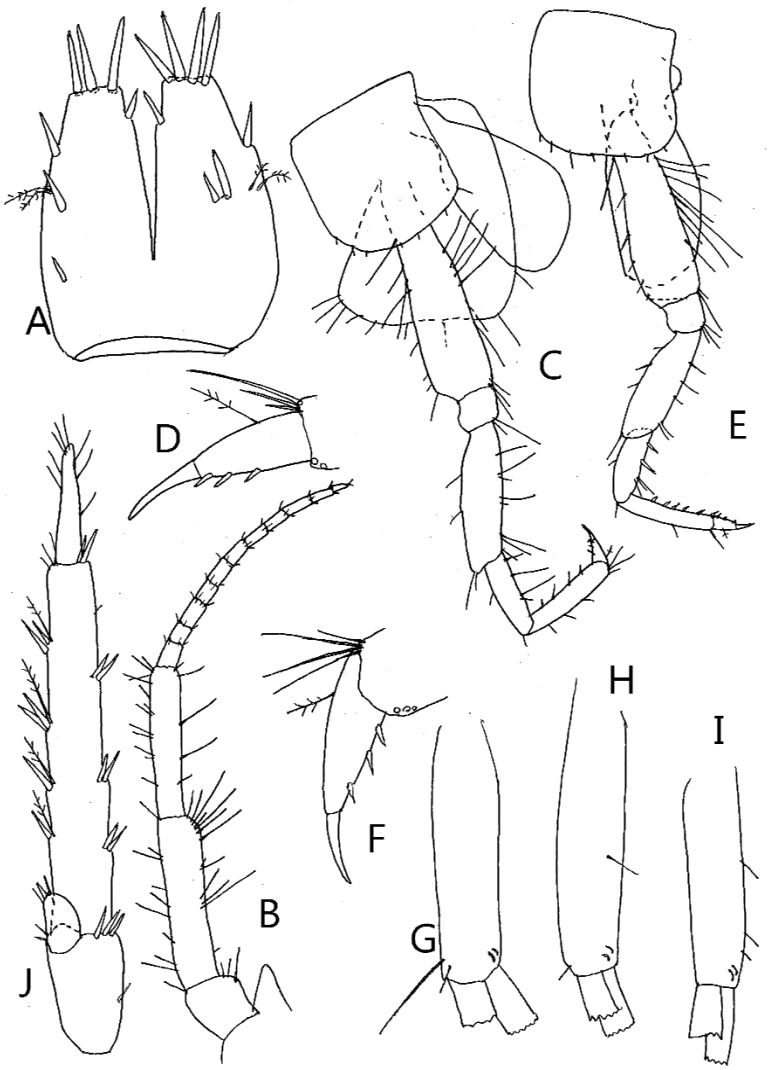

Figure 5.*Niphargussmederevanus* S. Karaman, 1950, Smederevo, male 9.5 mm: A= telson. **Female 7.5 mm**: B= antenna 2; C–D= pereopod 3; E–F= pereopod 4; G= pleopod 1-peduncle; H= pleopod 2-peduncle; I= pleopod 3-peduncle; J= uropod 3.

