

==== REVIEW ====

## Endemic species of terrestrial isopods (Isopoda, Crustacea) in the Romanian fauna

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**SUMMARY.** In the Romanian fauna 32 endemic species of terrestrial isopods were described; most of them are epigenous, few are troglobiont, troglophilous and edaphic species. **Troglobiont species:** *Biharoniscus racovitzai*, *Biharoniscus fericeus*, *Haplophthalmus tismaniscus*, *Haplophthalmus caecus*, *Trachelipus troglobius*. **Troglophilous species:** *Trachelipus trilobatus*, *Hyloniscus flamuloides*. **Edaphic species:** *Trichoniscoides danubianus*, *Haplophthalmus napocensis*, *Haplophthalmus banaticus*, *Haplophthalmus medius*, *Haplophthalmus ionescui*, *Thaumatonicellus orghidani*. **Epigenous species:** *Ligidium intermedium*, *Hyloniscus dacicus*, *Hyloniscus siculus*, *Hyloniscus motasi*, *Trichoniscus carpaticus*, *Haplophthalmus orientalis*, *Buddelundiella serbani*, *Trichorhina dobrogica*, *Platyarthrus dobrogicus*, *Cylisticus transsilvanicus*, *Cylisticus brachiurus*, *Porcellium transsylvanicum*, *Trachelipus ater*, *Trachelipus vareae*, *Trachelipus bujori*, *Trachelipus pleoglandulatus*, *Trachelipus spinulatus*, *Orthometopon romanicus*, *Armadillidium banaticum*.

**Keywords:** endemic species, terrestrial isopods.

### Introduction

In Romanian fauna 32 endemic species of terrestrial isopods were described. The majority of them has been described by Radu (1949, 1950, 1951, 1955, 1956, 1959, 1973, 1976, 1977, 1983) and Tăbăcaru (1962, 1970, 1971, 1972, 1973, 1974, 1989, 1996). Radu had generally studied the epigenous isopod species, while Tăbăcaru the troglobiont (cave-dwelling) species.

All the endemic isopod species are described separately by Radu (1983, 1985) in the two sections of the Romanian Fauna: volume IV section 13/1983 and volume IV section 14/1985. Schmalzfuss (2003) mentions the endemic species in the World Catalogue of terrestrial isopods (Isopoda Oniscoidea), except three

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species, described by Radu: *Trachelipus vareae* (Radu 1949), *Trachelipus bujori* (Radu 1950) and *Trachelipus pleonglandulatus* (Radu 1950), which Schmidt (1997) synonymised with other species from the genus *Trachelipus*.

In our publication (Tomescu *et al.*, 2015) we presented a comparative description of the three species described by Radu and the species they were synonymised with. The results of our research are based on the study of a vast biological sample (tens of males and females from each species), collected in the period 1990-2013, from habitats of several geographic regions, including those mentioned by Radu. We prepared microscopic slides with male organs of taxonomic value, and used them to re-describe the species and to draw some well-documented conclusions. We found that the three species described by Radu (1949, 1950) are valid species and the synonymising by Schmidt (1997) does not correspond to reality. Probably Schmidt did not have biological material from Romania. We include in this paper comparative figures of the three species that were synonymised (Tomescu *et al.*, 2015).

The diversity of geographical units and habitats in Romania favoured the isolation of several terrestrial isopod populations and the evolutionary process of forming new species. The biological traits of the terrestrial isopods also contributed to the isolation of their populations. The majority of the species are stenobiont and have a low mobility, that is particularly low in troglobiont and edaphic species, but also in epigenous species.

The majority of endemic species lives in montane areas and their populations have a limited distribution in their area. There are many caves in the montane areas, inhabited also by isopods among other organisms. Five troglobiont and two troglophilous isopod species have been described.

#### **The species of endemic isopods:**

##### **Diplocheta: family Ligiidae**

*Ligidium intermedium* Radu 1950

**Ecology:** epigenous species, lives in the litter layer of forests, in humid microhabitats.

**Distribution:** Northern Romania, prevalent in montane areas.

##### **Synocheta: family Trichoniscidae**

*Hyloniscus dacicus* Tăbăcaru 1972

**Ecology:** epigenous species, lives in the litter layer of forests and under rocks, in humid microhabitats.

**Distribution:** Făgăraş Mountains, Prahova Valley

*Hyloniscus flamuloides* Tăbăcaru 1972

**Ecology:** troglophilous species, lives in caves and in the litter layer of forests around caves, in humid microhabitats.

