

## Terrestrial isopods (Isopoda, Crustacea) from the “Danube Delta” Biosphere Reserve

Nicolae Tomescu<sup>1,✉</sup> and Lucian Alexandru Teodor<sup>1</sup>

**SUMMARY.** The authors describe the fauna of terrestrial isopods and the habitats analysed in 13 sites located in the Biosphere Reserve “Danube Delta”: Letea Forest, Periprava Village, the Levees Maliuc, Caraorman, Dunavăț, Sfântu Gheorghe, Sacalin Island, Popina Island, Enisala Fortress, Sălcioara (6 Martie) Forest, Doloșman Hill, Gura Portiței and Lupilor Levee. In the investigated habitats 14 species of terrestrial isopods were identified: *Hyloniscus riparius*, *Haplophthalmus orientalis*, *Cylisticus convexus*, *Porcellionides* (= *Metoponorthus*) *pruinus*, *Orthometopon romanicus* n. sp., *Protracheoniscus politus*, *Porcellium collicola*, *Trachelipus arcuatus*, *Trachelipus nodulosus*, *Trachelipus rathkii*, *Trachelipus ratzeburgi*, *Trachelipus squamuliger*, *Armadillidium vulgare*, *Armadillidium jaqueti*.

**Keywords:** Danube Delta, terrestrial isopods.

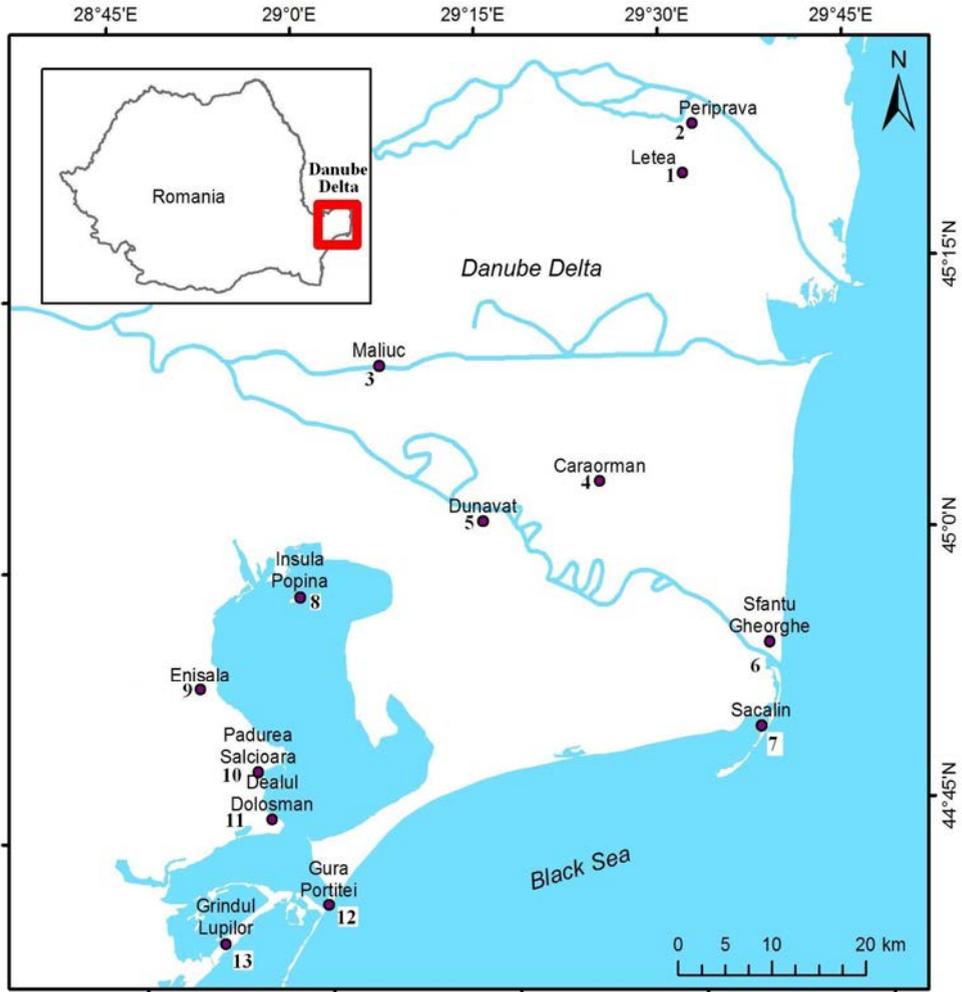
### Introduction

Research to investigate the flora and fauna of the “Danube Delta” Biosphere Reserve was conducted in the period 1991-1994 under the supervision of the biologist Dr. Vasile Oțel from the Natural Sciences Museum “Danube Delta”, in Tulcea, Tulcea County. Researchers from Bucharest, Cluj, Iași and Constanța participated in this study. Tomescu N. collected terrestrial isopod samples from 13 sites located in the “Danube Delta” Biosphere Reserve: Letea Forest, Periprava Village, the levees Maliuc, Caraorman, Dunavăț, Sfântu Gheorghe, Sacalin Island, Popina Island, Enisala Fortress, Sălcioara (6 Martie) Forest, Doloșman Hill, Gura Portiței and Lupilor Levee (Fig. 1).

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<sup>1</sup> Babeș-Bolyai University, Faculty of Biology and Geology, Department of Taxonomy and Ecology, Cluj-Napoca, Romania.

✉ **Corresponding author:** Nicolae Tomescu, Babeș-Bolyai University of Cluj-Napoca, Department of Taxonomy and Ecology, 5-7 Clinicilor Str., 400006, Cluj-Napoca, Romania.  
E-mail: nicolaetomescu36@gmail.com



**Figure 1.** Map of the study sites investigated in the years 1991-1994, located in the Biosphere Reserve “Danube Delta”: 1 – Letea Forest, 2 – Periprava Village, 3 –Maliuc Levee, 4 – Caraorman Levee, 5 – Dunavăț Levee, 6 – Sântu Gheorghe Levee, 7 – Sacalin Island, 8 – Popina Island, 9 – Enisala Fortress, 10 – Sălchioara (6 Martie) Forest, 11 – Dolosman Hill, 12 – Gura Portiței, 13 – Lupilor Levee.

Fourteen isopod species were identified in the investigated sites, covering a wide range of ecological conditions (habitat types and microhabitats). The species were identified using specific literature: Radu 1983, 1985, Schmalfuss 1993, 2003, Schmidt 1997, Tomescu 1992, Tomescu *et al.* 2015, Tomescu and Teodor 2016, Vandel 1962, Verhoeff 1907, Wächtler 1937.

