

A NEW RECORD OF THE SPECIES *HAPLOPHTHALMUS*
MOVILAE GRUIA & GIURGINCA, 1998 (ISOPODA,
ONISCIDEA, TRICHONISCIDAE, HAPLOPHTHALMINAE)

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Abstract. The species *Haplophthalmus movilae*, long considered as restricted to the sulfidic groundwater ecosystem of Movile Cave was collected from an endogenous location outside the cave. This outlines the endogenous origin of the four species of Oniscidea inhabiting Movile Cave and possible movement of certain species between this cave and other ecosystems.

Key words: Isopoda, Oniscidea, Trichoniscidae, Haplophthalminae, *Haplophthalmus movilae*, Movile Cave.

1. INTRODUCTION

The family Trichoniscidae Sars, 1899 is arguably one of the most remarkable of the 15 families of Oniscidea from Romania: it includes no less than 37 species, most of them endemic, more than any other family of Oniscidea from our country (GIURGINCA, 2022).

In Romania, the Trichoniscidae are represented by three subfamilies: Trichoniscinae Sars, 1899, Haplophthalminae Verhoeff, 1908 and Thaumatoniscellinae Tabacaru, 1993.

The latter subfamily contains only one genus (*Thaumatoniscellus* Tabacaru, 1973) with a sole species, *Thaumatoniscellus orghidani* Tabacaru, 1973, a species endemic for the Southern Carpathians (TABACARU, 1973, 1993).

The subfamily Trichoniscinae includes the genera *Caucasonethes* Verhoeff, 1932 (with a sole species, *Caucasonethes vandeli*, endemic for Dobrogea), the genus *Hyloniscus* Verhoeff, 1908 (with 8 species among which the endemites *H. dacicus* Tabacaru, 1972; *H. flammuloides* Tabacaru, 1972; *H. inflatus* Verhoeff, 1927; *H. motasi* (Radu, 1976); *H. siculus* Mehely, 1929), the genus *Biharoniscus* Tabacaru, 1963 (with two species, *B. racovitzai* Tabacaru, 1963 and *B. fericeus* Tabacaru, 1973, both endemic for Romania), the genus *Androniscus* Verhoeff, 1908 (one species *A. roseus roseus* (C.L. Koch, 1838), the genus *Trichoniscoides* Sars, 1898 (with the endemic species *T. danubianus* Radu, 1973), the genus

Trichoniscus Brandt, 1833 (with 11 species among which *T. carpaticus* Tabacaru, 1974; *T. dancaui* Tabacaru, 1996; *T. inferus* Verhoeff, 1908; *T. racovitzai* Tabacaru, 1994; *T. tuberculatus* Tabacaru, 1996; *T. vandeli* Tabacaru, 1996 and *T. selenae* Giurginca, 2023 are endemic for Romania) and the genus *Stylohylea* Verhoeff, 1930 (with a sole species, *S. bosniensis* (Verhoeff, 1930)). (GIURGINCA, 2022; 2023).

The third subfamily, the Haplophthalminae contains the genera *Monocyphoniscus* Strouhal, 1939 (with a sole species, *M. babadagensis* (Radu, 1965), endemic for Romania), the genus *Banatoniscus* Tabacaru, 1991, with the species *B. karbani* Tabacaru, 1991 (also endemic for Romania) and the genus *Haplophthalmus* Schöbl, 1861 with 10 species, most of which are endemic for the Romanian fauna: *H. banaticus* Radu, 1977; *H. caecus* Radu, Radu, Cadariu, 1955; *H. jonescui* Radu, 1983; *H. orientalis* Radu, Radu, Cadariu, 1956; *H. medius* Radu, Radu, Cadariu, 1956; *H. napocensis* Radu, 1977; *H. tismanicus* Tabacaru, 1970 and *H. movilae* Gruia & Giurginca, 1998 (GIURGINCA, 2022).

One of the most remarkable species is, without doubt, the species *H. movilae* known until now only from the limestone walls of air-bell I and the Great Hall of Movile Cave, the first known subterranean chemoautotrophy-based sulfidic ecosystem (SARBU *et al.*, 2019; BRAD *et al.*, 2021).

The cave atmosphere contains 19% dioxygen (O₂) and around 1% carbon dioxide (CO₂) in the upper level of the cave, while the air bells become progressively depleted in O₂ (16–7%) and enriched in CO₂ (1.5–3.5%) (SARBU, 2000; SARBU *et al.*, 2019; BRAD *et al.*, 2021). Sulfur- and methane-oxidizing, but also nitrifying, microorganisms form microbial biofilms covering the water surface and the cave walls adjacent to the water, and represent the base of the food web in this ecosystem (SARBU *et al.*, 2019). This remarkably abundant primary production sustains and allows 52 invertebrate species (37 endemic) to thrive (BRAD *et al.*, 2021).