**Distribution:** Retezat Mountains, Șureanului Mountains, Cozia Mountains, Căpățâni Mountains

*Hyloniscus siculus* Mehely 1929

**Ecology:** epigenous species, lives in the litter layer of forests in montane areas, in humid microhabitats.

**Distribution:** Eastern and Southern Carpathians, Apuseni Mountains

*Hyloniscus (=Ropaloniscus) motasi* Radu 1976

**Ecology:** epigenous species, lives in the litter layer of forests in montane areas, in humid microhabitats.

**Distribution:** Gutâi Mountains

*Trichoniscus carpaticus* Tăbăcaru 1974

**Ecology:** epigenous species, lives in the litter layer of forests in montane areas, in humid microhabitats.

**Distribution:** Eastern and Southern Carpathians.

*Biharoniscus racovitzae* Tăbăcaru 1962

**Ecology:** troglobiont species, lives in caves.

**Distribution:** caves of the Apuseni Mountains.

*Biharoniscus fericeus* Tăbăcaru 1973

**Ecology:** troglobiont species, lives in caves.

**Distribution:** the cave in Ferice, Bihor Mountains.

*Trichoniscoides danubianus* Radu 1973

**Ecology:** edaphic species, lives in the hummus layer in humid forests.

**Distribution:** forests located on the left side of the Danube, Plavișevița and Berzasca, Caraș-Severin County.

*Haplophtalmus orientalis* Radu G., Radu V., Cădăriu 1955

**Ecology:** edaphic species, lives in the humid litter layer of deciduous forests.

**Distribution:** Dobrogea.

*Haplophtalmus napocensis* Radu 1977

**Ecology:** edaphic species, lives in the hummus layer of deciduous forests.

**Distribution:** the forests around Cluj-Napoca city.

*Haplophthalmus banaticus* Radu 1977

**Ecology:** edaphic species, lives in the hummus layer of deciduous forests.

**Distribution:** Porțile de Fier area, Orșova, Moldova Nouă.

*Haplophthalmus medius* Radu G., Radu V., Cădariu 1956

**Ecology:** edaphic species, lives in the hummus layer of deciduous forests.

**Distribution:** Perșani Mountains.

*Haplophthalmus tismanicus* Tăbăcaru 1970

**Ecology:** troglobiont species, lives in caves.

**Distribution:** the cave at Tismana Monastery, Gorj County.

*Haplophthalmus caecus* Radu G., Radu V., Cădariu 1955

**Ecology:** troglobiont species, lives in caves.

**Distribution:** in the cave on Biborț Valley, village Presaca Ampoiului, Alba County.

*Haplophthalmus ionescui* Radu 1983

**Ecology:** edaphic species, lives in the hummus layer of deciduous forests.

**Distribution:** forests in the Porțile de Fier area.

*Thaumatoniscellus orghidani* Tăbăcaru 1973

**Ecology:** edaphic species, lives in the hummus layer of deciduous forests.

**Distribution:** forests around the cave from Topolnița, Mehedinți County.

*Buddelundiella serbani* Tăbăcaru 1971

**Ecology:** edaphic species, lives in the very humid litter layer of deciduous forests.

**Distribution:** forests in Tismana, Gorj County.

#### **Crinocheta: family Platyarthridae**

*Trichorina dobrogica* Radu 1959

**Ecology:** epigenous species, lives under rocks, fallen trees, on arid soils.

**Distribution:** Dobrogea, Black Sea littoral.

*Platyarthrus dobrogicus* Radu 1951

**Ecology:** epigenous species, lives in the litter layer of deciduous forests.

**Distribution:** deciduous forests in Dobrogea.

#### **Crinocheta: family Cylisticidae**

*Cylisticus transsilvanicus* Verhoeff 1908

**Ecology:** epigenous species, lives in forests on areas with plant detritus at the basis of rocks.

**Distribution:** Muntele Rece, Apuseni Mountains.

*Cylisticus brachiurus* Radu 1951

**Ecology:** epigenous species, lives in the litter layer of forests.

**Distribution:** Ciucului Mountains, Eastern Carpathians.

**Crinocheta: family Trachelipoidae**

*Porcellium transsylvanicum* Tomescu, Teodor, Ferenți 2012

**Ecology:** epigenous species, lives in the litter layer of forests and on herbaceous forest plants.

**Distribution:** Bârgăului Mountains.

*Trachelipus ater* Budde-Lund 1896

**Ecology:** epigenous species, lives in the litter layer of beech and spruce forests, under fallen trees.

**Distribution:** Southern Făgăraș Mountains, Lotrului Mountains, Căpățâni Mountains.

*Trachelipus trilobatus* Stein 1859

**Ecology:** troglophilous species, lives in humid and old oak forests, at lower temperatures, in the litter layer, under rocks, around cave entrances and on rock walls.