Giurginca and Curcič (2003) and Tăbăcaru and Boghean (1989) published terrestrial isopod species lists from Dobrogea, where Popina Island and Enisala are the only locations from the “Danube Delta” Biosphere Reserve mentioned. Tomescu (1992) published terrestrial isopod species from the Caraorman Levee.

The investigated habitats are particularly rich in microhabitats, offering a large variety of environmental conditions for isopods with different ecological requirements (paludal, forest and grassland species).

### **Materials and methods**

Qualitative samples were collected from the 13 sites mentioned in the introduction. Samples were collected directly with tweezers and by using a leaf litter sieve. Isopods were preserved in 70% alcohol. Identification of species followed morphological identification keys from the specialized literature.

The number of samples collected and number of habitats and microhabitats differ in the 13 investigated sites, so a quantitative analysis is impossible to perform. Estimates of the terrestrial isopod fauna were based only on qualitative information. The most frequently sampled habitats in 1991 and 1992 were those present on the Caraorman and Maliuc levees. The other sites were investigated in only one year and over short periods of time, of 1-2 days, following the program established by the project director, biologist dr. Vasile Oțel, who provided transportation of the researchers to the study sites in the Danube Delta.

### **Description of study site habitats**

**Letea Forest** is dominated by species of poplars, willows and shrubs, growing mostly on dry soil, which is locally interrupted by patches of humid soil on uneven terrain. Thirteen samples from under litter and tree bark from fallen trees were collected in 1993.

**Periprava Village** is located in the vicinity of Letea forest and has alternating patches of humid soil with rush and dry soils with rare willows and grasslands. The soil of the Danube bank is covered in plant detritus and wood deposits by the houses. Four samples were collected from this area in 1993.

**Maliuc Levee.** Seven samples were collected from the banks of the Sulina channel, in 1991 and 1992, from habitats dominated by poplars and willows. Isopods were sieved with a leaf litter sieve and collected under rocks and fallen trees.