Among the species cohabiting in this ecosystem are four species of Oniscidea: *Trachelipus troglobius* Tabacaru & Boghean, 1989; *Armadillidium tabacarui* Gruia, Iavorschi, Sârbu, 1994 *Haplophthalmus movilae* Gruia & Giurginca, 1998; and *Caucasonethes vandeli pygmaeus* Giurginca, 2021 (GIURGINCA, 2021; 2022).

Herewith, we present an unexpected and surprising new location for the species *H. movilae*, all the more so as the species was considered since its description as being confined solely to the air-bell I and the Great Hall of Movile Cave (GRUIA & GIURGINCA, 1998; GIURGINCA & ĆURČIĆ, 2003; SARBU *et al.*, 2019; GIURGINCA, 2021; 2022).

2. THE NEW LOCATION OF *HAPLOPHTHALMUS MOVILAE*

As we have pointed out in a paper from the same volume, biological collections are not only essential for taxonomic work by providing raw data as centralized storehouses of reference material, acting as sites of accumulated knowledge and resources but also providing unexpected findings (SUAREZ & TSUTSUI, 2004; GIURGINCA, 2024, Q.V.). One such discovery, resulting from

sorting and identifying almost 2000 vials with unidentified biological material collected from 1955 up to the present, is the finding in the collection of the “Emile Racovitza” of the species *H. movilae* from an unexpected location.

This is about one adult male and one adult female of *Haplophthalmus movilae* collected in 19 April 1966 by dr. I. Gr. Tabacaru on the shore of Mangalia Lake (nowadays Limanu Lake, south from the Mangalia city, but named Mangalia Lake in older maps see for instance DUMITRESCU *et al.*, 1965; CONSTANTINESCU, 1989) (see Fig. 1).

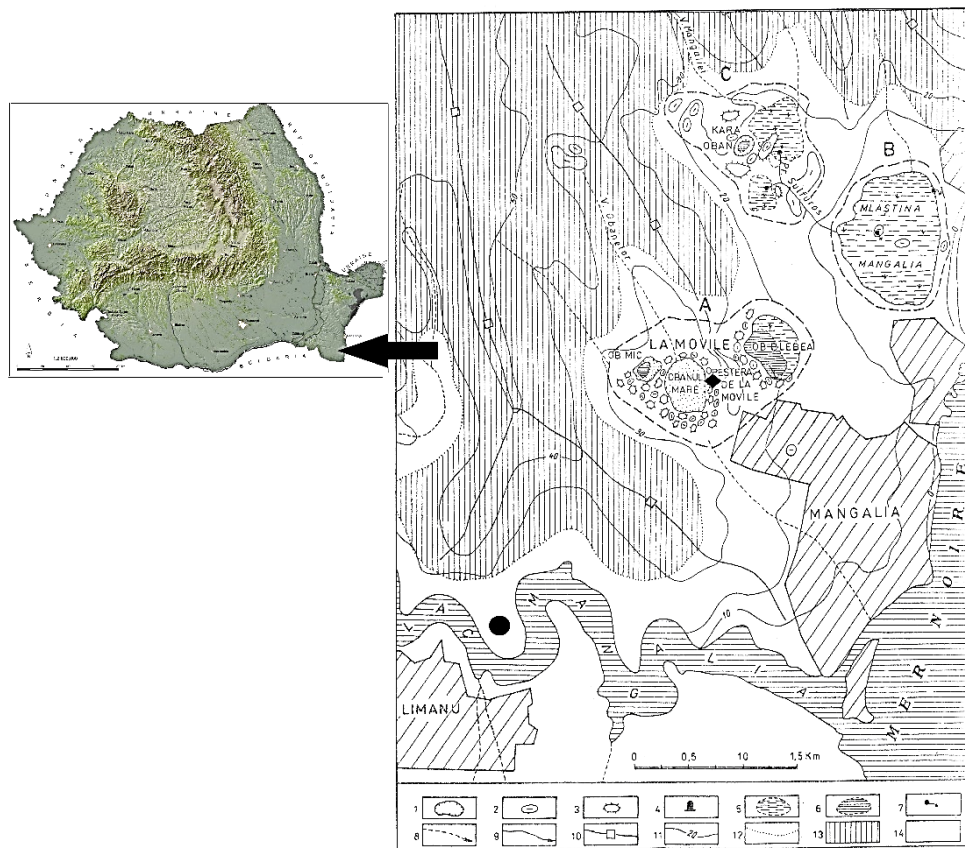


Figure 1. Map with the known locations of *Haplophthalmus movilae*: black diamond: Movile Cave; black circle: shore of Mangalia (=Limanu) Lake; symbols: 1: karstic depression (oban); 2: sinkhole; 3: Movile; 4: Movile Cave; 5: Swamp; 6: Lake; 7: Thermo-mineral spring; 8: Temporary stream; 9: Permanent stream; 10: Watershed; 11: Isohypse; 12: Loess deposits; 13: Sarmatian limestones (after CONSTANTINESCU, 1995).