**Distribution:** forests around Băile Herculane, Ponorul Pecinișcăi, Eastern Mehedinți Mountains.

*Trachelipus vareae* Radu 1949

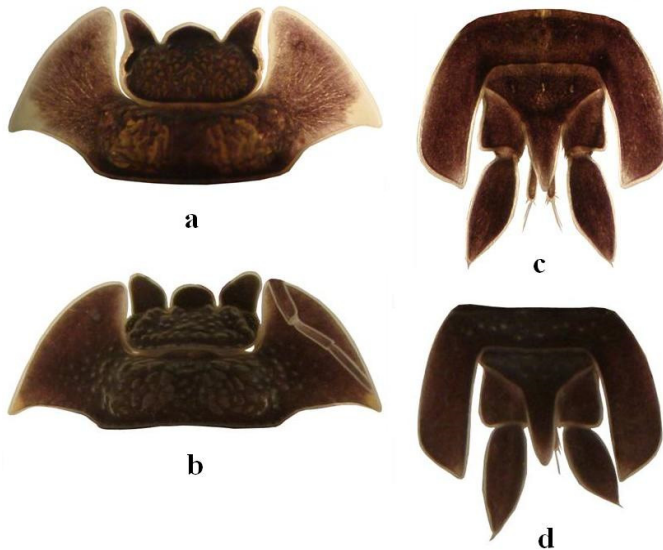
**Ecology:** epigenous species, lives in the litter layer of deciduous forests.

**Distribution:** Lunca Cernii, Cioclovina, Turnu Roșu, Călimănești, Trascău Mountains, Muntele Mare, Metaliferi Mountains (Tomescu *et al.*, 2015).

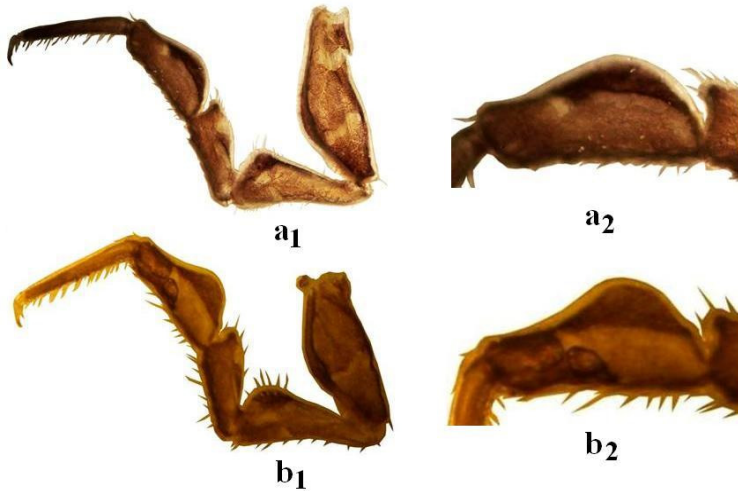
**Note:** Schmidt (1997) synonymized *Trachelipus vareae* Radu 1949 with *Trachelipus ater* Budde-Lund 1896. Tomescu *et al.* (2015) studied tens of male and female individuals from both species, collected in the period 1990-2013 from different localities in Romania, and concluded that there is a clear morphological difference between the species. The scientifically argued conclusion states that *Trachelipus vareae* Radu 1949 is a valid species and cannot be synonymized with *Trachelipus ater* Budde-Lund 1896. We present several figures representing morphological characters of the two species, published by Tomescu *et al.* (2015) (Figs. 1- 4). We mention that their spatial distribution is also different.



**Figure 1.** Yellow spots on the coxal plates base of males: **a.** *Trachelipus ater*, ♂ 14 x 7 mm – Vâlsan river Gorges (Argeş county), **b.** *Trachelipus vareae*, ♂ 17 x 9 mm – Feneş Valley (Alba county).



