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CONTRIBUTION TO THE KNOWLEDGE OF AMPHIPODS (CRUSTACEA, AMPHIPODA) FROM SĂLAJ COUNTY, ROMANIA

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ABSTRACT: The author presents here amphipod records from 16 sampling sites from Sălaj County, Romania. The found species belong to two Amphipoda families: Niphargidae and Gammaridae. This is the first record of *Niphargus elegans* Garbini, 1894 from the county. The widely distributed *Gammarus* cf. *balcanicus* Schäferna, 1922 was found in 15 localities. Comments on the species' taxonomy and illustrations of their main morphological traits are given in present study. Further collection in additional sampling sites would be necessary to complete our knowledge on the amphipod diversity of Sălaj County.

Keywords: Amphipoda, *Niphargus*, *Gammarus*, Romania, Sălaj County, faunistical data

INTRODUCTION:

The amphipod fauna of Romania is relatively well known (e.g. Cărăuşu *et al*., 1955, Karaman et Pinkster, 1987, Copilaş-Ciocianu, 2013, Meleg *et al*., 2013). During the latest extensive research on zoogeoraphy of epigean freshwater amphipods of Romania, 14 Amphipoda taxa have been revealed. These species, species complexes and subspecies belong to 3 genera in 3 families: *Gammarus* (Gammaridae), *Niphargus* (Niphargidae) and *Synurella* (Crangonyctidae), and are characterized by patchy distribution and wide altitudinal variability (Copilaş-Ciocianu *et al*. 2014). Up to now only 5 amphipod taxa had been revealed from Sălaj County. Among them, the most frequently found was *Gammarus* cf. *balcanicus*, while *Gammarus fossarum* s.l., *Gammarus roeseli* s. l., S*ynurella ambulans* and *Niphargus valachicus* were collected only from a few localities. The hypogean amphipods of Romania are represented by niphargids. According to the Fauna Europea database, currently 41 *Niphargus* species and subspecies are known from the country (Fišer, 2013), and records of further species were found in the relevant literature (e.g. Cărăuşu *et al*., 1955, Petrescu, 1998). The aim of present study was to widen our knowledge about the poorly known amphipod diversity of the Sălaj region.

MATERIALS AND METHODS:

Material was collected from streams and springs in Sălaj County between 2014 and 2015 by zoologists of the Hungarian Natural Histiory Museum (HNHM), Department of Zoology. Various collecting methods were used, like hand collecting from stones and sediment, netting from water, flotation of mosses on rocks around sprinkling water, collection of mud samples and plankton samples, and elutriation of sediment samples. Specimens were preserved in 70% ethanol, and were deposited in the Crustacea Collection of the HNHM. A complete list of collecting localities and collectors can be found in Gubányi (2016). For identifacation of the niphargid sample, specimen was cooked in 10% KOH solution, rinsed with HCl and washed in distilled water. Cleared exoskeleton was stained with chlorazol black in glycerol, and then dissected in glycerol gelatin under a Leica M125 stereomicroscope. Two slides were made, one contained the left side appendages and the mouth parts, while the other contained the whole body with the right side appendages. The slides were examined using a Leica DM 1000 light microscope. Drawings were made using a drawing tube mounted on the light microscope. Habitus photos were taken by a Nikon Coolpix E995 camera attached to a Leica MZ75 stereomicroscope. In case of the gammarid samples, only uropod III, epimeral plates, antennae and the telson were dissected and mounted in glycerol. For identification, publications of Cărăuşu *et al*. (1955), Copilaş-Ciocianu *et al.* (2014), G. S. Karaman (1977), G. Karaman *et* Pinkster (1987) and Petrescu (1998) were used.

RESULTS:

Niphargidae

***Niphargus elegans* Garbini, 1894** (Figure 1)

Niphargus elegans: Garbini 1894: 109.
Niphargus illidzensis: Schäferna 1922: 51-56.
Niphargus illidzensis f. *dalmaticus*: Schäferna 1922: 56-57, S. Karaman 1932: 201-202, Schellenberg 1935: 200.
Niphargus illidzensis illidzensis: S. Karaman 1932: 197-200.
Niphargus puteanus (illidzensis) dalmatinus: Dobreanu & Manolache 1936: 2-3.
Niphargus puteanus elegans: Ruffo 1937: 8-14, Cărăuşu, Dobreanu & Manolache: 1955: 302-307.
Niphargus elegans: GS. Karaman 1977: 177-187.
Niphargus elegans elegans: Petrescu 1998: 349-357

Locality: Vălişoara (Dióspatak), 3.7 km SE from the village, below the first pond in a spring, right side of the stream, by elutriation. Leg. Z. Erőss & A. Kenéz, 15.07.2015, 1 aged ♂.