The material is registered in the collection of “Emil Racoviță” Institute of Speleology, register number ODT085.

The species was identified by the presence of a single black ommatidia, pereionites with two pairs of developed ribs. In contrast, all the other cavernicolous species of *Haplophthalmus* from Romania (*H. caecus* and *H. tismanicus*) are both blind and have three pairs of developed ribs (TABACARU & GIURGINCA, 2014).

In the same location with *H. movilae*, a second species of *Haplophthalmus*, namely *H. orientalis*, was collected. Both species share the presence of a black ommatidia, but *H. movilae* differs clearly from *H. orientalis* by the tergal ribs and the tubercle on the pleonite III.

In *H. movilae* the tergal ribs are reduced in number: there are only two, prominent ribs on each pereionite and the ribs are short and tubercle-like; the pleon III presents a single dorsal-median, widened tubercle formed by one or two fused tubercles more or less distinct on a common base (GRUIA & GIURGINCA, 1998 see Figs. 1–6). In contrast, in *H. orientalis* the ribs are long and, in some cases, ramified and reach the distal edge of the pereionites; also, on the pleonal tergites and on the pleotelson there are no tubercles or prominences (RADU, RADU, CADARIU, 1956; GRUIA & GIURGINCA, 1998).

The ornamentation of the cephalon is also quite distinct in the two species. In *H. movilae* there are four tubercle-like ribs on the maxillipedal segment of which the median ribs are more prominent and circular, the lateral ribs are broader and, in frontal view, the lateral ribs are subdivided in two; the posterior part of the vertex has two big, median tubercles (GRUIA & GIURGINCA, 1998 see Figs. 1–6). In *H. orientalis*, the vertex has 5–6, longitudinal ribs, followed by a second group of radially disposed ribs; toward the frons, there are two tubercles followed, exactly on the edge of the frons, by two smaller ones (RADU, RADU, CADARIU, 1956).

There are further differences at the level of male pleopods I and II. At *H. movilae* the male pleopode I exopodite is strongly constricted distally, with a straight inner edge and the upper third is slightly curved externally; distal half of external edge is strongly excavated defining a narrow, rounded apex; the rod-like, bi-articulated endopodite with nearly subequal article and a striated zone extending for 1/5 the length of article 2. At *H. orientalis* the basal third of the exopodite presents a large, quadrangular lateral expansion (rounded at *H. movilae*); the tip of the endopodite is obliquely cut (rounded and rounded at *H. movilae*) and bears in the basal third two transversal bands of hairs (not found at *H. movilae*) (RADU, RADU, CADARIU, 1956; GRUIA & GIURGINCA, 1998).

The male pleopode II exopodite at *H. movilae* has a convex internal edge, outer edge is strongly excavated in the distal part, so the distal part is reduced to a quarter of the articles width and is beveled and ciliated on the external edge; the endopodite is styliform, with a truncated point presenting a finger-like appendix curved externally. In contrast, at *H. orientalis* the tip of the exopodite is posteriorly elongated and with a rounded tip. The styliform endopodite ends in three unequal,

digitiform elongations, the middle one being the longest (so very different from *H. movilae*) (RADU, RADU, CADARIU, 1956; GRUIA & GIURGINCA, 1998).

There is one analogy shared between the two species. Both in *H. movilae* and *H. orientalis*, the lamella dorsalis is longer than the lamella ventralis (GRUIA & GIURGINCA, 1998 see Fig. 18).

In conclusion, the obvious differences in the ornamentation of the cephalon, pereion and pleon clearly set apart *Haplophthalmus movilae* from the co-occurring species *Haplophthalmus orientalis* precluding any possible confusion between the two species.

3. COEXISTING SPECIES

Besides *H. orientalis* 2003, a series of other species of Oniscidea and Diplopoda have been collected from the area surrounding Lake Mangalia.

There are nine species of Oniscidea, namely *Hyloniscus riparius* (C.L. Koch, 1838), *Platyarthrus coronatus* Radu, 1959 and *Pl. schoeblii* Budde-Lund, 1885, *Cylisticus convexus* (De Geer, 1778), *Porcellionides myrmecophilus* (Stein, 1859), *Trachelipus rathkii* (Brandt, 1833), *Armadillidium traiani* Demianowicz, 1932 and *Arm. vulgare* Latreille, 1804.