**Figure 2.** Comparative cephalic lobes: **a.** *Trachelipus ater*, ♂ 12 x 6 mm – Bistriţa river Gorges (Vâlcea county), **b.** *Trachelipus vareae*, ♂ 17 x 9 mm – Feneş Valley (Alba county); **pleotelson:** **c.** *T. ater*, ♂ 14 x 7 mm – Vâlsan river Gorges (Argeş county); **d.** *T. vareae*, ♂ 17 x 9 mm – Feneş Valley.



**Figure 3. Comparative crest of carpus pereopod 7 of males: a<sub>1</sub>-a<sub>2</sub>. *Trachelipus ater*, ♂ 14 x 7 mm – Vâlsan river Gorges (Argeş county), b<sub>1</sub>-b<sub>2</sub>. *Trachelipus vareae*, ♂ 17 x 9 mm – Feneş Valley (Alba county).**



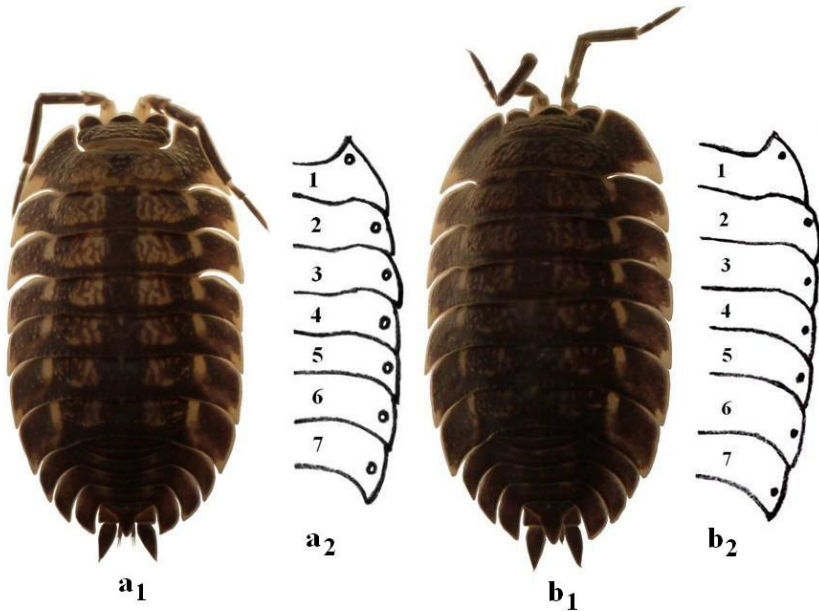
**Figure 4. Comparative of pleopods 1 of males, the exopod of pleopods 1 of males: a. *Trachelipus ater*, ♂ 14.5 x 8 mm – Vâlsan river Gorges; b. *Trachelipus vareae*, ♂ 17 x 9 mm – Feneş Valley.**

*Trachelipus bujori* Radu 1950

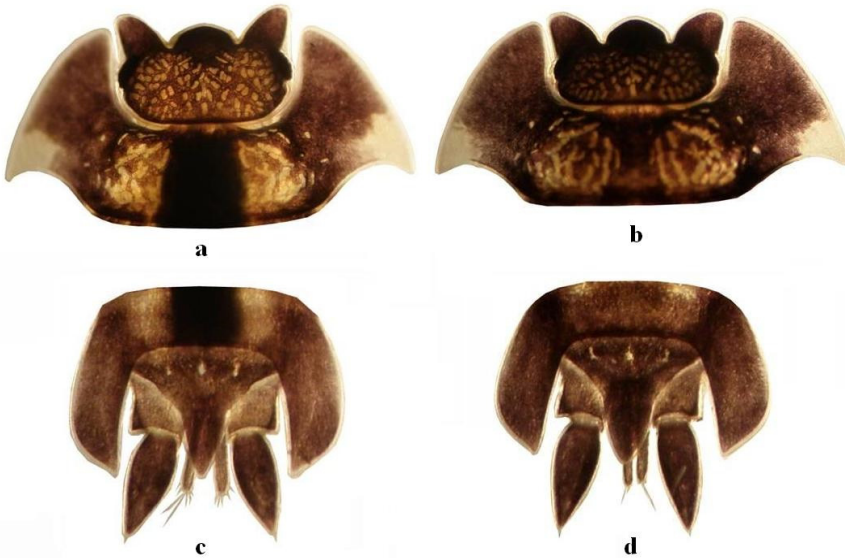
**Ecology:** epigenous species, lives under fallen trees, under bark and in the litter layer of beech and oak forests, at altitudes of 120-360m.

