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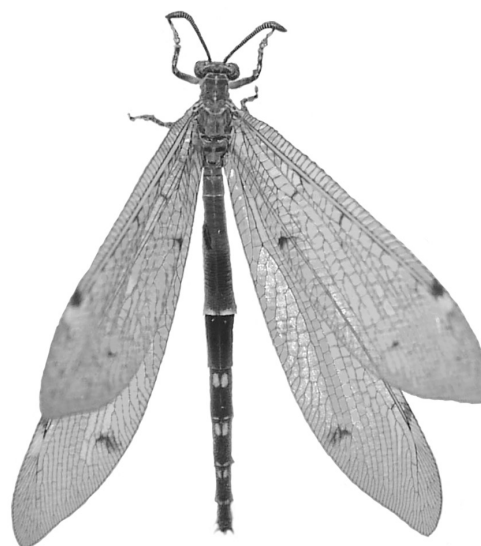


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**New recorded species of *Heteraphorura* Bagnall, 1948
(Collembola: Onychiuridae) from Georgia
with a key to the Holarctic species**

**Новая находка представителя рода *Heteraphorura* Bagnall, 1948
(Collembola: Onychiuridae) в Грузии
с определительной таблицей голарктических видов**

**Sh. Barjadze, G. Nebieridze
Ш. Барджадзе, Г. Небиеридзе**

Institute of Zoology, Ilia State University, Giorgi Tsereteli str., 3, Tbilisi 0162 Georgia. E-mail: shalva.barjadze@yahoo.com
Институт зоологии, Государственный университет Илии, ул. Георгия Церетели, 3, Тбилиси 0162 Грузия

Key words: Collembola, new record, Caucasus, cave, distribution.

Ключевые слова: Collembola, новое указание, Кавказ, пещера, распространение.

Abstract. One springtail species, *Heteraphorura iranica* Kaprus', Shayanmehr et Kahrarian, 2017 is recorded from the Caucasus for the first time. A key to the Holarctic species of the genus *Heteraphorura* Bagnall, 1948 including *H. magnina* (Wray, 1950) is given.

Резюме. Впервые с Кавказа указана ногохвостка *Heteraphorura iranica* Kaprus', Shayanmehr et Kahrarian, 2017. Приведена определительная таблица видов рода *Heteraphorura* Bagnall, 1948, включающая вид *H. magnina* (Wray, 1950).

Introduction

There are ca. 8700 springtail species in the world [Bellinger et al., 1996–2018]. Springtails are good bioindicators of environmental pollution and restoration in mined areas [Dunger et al., 2001; Fountain, Hopkin, 2001; Zeppelini et al., 2009]. At present, 101 species of springtails are known from Georgia [Barjadze et al., 2012, 2016; Vargovitsh, 2013, 2017; Djanashvili et al., 2014; Barjadze, Murvanidze, 2016].

After investigation of Collembola separated from the soil samples collected in Marshy forest in Kolkheti Lowland and from leaf litter and moss in the entrance zone of karstic Sakajkari Cave (Imereti Region, Western Georgia) we determined specimens as *Heteraphorura iranica* Kaprus', Shayanmehr et Kahrarian, 2017 (Fig. 1) using the original description of this species [Kaprus' et al., 2017]. The above mentioned species was described from the soil in forest areas in Iran [Kaprus' et al., 2017]. So far only one species from the genus *Heteraphorura* Bagnall, 1948, *H. variotuberculata* (Stach, 1934), was recorded from Georgia [Barjadze, Djanashvili, 2008].

The genus *Heteraphorura* was established by Bagnall [1948] with the type species *Onychiurus variotuberculatus* Stach, 1934. Species of the genus *Heteraphorura* are characterized by absence of posterior cephalic pseudocelli;

body without lateral pseudocelli; thoracic tergum I and abdominal tergum III without pseudocelli; granulation strong without granular areas; Ant III O with simple papillae and guard setae; different kind of vesicles are in PAO: simple, bilobed, multilobed or granulated; furca reduced to small area of fine granulation with 4 setulae arranged in one row or an arch; strong anal spines located on distinct papillae closely together; distal whorl of Tibiotarsi I–III with 11 chaetae, sensilla on the head and body indistinct [Pomorski, 1998, 2002]. Pomorski [2002] suggested a new diagnosis of the genus *Heteraphorura*, synonymised *Japonychiurus* Yoshii, 1996 with *Heteraphorura* and transferred 11 species and one subspecies to the abovementioned genus. Arbea [2014] distinguished three species groups within the genus *Heteraphorura* based on the shape of PAO vesicles: Nearctic, Euro-asiatic and Oriental. Nowadays, there are 17 species in the genus *Heteraphorura*, from which 7 are distributed in Nearctic and 10 species and 1 subspecies in Palaearctic [Pomorski, 2002; Arbea, 2014; Bernard, 2015; Kaprus' et al., 2017].

Keys to the species of the genus *Heteraphorura* in Nearctic and Palaearctic were published by Pomorski [2002] and Kaprus' and his co-authors [2017] respectively, but one species in the key [Pomorski, 2002], *H. magnina* (Wray, 1950) from Nearctic, was omitted there. We included the above mentioned species and suggested key for Holarctic *Heteraphorura* spp.