Remarks: The species was described from Legnano, Tartaro, near Verona, Italy. The type material is destroyed, the neotype locality is 14 km from San Pancrazio, near Verona. It was found in several Northern and Central Italian springs and even in some fountains (GS. Karaman, 1987). Carauşu *et al*. (1955) mentioned its 'Yugoslavian' distribution and also some Romanian records from springs in Baia Mare (Maramureş County), Satu Mare (Satu Mare County) and Orşova (Mehedinţi County). Petrescu (1998) published ditribution data of *N. elegan elegans* from 21 streams and springs of Maramureş County. The species

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was also found in Slovenia (Fišer, unpubl.). Taxonomic positions of the morphologically similar species *N. elegans, N. dalmatinus* Schäferna, 1922, *N. puteanus* Koch C.L. 1836 and *N. illidzenzis* Schäferna, 1922 were rather uncertain until the recent phylogenetic studies on 104 European amphipod taxa, which have shown that *N. elegans* - such as *N. illidzenzis* - belongs to a clade of Illyrian species and it is not closely related to *N. puteanus* (Angyal *et al*. 2015). The subspecies *N. elegans zagrebensis* S. Karaman, 1950 can be found in the 'Endangered' category of the IUCN Red List of Threatened Species (Sket, 1996). After evaluating several characters of the newly collected male specimen from a spring near Vălișoara and of morphologically similar and geographically close species morphologically similar and geographically close species - based on literary data, some unambiguous distinguishing characters were found, such as the body length, the shape of epimeral plate 3 postero-ventral corner, the sexually dimorphic first and third uropods, the high number of setae on outer margins of gnathopod I and II dactyls, the position and number of setae on mandible palps, the high number of spines on pereopod III-VII dactyls in addition to spine-like seta at the base of the nail, and the shape and armature of the telson (Figures 2-3).

Gammaridae

***Gammarus* cf. *balcanicus* Schäferna, 1922**

Gammarus balcanicus: Schäferna 1922: 3-8.
Rivulogammarus spinulatus: Martynov 1935: 411.
Gammarus (Rivulogammarus) balcanicus: Schellenberg 1937: 5-6.
Rivulogammarus balcanicus: Cărăuşu, Dobreanu & Manolache: 1955: 93-96.
Gammarus gr. *balcanicus:* Ruffo & Vigna Taglianti 1967: 5.
Gammarus cf. *balcanicus:* Goedmakers & Pinkster 1977: 16.
Gammarus balcanicus: Karaman & Pinkster 1987: 211-217.
Gammarus cf. *balcanicus:* Copilaş-Ciocianu, Grabowski, Pârvulescu & Petrusek 2014: 258-260.