**Distribution:** Poiana Ruscă Mountains, Parâng Mountains, Almăjului Mountains, Aninei Mountains, Lipovei hills.

**Note:** Schmidt (1997) synonymized the species *Trachelipus bujori* Radu 1950 with *Trachelipus ratzeburgi* Brandt 1833. Like in the case of *Trachelipus vareae* Radu 1949, Tomescu *et al.* (2015) found morphological differences between *Trachelipus bujori* Radu 1950 and *Trachelipus ratzeburgi* Brandt 1833, proving that *T. bujori* is a valid species. Further, we present several figures with the morphology of the two species (Figs. 5-7).

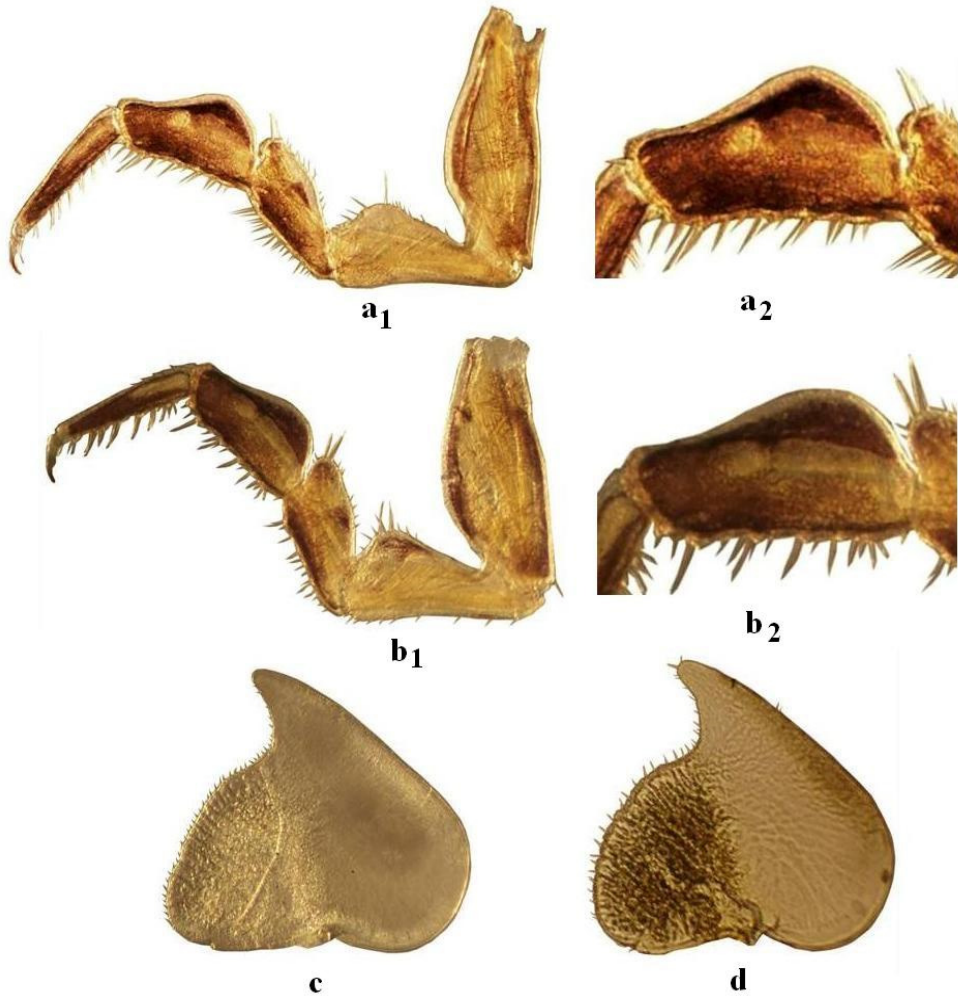


**Figure 5. Comparative dorsal view and glandular pore fields:** a<sub>1</sub>-a<sub>2</sub>. *Trachelipus ratzeburgi*, ♂ 10 x 5 mm, – Ersig (Caraş-Severin county), b<sub>1</sub>-b<sub>2</sub>. *Trachelipus bujori*, ♂ 10.8 x 5.5 mm – Herneacova (Timiș county).