In the same area, four species of Diplopoda have been collected: *Polyxenus lagurus* (Linnaeus, 1758), *Lophoproctus lucidus* (Chalande, 1888) and *Megaphyllum unilineatum* (C.L. Koch, 1838).

Hyloniscus riparius, *Cylisticus convexus*, *Trachelipus rathkii* and *Armadillidium vulgare* are expansive species found in a variety of habitats, *Platyarthrus coronatus*, *Pl. schoeblii* and *Porcellionides myrmecophilus* are endogeicolous species found in cleitric MSS and down to -15 m in the drillings made in the Movile Cave vicinity, while *Armadillidium traiani* has an affinity for dry places (GIURGINCA, 2022; GIURGINCA, NAE, VĂNOAICA, 2009; NITZU *et al.*, 2010). *H. orientalis* was also recorded from a small forest in a dry environment (RADU, RADU, CADARIU, 1956).

Polyxenus lagurus is a species inhabiting a wide variety of habitats (KIME & ENGHOFF, 2011), *Lophoproctus lucidus* is known from sclerophyllous forests and is a facultative myrmecophile (KIME & ENGHOFF, 2011) while *Megaphyllum unilineatum* is generally found in dry habitats such as grasslands on karst (KIME & ENGHOFF, 2017).

Overall, it is a fauna dominated by eurytopic species (*H. riparius*, *C. convexus*, *Tr. rathkii*, *Arm. vulgare*, *Pol. lagurus*, *Meg. unilineatum*), with an affinity to dryness (*Arm. traiani*) or endogeicolous species which use the cracks of the limestone from this area to endure the summer drought (the two species of *Platyarthrus* and *Por. myrmecophilus*).

We have also to point out that several of these taxa endorse the presence in the past of forests in this area and underline the role of a refuge of the South

Dobrogea karst after the disappearance of the primary arboreal formations as argued by NITZU, 2001.

In fact, taking into account the presence of the pigmented ommatidia, *H. movilae* clearly originated from an endogeicolous species and, perhaps, the similarity of its stomach with that of *H. orientalis* is something that might be considered in a future study.

4. THE NOT SO ISOLATED MOVILE CAVE

Speaking strictly from the point of view provided by the Oniscidea and Diplopoda, Movile Cave can no longer be framed in a “long history of cave isolation” (SARBU & POPA, 1992).

For instance, there is a common species of Oniscidea between Movile Cave and two caves of Central Dobrogea: *Caucasonethes vandeli*. The species, endemic for Romania, is represented by the subspecies *Caucasonethes vandeli vandeli* Tabacaru, 1993 from two caves situated in Central Dobrogea (Peștera Liliecilor de la Gura Dobrogei and Peștera de la Casian) and *Caucasonethes vandeli pygmaeus* Giurginca, 2020, described from Movile Cave.

Peștera de la Casian (peștera=cave) has a second species in common with Movile Cave, namely the diplopod species *Apfelbeckiella dobrogica* Tabacaru, 1966. A more interesting case is *Nopoiulus kochii* Gervais, 1847 which, besides Movile Cave, is recorded in caves from Vâlcan, Banatului and Pădurea Craiului Mountains and the Mehedinți Plateau (TABACARU, GIURGINCA, VĂNOAICA, 2004; GIURGINCA *et al.*, 2020). Also, *Strongylosoma jaqueti*, besides Movile Cave, is known only from the endogenous: Consul Mountain (Northern Dobrogea) and Ploiești Plain (TABACARU, 1966; TABACARU, GIURGINCA, VĂNOAICA, 2004).

Even *Archiboreoiulus serbansarbui* Giurginca, Vănoaica, Šustr, Tajovský, 2020, was described based on material collected from a dry well from Mecu Street from Mangalia (GIURGINCA *et al.*, 2020).

Haplophthalmus movilae, up to the present restricted to Movile Cave, shows clearly the possibility of movement between Movile Cave and other ecosystems, especially given the highly fractured nature of the lumachellic and oolithic limestone massif in which Movile Cave is formed (CONSTANTINESCU, 1995). This is sustained by the extensive hypogene karst features resulting from the presence in this area of sulphurous water and microbial activity (POPA *et al.*, 2024).

In conclusion, as we see it, at the base of the extraordinary Movile Cave fauna is not isolation at a geographical and chronological level, but an ecological isolation: namely the adaptation to the peculiar and extreme conditions within the cave.

Acknowledgments. Our study has been undertaken within the framework of Program 1 of the “Emil Racoviță” Institute of Speleology of the Romanian Academy.

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