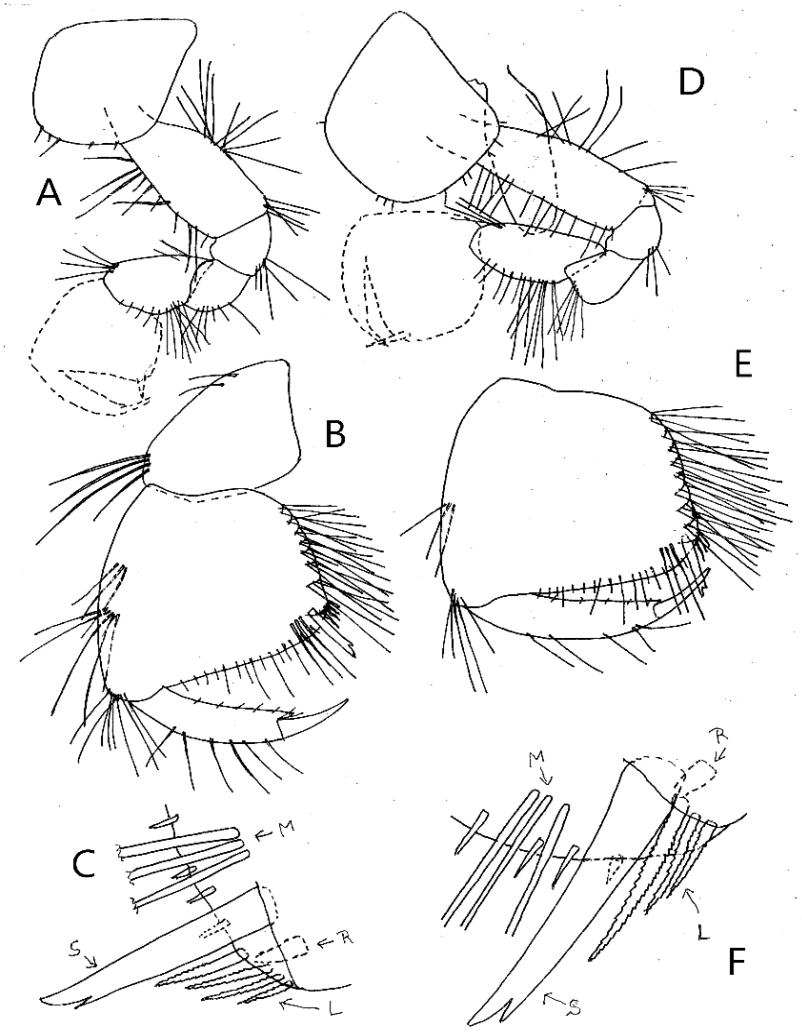

Figure 6.*Nipharguss mederevanus* S. Karaman, 1950, Smederevo, female 7.5 mm: A–B= gnathopod 1, outer face; C= distal corner of gnathopod 1-propodus, outer face (S= corner S-spine; L= lateral L-spines; M= corner facial M-setae; R= subcorner R-spine, inner face); D–E= gnathopod 2, outer face; F= distal corner of gnathopod 2-propodus, outer face (S= corner S-spine; L= lateral L-spines; M= corner facial M-setae; R= subcorner R-spine, inner face)

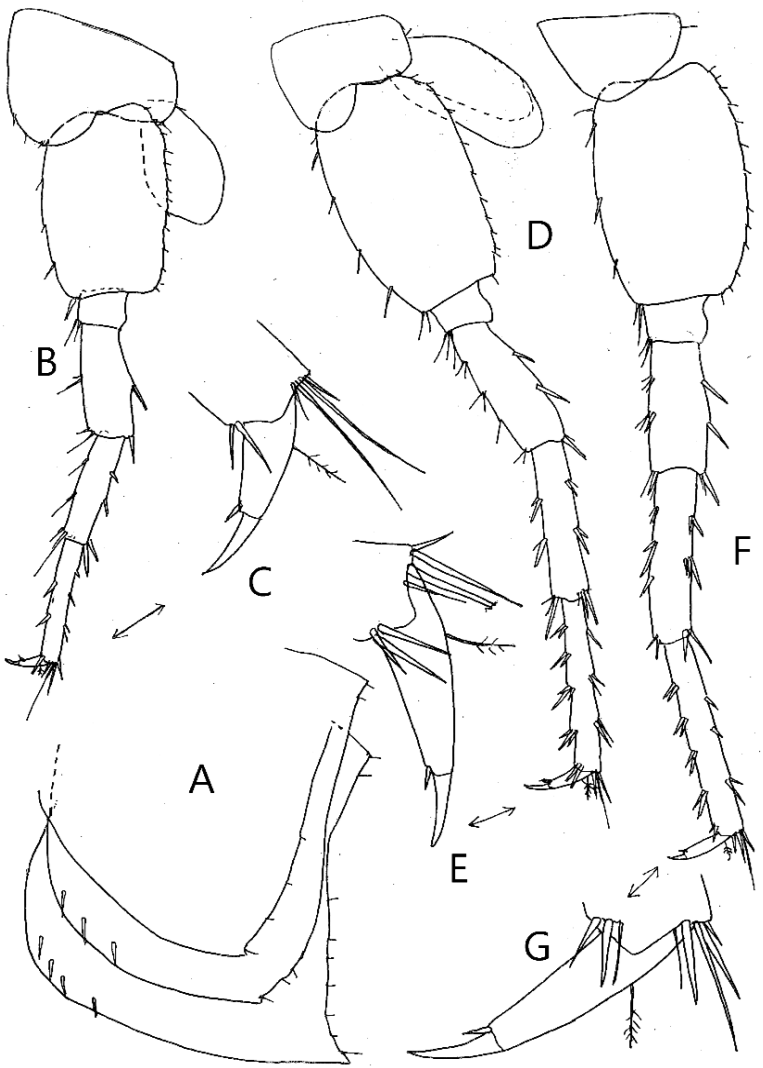

Figure 7.*Niphargussmederevanus* S. Karaman, 1950, Smederevo, female 7.5 mm: A= epimeral plates 1-3; B–C= pereopod 5; D–E= pereopod 6; F–G= pereopod 7.