**Figure 6. Comparative cephalic lobes:** a. *Trachelipus ratzeburgi*, ♂ 10 x 5 mm, – Ersig, b. *Trachelipus bujori*, ♂ 10.8 x 5.5 mm – Herneacova; **telson:** c. *Trachelipus ratzeburgi*, ♂ 10 x 5 mm, d. *Trachelipus bujori*, ♂ 10.8 x 5.5 mm, those males.





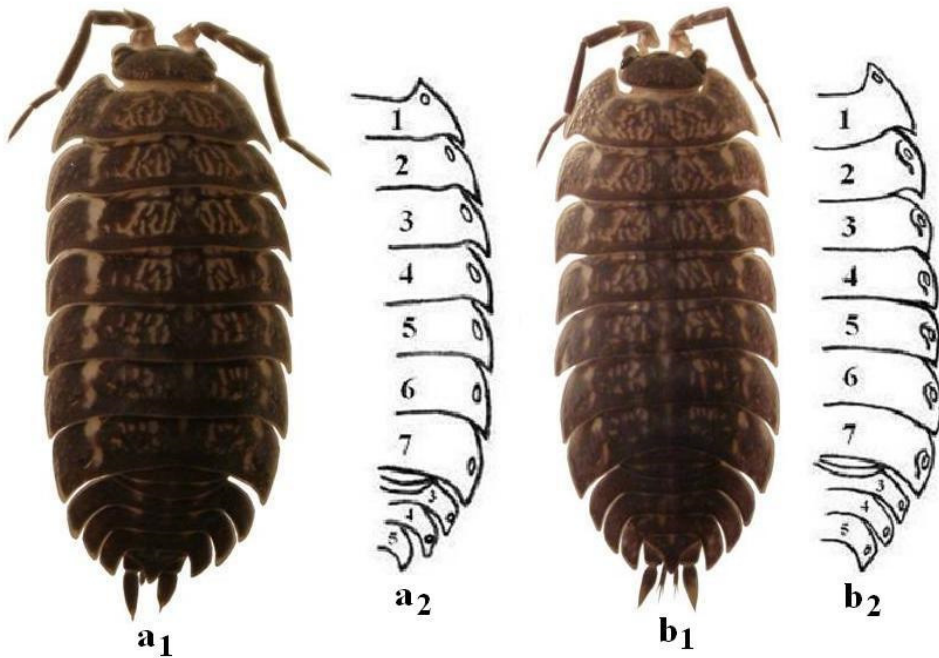
**Figure 7. Comparative pereopods 7 of the males: a<sub>1</sub>-a<sub>2</sub>. *Trachelipus ratzeburgi*, ♂ 10 x 5 mm, – Ersig, b<sub>1</sub>-b<sub>2</sub>. *Trachelipus bujori*, ♂ 10.5 x 5 mm – Meri; **Comparative exopod plopods 1 of males: c. *Trachelipus ratzeburgi*, ♂ 10.5 x 5 mm, –Gârliștei Gorges, d. *Trachelipus bujori*, ♂ 10.5 x 5 mm – Meri.****