Locality: **144**: Munţii Plopiş (Réz-hegység), 3km SW of Tusa (Tuszatelke), at Barcău (Berettyó) springs, rocky spring outlet, 28.04.2015, N47.02026° E22.74874°, 600m; flotation of mosses on rocks around sprinkling water [562], leg. A. Gubányi & Gy. Makranczi, 5 ad. + 9 juv.; **200**: Munţii Plopiş (Réz-hegység), Tusa (Tuszatelke), Barcău (Berettyó) springs, 13.05.2015, N47.02° E22.749°; hand collecting, leg. A. Grabant, O. Merkl, V. Szőke, 6 ad.; **111**: Munţii Meseşului (Meszes-hegység), Cizer (Csiszér), above the village at the Boului Stream, 01.10.2014, N47.02765° E22.85603°; hand collecting, leg. Zs. Bálint, L. Dányi, G. Katona & D. Murányi, 5 ad.; **99**: Munţii Meseşului (Meszes-hegység), Treznea (Ördögkút), main valley of the Treznea Stream, 29.09.2014, N47.11005° E23.06443°; netting, leg. Zs. Bálint, L. Dányi, G. Katona & D. Murányi, 3 ad. + 1 juv.; **126**: Munţii Plopiş (Réz-hegység), Tusa (Tuszatelke), valley of the Barcău (Berettyó) Stream, 02.10.2014, N47.04743° E22.7508°; hand collecting, leg. Zs. Bálint, L. Dányi, G. Katona & D. Murányi, 4 ad. (2 on slides); **94**: Culoarul Someşului (Szamos völgye), Cliţ (Csűrfalva), 14.08.2014, N47.292° E23.432°; netting, leg. G. Katona, A. Orosz, G. Puskás, 4 ad. + 9 juv. (3 ad. on slides); **125**: Munţii Plopiş (Réz-hegység), Tusa (Tuszatelke), Ponor,Barcău (Berettyó) springs, 02.10.2014, N47.02031° E22.74875°; netting, leg. L. Dányi, G. Katona & D. Murányi, 6 ad.; **182**: Munţii Meseşului (Meszes-hegység), Poic, Poic Stream, 12.05.2015, N46.98° E22.925°; netting from water, leg. A. Grabant, O. Merkl, V. Szőke, 13 ad.; **275**: Dealurile Boiului (Szamoszug), Vălişoara (Dióspatak), stream valley, spring, 10.09.2015, N47.356965° E23.427326°; mud sample, leg. A. Gubányi, 25 juv.; **19**: Munţii Plopiş (Réz-hegység), Tusa (Tuszatelke), plateau, above Barcău (Berettyó) springs, slowly streaming part, 24.04.2014, N47.01991° E22.75491°, 654 m; from beneath stones, leg. A. Gubányi, L. Forró, G. Katona & Cs. Kutasi, 4 ad. + 19 juv.; **79**: Munţii Meseşului (Meszes-hegység), Cizer (Csiszér), 12.08.2014, N47.021° E22.864°; netting, leg. A. Gubányi, G. Katona, A. Orosz & G. Puskás, 2 ad. + 10 juv.; **115**: Munţii Meseşului (Meszes-hegység), Huta (Csákyújfalu), 01.10.2014, N46.99416° E22.92813°; hand collecting, leg. Zs. Bálint, L. Dányi, G. Katona & D. Murányi, 7 ad. **255**: Munţii Meseşului (Meszes-hegység), 6 km S of Cizer (Csiszér) on road 108G, Crasna (Kraszna) spring, beech forest and roadside vegetation, 17.07.2015, N47.0161° E22.8701°, 546m; plankton samples, leg. Z. Erőss, A. Kenéz, P.G. Sulyán, Z. Vas, 1 ad. + 6 juv.; Depresiunea Almaş--Agrij (Almás--Egregy-medence), **Agrij Stream**, 23.04.2015, N46.89728° E23.09911°, netting, leg. A. Gubányi, L. Forró, G. Katona & Cs. Kutasi, 2 ad.; **183**: Munţii Meseşului (Meszes-hegység), Poic, Poic Stream, 12.05.2015, N46.980138° E22.925351°; plankton sample, leg. A. Grabant, O. Merkl, A. Podlussány, V. Szőke, 9 ad.

Remarks: The *Gammarus balcanicus* species complex is widely distributed throughout South-Eastern Europe and Asia Minor and may represent several distinct cryptic lineages (e. g. Copilaş-Ciocianu *et al.*, 2014, Hou *et al*., 2011, G. Karaman et Pinkster, 1987, Özbek *et al*., 2009). Our new findings confirm that its also the most widespread amphipod in Romania, mostly occuring in springs and brooks (Petrescu, 1994, Copilaş-Ciocianu *et al.*, 2014). Hou *et al*. (2011) and Mamos *et al*. (2014) have shown that the Romanian populations are phylogenetically distinct from the other populations, therefore, Copilaş-Ciocianu *et al.* (2014) suggested to label it as *G*. cf. *balcanicus*. During the present research, samples were found in 15 localities in springs and streams. Specimens were identified by analysing some main traits on each, like length (longer than 8 mm, not as *G. b. montanus*), shape of second and third epimeral plates postero-inferior corner (approximately perpendicular on epimeral plate 2 and pointed on epimeral plate 3), the armature of the third uropod, the proportion of inner and outer rami of uropod III (inner ramus is longer than half length of outer ramus) and the armature of the telson (dorsal surface spines and lateral plumose setae frequently present) (Figure 4).

Fig. 1. Habitus photo of *Niphargus elegans* Garbini, 1894, male from Vălişoara (Dióspatak), 3.7 km SE from the village, below the first pond, from a spring, leg. Z. Erőss & A. Kenéz. Scale bar: 10 mm.