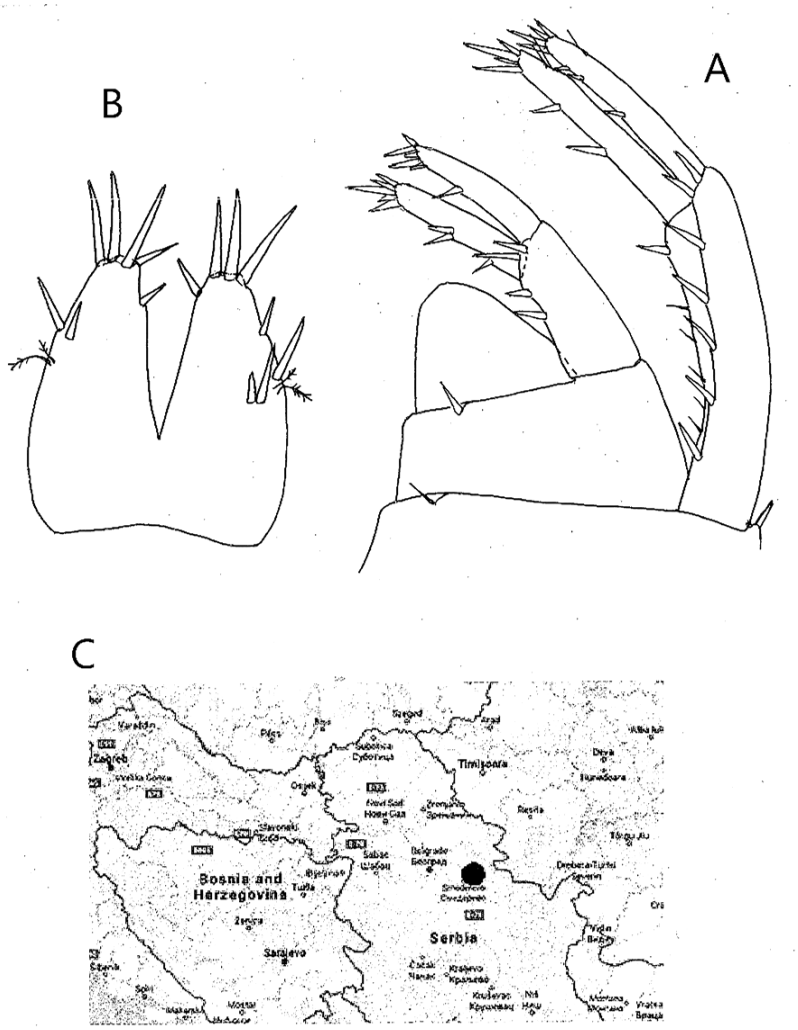

Figure 8. *Niphargus smederevanus S. Karaman, 1950, Smederevo, female 7.5 mm: A= urosome with uropods 1-2; B= telson.* ***C= Map of locality of Niphargus smederevanus S. Karaman, 1950*** *(black dot).*

Material Examined

Sp. 79= paratypes, Smederevo, fountain-spring W of town, 1942-1944, 6 exp. (leg. Stanko Karaman);

Sp. 182= Smederevo, 5 exp. (leg. S. Karaman);

Sp. 485= Smederevo, fountain, 20.8.1956, many exp. mixed with *Gammarus balcanicus* Schäferna, 1922 (leg. Zora Karaman);

Sp. 486= Smederevo, 22.8.1957, 10 exp. (leg. Gordan & Biljana Karaman);

S-7173= Smederevo, fountain-spring, August 1956, 2 dried exp. (leg. G. Karaman).

Diagnosis

Body moderately slender, urosomal segment 1 with seta, urosomal segment 2 with spine on each dorsolateral side. Epimeral plates with ventroposterior tooth. Coxae relatively short, coxa 4 without posterior lobe. Antenna 2 slender, with flagellum longer than last peduncular article. Maxilla 1 inner plate with 2-3 setae, palpus short. Maxilliped well developed.