Material and methods

Material. *Heteraphorura iranica*: Georgia: 2♂, 3♀, Kolkheti Lowland, in soil of Marshy forest, 42°17'8.34"N / 41°39'54.89"E, 7 m a.s.l., 20.08.2009 (leg. M. Salakaia); 1♀, 2♂ subadult, Kolkheti Lowland, in soil of Marshy forest close to Anaklia, 42°22'17.05"N / 41°36'6.30"E, 0 m a.s.l., 20.08.2009 (leg. M. Salakaia); 2♂ subadult, Imereti Region, Chiatura district, Sakajkari Cave, entrance zone, in leaf litter and moss, 42°19'33.80"N / 43°16'14.29"E, 619 m a.s.l., 19.04.2017 (leg. G. Nebieridze). Material is deposited at Institute of Zoology, Ilia State University, Tbilisi, Georgia.



Fig. 1. Habitus of *Heteraphorura iranica* from Kolkheti Lowland, Georgia.

Рис. 1. Габитус *Heteraphorura iranica* с Колхидской низменности, Грузия.

The morphological characters of Georgian specimens of *Heteraphorura* were congruent in the original description of *Heteraphorura iranica* in all diagnostic characters.

The following abbreviations are used in the text: Abd – abdominal tergites; Ant – antenna; Ant III O – antennal III sense organ; Asp – anal spines; Cl – claw; Emp – empodium; MVO – male ventral organ; PAO – postantennal organ; pso – pseudocelli; VT – ventral tube.

Key to the species of the genus *Heteraphorura*

1. Ant base with 4 pso 2
 - Ant base with 2 or 3 pso 3
2. PAO with simple and bilobed vesicles. Cl without tooth. Pso formula dorsally: 40/011/11035 *H. magnina* (Wray, 1950) (USA)
 - PAO with only simple vesicles. Cl with tooth. Pso formula dorsally: 40/011/11(0)02(3)3–5 *H. bima* (Christiansen et Bellinger, 1980) (USA)
3. Emp rudimental. Its length equal 1/4 or less of inner edge of Cl. Pso formula dorsally: 20/011/11023(2,4) *H. carpatica* (Stach, 1954) (Poland, Slovakia, Ukraine)
 - Emp normal. Its length more than inner edge of Cl 4
4. PAO with granulated vesicles 5
 - PAO with only simple or simple and bi-, tri-lobed or simple and multilobed vesicles 11
5. Ant bases with 2 pso 6
 - Ant bases with 3 pso 8
6. Abd V with 2 pso. Abd VI with only m_2 seta. Pso formula dorsally: 20/011/11022 *H. pseudoseolagensis* (Martynova, 1981) (Russia)
 - Abd V with 3–4 pso. Abd VI with m_1 and m_2 or only m_2 setae 7
7. Abd VI with 3 medial setae. Only m_2 setae present on the Abd VI. Pso formula dorsally: 20/011/11023 *H. iranica* Kaprus', Shayanmehr et Kahrarian, 2017 (Iran)
 - Abd VI with 2 medial setae. m_1 and m_2 setae present on the Abd VI. Pso formula dorsally: 20/011/11023(4) *H. japonica kyotensis* Yoshii, 1996 (Japan)
8. Abd V with 1–2 pso. Pso formula dorsally: 30/011/1101(0)2(1) *H. longisetosus* (Lee et Park, 1986) (South Korea)
 - Abd V with 3–4 pso 9
9. Abd IV with m_0 seta. Pso formula dorsally: 30/011/11023 *H. seolagensis* (Lee, 1974) (South Korea, Russia)
 - Abd IV without m_0 seta 10
10. MVO absent. Pso formula dorsally: 30/011/11023(4) *H. japonica* (Yosii, 1967) (Japan)

- MVO present on Abd sternum IV, consists of 2 + 2 club-shaped, ciliated chetae, located on papillae. Pso formula dorsally: 30/011/11023 *H. imadatei* (Yosii, 1956) (Japan)
11. Emp with distinct basal lamella 12
 - Emp without distinct basal lamella 16
 12. PAO with only simple vesicles. Pso formula dorsally: 20/011/1(0)1(0)023 *H. subtenuis* (Folsom, 1917) (USA)
 - PAO with simple and bi-, tri- or simple and multilobed vesicles 13
 13. PAO with 25–28 simple, bi- and trilobed vesicles. Male without MVO. VT with 13–19 setae apically. Pso formula dorsally: 20/011/11022 *H. orientalis* (Martynova, 1976) (Russia)
 - PAO with 8–25 simple and multilobed or simple and bilobed vesicles. Male with MVO. VT with 7–8 or 8–8 setae apically 14
 14. PAO with 17–25 simple and multilobed vesicles. Cl with inner tooth 15
 - PAO with 8–11 simple and bilobed vesicles. Cl without inner tooth. Pso formula dorsally: 20/011/1(0)1(0)023 *H. justynae* Pomorski, 2002 (Canada)
 15. m_1 setae present on Abd I–III. Pso formula dorsally: 3(2)0/011/11022(3) *H. variotuberculata* (Stach, 1934) (Europe)
 - m_1 setae absent on Abd I–III. Pso formula dorsally: 30/011/11023 *H. steineri* Arbea, 2014 (Italy)
 16. PAO with 13–16 simple and bilobed vesicles 17
 - PAO with 8–14 simple vesicles. Pso formula dorsally: 30/011/1(0)1(0)023 *H. tala* (Christiansen et Bellinger, 1980) (USA)
 17. Tip of antenna without cauliflower-like papilla. Cl without inner tooth. Pso formula dorsally: 30/011/11023(4–5) *H. cassa* (Christiansen et Bellinger, 1980) (USA)
 - Tip of antenna with cauliflower-like papilla. Cl with inner tooth. Pso formula dorsally: 30/011(0)/1(0)1(0)024(5) *H. intricata* Pomorski, 2002 (USA)

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