*Trachelipus pleoglandulatus* Radu 1950

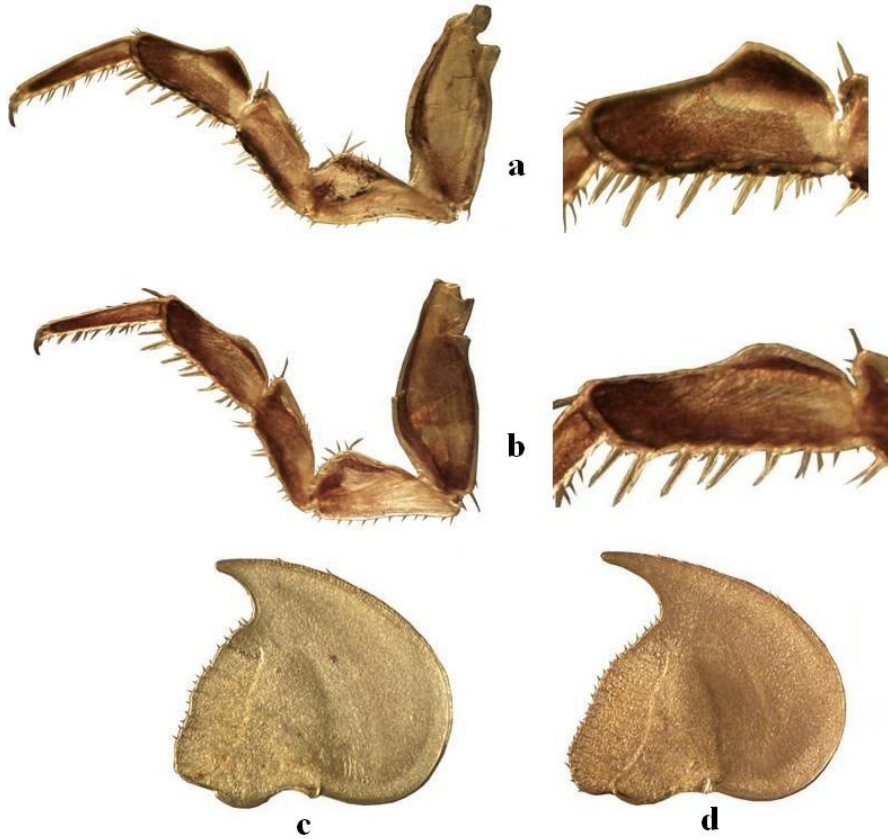
**Ecology:** epigenous species, lives in the litter layer of deciduous forests, in carstic regions, on rocky surfaces, but also on open areas near forests.

**Distribution:** Poiana Ruscă Mountains, Danube Gorges, Baia de Aramă, Parâng Mountains, Mehedinți Mountains.

**Note:** Schmidt (1997) synonymized the species *Trachelipus pleoglandulatus* Radu 1950 with *Trachelipus ratkii* Brandt 1833. Tomescu *et al.* (2015) found specific morphological differences, which we present further, published by the authors (Figs. 8-9).



**Figure 8.** Comparative dorsal view and glandular pore fields: **a<sub>1</sub>, a<sub>2</sub>**. *Trachelipus ratkii* (Brandt, 1833), ♂ 11.5 x 5.5 mm – Milova (Arad county), **b<sub>1</sub>, b<sub>2</sub>**. *Trachelipus pleoglandulatus* Radu, 1950, ♂ 15 x 6 mm – Pecinișcăi Gorges, Cernei Mountains.



**Figure 9. Comparative appendages of males by *Trachelipus rathkii* (Brandt, 1833) and *Trachelipus pleonglandulatus* Radu, 1950: pereiopod 7, a. *T. rathkii*, ♂ 11.5 x 5.5 mm, b. *T. pleonglandulatus*, ♂ 15 x 6 mm; pleopod-exopodites 1, c. *T. rathkii*, ♂ 11.5 x 5.5 mm, d. *T. pleonglandulatus*, ♂ 15 x 6 mm.**

*Trachelipus spinulatus* Radu 1959

**Ecology:** epigenous species, lives in the litter layer of deciduous forests.

**Distribution:** forests in the vicinity of the Câmpeni locality, Arieșului Valley.

*Trachelipus troglobius* Tăbăcaru 1989

**Ecology:** troglobiont species, lives in caves.

**Distribution:** Movila Cave, in Dobrogea.

**Crinocheta: family Agnaridae**

*Orthometopon romanicus* Tomescu, Teodor 2016

**Ecology:** epigenous species, lives on sandy areas with reeds and sedges, in layers of thick detritus and high soil humidity.

**Distribution:** Sacalin Island, Portița, Grindul Lupilor in the Danube Delta.

**Crinocheta: family Armadillidae**

*Armadillidium banaticum* Verhoeff 1907

**Ecology:** epigenous species, lives in the litter layer, under rocks and at the base of rocky walls.

**Distribution:** Banat, Mehadia, Beului Valley, Șușarei.

**Conclusions**

In the Romanian fauna there are 32 endemic isopod species: 5 troglobiont species, 2 troglophilous species, 6 edaphic species and 19 epigeic species.

Twenty endemic isopod species are classified in lower taxonomic categories: the families Trichoniscidae and Platyarthridae, small-sized species, of several mm in length and low mobility.

All endemic species have a limited distribution; the majority lives in habitats located in montane regions. With a single exception, the epigenous species live in the litter layer of forests.

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