Gnathopods 1-2: propodus trapezoid, with palm inclined up to half of propodus length, with elevated number of L-spines sitting laterally, facial corner with 3 M-setae only. Pereopods 3-4 with 2-3 spines along inner margin of dactylus. Pereopods 5-7 with 1 spine at inner margin of dactylus, article 2 dilated but without lobe, articles 3-6 moderately spinose. Pleopods with 2 retinacula, peduncles very scarcely setose. Uropod 1 peduncle with dorsointernal row of setae, inner ramus elongated in males. Uropod 3 in males elongated, with long second article of outer ramus, in females second article short. Telson strong, with distal, lateral and facial spines. Coxal gills not elongated.

Description:

MALE 9.5 mm (Sp. 485): Body moderately slender, metasomal segments with 2-4 dorsoposterior marginal setae each (Figure 1E); urosomal segment 1 with 1 seta on each dorsolateral side, urosomal segment 2 with 1 spine on each dorsolateral side; urosomal segment 3 naked. Urosomal segment 1 at each ventroposterior corner with one spine (Figure 3G).

Epimeral plates 1-2 with small ventroposterior tooth and nearly transversal posterior margin bearing 3-4 marginal setae; epimeral plate 3 with distinct ventroposterior tooth, posterior margin rather inclined, with 5 posterior marginal setae. The ventroposterior stronger seta at all three epimeral plates is attached above the tooth itself (Figure 1G). Epimeral plate 2 with one ventral spine, epimeral plate 3 with 2 ventral spines.

Head with short rostrum and subrounded lateral cephalic lobes, ventroanterior excavation present, eyes absent (Figure 1A). Antenna 1 reaching almost half of body-length; peduncular articles 1-3 progressively shorter (ratio: 60:45:22), scarcely setose (Figure 1B); main flagellum consisting of 21 articles (articles often with one aesthetasc); accessory flagellum short, 2-articulated, reaching nearly half of last peduncular article (Figure 1C).

Antenna 2: article 3 short, with distoventral bunch of setae and 2-3 distodorsal setae; peduncular article 4 poorly longer than article 5 (ratio: 52:48), both articles with several groups or single ventral longer setae (most of them longer than diameter of articles) and shorter dorsal setae (Figure 1D); flagellum relatively slender, rather shorter than peduncular articles 4-5 combined (ratio: 80:100), consisting of 11 articles scarcely setose; antennal gland cone short (Figure 1D).

Mouthparts well developed. Labrum broader than long (Figure 3A). Labium broader than long, inner lobes well developed, outer lobes entire (Figure 3B).

Mandibles: molar triturative. Left mandible: incisor with 5 teeth, lacinia moblis with 4 teeth accompanied by nearly 6 rakers. Right mandible: incisor with 4 teeth, lacinia mobilis serrate, accompanied by several rakers. Palpus 3-articulate: first article short, naked; second article with 6 setae; third article subfalciform, hardly longer than second one, provided with nearly 20 marginal D-setae and 5-6 distal E-setae, on outer face with one bunch of 4 A-setae, on inner face by 3 single B-setae (Figure 1F).

Maxilla 1: inner plate with 2-3 short setae (Figure 1G, H), outer plate with 7 spines (6 spines with one lateral tooth, one spine with 2-3 small teeth), palpus 2-articulated, short, not reaching distal tip of outer plate-spines and provided with 5 setae (Figure 1G).

Maxilla 2 well developed, both plates rather longer than broad, with numerous distal setae, inner plate with several distomesial setae.

Maxilliped: inner plate short, with 3 distal spines, outer plate reaching nearly half of palpus article 2; article 4 at ventral margin with 2 setae near basis of the nail (Figure 1 I).

Coxae relatively short. Coxa 1 broader than long (ratio: 40:30), with subrounded ventroanterior corner, bearing 8 marginal setae (Figure 2A). Coxa 2 nearly as long as broad, with nearly 7 marginal setae (Figure 2D). Coxa 3 rather broader than long (ratio: 50:43), bearing 5-6 marginal setae (Figure 3C). Coxa 4 broader than long (ratio: 51:40), bearing 5-6 marginal setae, ventroposterior lobe not developed (Figure 3E).