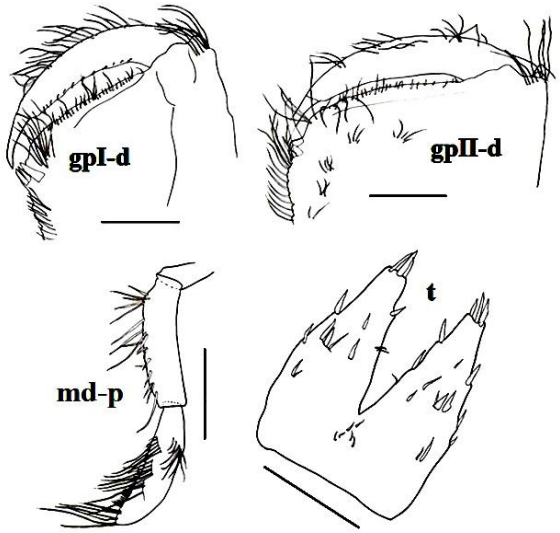

Fig.2. *Niphargus elegans* Garbini, 1894, male from Vălişoara (Dióspatak), 3.7 km SE from the village, below the first pond, from a spring, leg. Z. Erőss & A. Kenéz. gpI-d = gnathopod I dactylus, gpII-d = gnathopod II dactylus, md-p = mandible palp, t = telson. Scale bar: 0.5 mm.

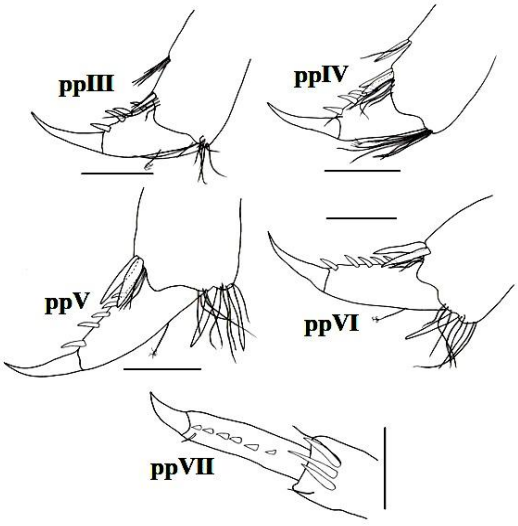

Fig. 3. *Niphargus elegans* Garbini, 1894, male from Vălişoara (Dióspatak), 3.7 km SE from the village, below the first pond, from a spring, leg. Z. Erőss & A. Kenéz. ppIII = pereopod III (dactylus), ppIV = pereopod IV (dactylus), ppV = pereopod V (dactylus), ppVI = pereopod VI (dactylus), ppVII = pereopod VII (dactylus). Scale bar: 0.25 mm.

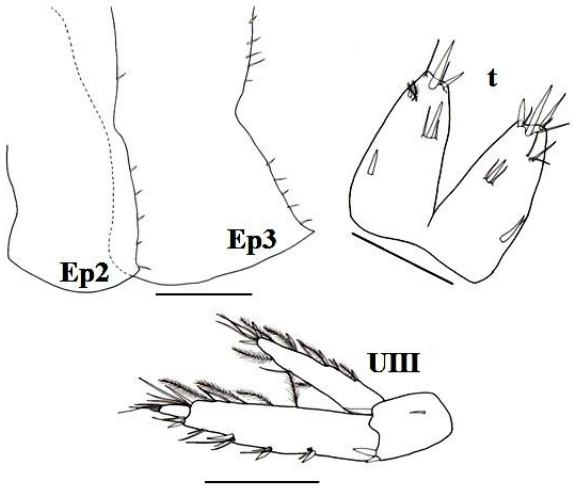

Fig. 4. *Gammarus* cf. *balcanicus* Schäferna, from Culoarul Someşului, Cliţ, from a brook, leg. G. Katona, A. Orosz & G. Puskás. Ep2 = epimeral plate 2, Ep3 = epimeral plate 3, t = telson, UIII = uropod III. Scale bar: 0.5 mm.

DISCUSSION:

Two amphipod species belong to two different families were identified from 16 localities from Šalaj County. Apart from a single male individual of *N. elegans*, all the collected specimens (79 juveniles and 71 adults) proved to be *G.* cf. *balcanicus*. Although Petrescu (1998) mentioned several occasions of the two species' coexistence in springs and streams of Maramureş County, each of our samples contained only one species. *G.* cf. *balcanicus* was already known in Šalaj County, among others it was collected in Almaşu and Treznea (Copilaş-Ciocianu *et al*. 2014). As a result of present study, there are records from 15 further localities from the county. *N. elegans* was previously unknown in the region, however it was found in the neighbouring Maramureş and Satu Mare counties. The new data published here raised the number of species known in Sălaj from 5 to 6. The illsutrations of the main distinguishing characters of the two species presented in this study may will be helpful

in species identification during further, imperious investigations on amphipod diversity of the region.

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