Coxa 5 bilobed, broader than long (ratio: 60:38), anterior lobe subrounded (Figure 4A). Coxa 6 smaller than coxa 5, bilobed, broader than long (ratio: 51:30) (Figure 4C). Coxa 7 entire, much broader than long (ratio: 52:24) (Figure 4E).

Gnathopods 1-2 with propodus nearly as large as corresponding coxa (Figure 2A, D). Gnathopod 1 rather smaller than gnathopod 2, article 2 along anterior and posterior margin with long setae; article 3 with distoposterior bunch of setae; article 5 shorter than propodus (ratio: 30:39), with distal bunch of setae at anterior margin (Figure 2A). Propodus trapezoid, poorly longer than broad (ratio: 88:83), along posterior margin with 6 transverse groups of setae (Figure 2B), palm slightly convex, inclined nearly to the half of propodus-length, defined on outer face by corner S-spine accompanied laterally by 4 serrate L-spines and by 3 corner facial M-setae, on inner face by one short subcorner R-spine (Figure 2C). Dactylus distinctly reaching posterior margin of propodus, along outer margin with 7 single median setae, along inner margin with 4-5 short marginal setae (Figure 2B).

Gnathopod 2: article 2 along both margins with long setae; article 3 with one distoposterior bunch of setae; article 5 nearly as long as propodus, at anterior margin with distal bunch of setae (Figure 2D). Propodus trapezoid, poorly broader than long (ratio: 97:90), along posterior margin with 7 transverse rows of setae (Figure 2E); palm slightly convex, inclined nearly half of propodus-length, defined on outer face by corner S-spine accompanied laterally by 3 L-spines and 3 corner facial M-setae, on inner face by one subcorner R-spine (Figure 2F). Dactylus distinctly reaching posterior margin of propodus, with 5 single median setae at outer margin and 5 short setae along inner margin (Figure 2E).

Pereopods 3-4 moderately slender. Pereopod 3 poorly longer than pereopod 4, article 2 with shorter setae along anterior margin (except 2 proximal long

setae) and longer setae along posterior margin (Figure 3C). Articles 4-7 of different length (ratio: 46:33:35:19); the longest setae exceeding diameter of articles themselves; article 6 along both margins with single short setae

(except distal spines). Dactylus strong and short, along inner margin with 2 single spines, at outer margin with one median plumose seta (Figure 3D), nail shorter than pedestal.

Pereopod 4: article 2 with short setae along anterior margin and long setae along posterior margin (Figure 3E); article 3 with group of 1-2 distoposterior setae. Articles 4-7 of different length (ratio: 45:28:35:19); article 4 along both margins with setae, article 5 at posterior margin with median spine and distal setae; article 6 along posterior margin with 5 single or paired short spines, along anterior margin with 3-4 short single setae. Dactylus short and strong, at inner margin with 2 single spines, at outer margin with median plumose seta; nail shorter than pedestal (Figure 3F).

Pereopod 5 distinctly shorter than pereopods 6 and 7; article 2 dilated but without lobe, longer than broad (ratio: 67:44), anterior margin rather convex, with row of 5-7 spine-like setae, along posterior margin almost straight medially with 9 short setae (Figure 4A). Articles 4-7 of different length (ratio: 35:37:40:19), articles 4 and 5 with single setae at anterior margin and spines at posterior margin; article 6 along both margins with spines sometimes mixed with single short seta. Dactylus at inner margin with spine near basis of the nail, along outer margin with one medial plumose seta, nail shorter than pedestal (Figure 4B).

Pereopod 6: article 2 longer than broad (ratio: 79:50), without lobe, along slightly convex anterior margin with row of several spine-like setae, along posterior, medially nearly straight margin with 9 short setae (Figure 4C). Articles 4-7 of different length (ratio: 47:55:76:25), article 4 at anterior margin with several setae, along posterior margin, and along both margins of articles 5 and 6 with single or paired spines. Dactylus strong, at inner margin with one spine near basis of the nail, at outer margin with one median plumose seta, nail shorter than pedestal (Figure 4D).

Pereopod 7: article 2 longer than broad (ratio: 82:51), along anterior slightly convex margin with 6-7 spine-like setae, along posterior slightly convex margin with 11 short setae, ventroposterior lobe not developed (Figure 4E). Articles 4-7 of different length (ratio: 48:56:78:25), article 4 along anterior margin with several short setae, along posterior margin with spines; articles 5-6 along both margins with single or groups of spines. Dactylus strong, at