**Caraorman Levee.** Caraorman village is surrounded by forests dominated by poplar and willow, oak and ash, or poplar and ash, with forest glades, as well as by grasslands and marshes and rush- covered channel banks. This study site is characterised by a high diversity of habitats and microhabitats. Twenty-five samples were collected from this site in the years 1991-1992.

**Dunavăț Levee.** Eight litter samples were collected in 1994 from the following habitats: a willow forest with humid soil, under fallen tree trunks, on grasslands, under rocks and around an abandoned building.

**Sfântu Gheorghe Levee.** Nine samples were collected in 1994 from the following habitats: a poplar forest, an alder forest at the outskirts of Sfântu Gheorghe locality, humid soil flood plains with sedges and rush and channel banks with grassy vegetation.

**Sacalin Island.** Three samples were collected in 1994 from very humid sandy soil, dominated by rush and sedges and from the edges of rush patches, with less humid soil and with plant detritus.

**Popina Island.** Six samples were collected in 1992 from grasslands with moderate soil humidity and from the lake shore.

**Enisala Fortress.** One sample was collected in 1992, from a dry, rocky-soil grassland located at the base of the fortress.

**Sălcioara (6 Martie) Forest** is mostly composed of oak trees and glades and a pine plantation with humid soil. Five samples were collected here in 1992.

**Doloșman Hill.** Six samples were collected in 1992 from areas with grassy vegetation, dry soil and lake shore with very humid soil.

**Gura Portiței.** Two soil samples were collected in 1994 from areas with sandy, highly humid soil, covered with rush and a thick plant detritus layer, and from areas without rush and with moderate soil humidity.

**Lupilor Levee.** Three samples were collected in 1994 from areas with sandy, highly humid soil, covered with rush and Sea Buckthorn, and from areas without rush, with dry soil and plant detritus.

## Results and discussion

### Terrestrial isopod species from Letea Forest

Five terrestrial isopod species were identified in the samples collected from Letea Forest: *Hyloniscus riparius*, *Trachelipus arcuatus*, *Trachelipus rathkii*, *Trachelipus ratzeburgi* and *Armadillidium vulgare* (Table 1). The diversity of the investigated microhabitats is reflected by the diversity of the ecological preferences of the species: hygrophilous species (*H. riparius*), forest species (species from the genus *Trachelipus*) and grassland species (*A. vulgare*). *H. riparius*, *T. rathkii* and *A. vulgare* were present in large populations.

### Terrestrial isopod species from Periprava Village

Five terrestrial isopod species were found in Periprava Village too: *Hyloniscus riparius*, *Porcellionides* (= *Metoponorthus*) *pruinus*, *Trachelipus rathkii*, *Armadillidium vulgare*, *Armadillidium jaqueti* (Table 1).

**Table 1.**

Terrestrial isopod species that were identified in the habitats of the “Danube Delta” Biosphere Reserve

Species/ Sites	1	2	3	4	5	6	7	8	9	10	11	12	13
<i>Hyloniscus riparius</i> C. L. Koch, 1838	+	+	-	+	+	+	-	-	-	-	+	-	-
<i>Haplophtalmus orientalis</i> Radu Gh. V., Radu V. V., Cădariu M., 1955	-	-	-	+	-	-	-	-	-	-	+	-	-
<i>Cylisticus convexus</i> De Geer, 1778	-	-	-	+	-	-	-	-	-	-	-	-	-
<i>Porcellionides</i> (= <i>Metoponorthus</i> ) <i>pruinus</i> Brandt, 1833	-	+	+	+	-	-	-	+	+	-	+	-	-
<i>Orthometopon romanicus</i> Tomescu, Teodor, 2016	-	-	-	-	-	-	+	-	-	-	-	+	+
<i>Protracheoniscus politus</i> C. L. Koch, 1841	-	-	-	-	-	-	-	-	-	+	-	-	-
<i>Porcellium collicola</i> Verhoeff, 1907	-	-	-	-	-	-	-	-	-	+	-	-	-
<i>Trachelipus arcuatus</i> Budde- Lund, 1885	+	-	+	+	-	-	-	-	-	-	-	-	-
<i>Trachelipus nodulosus</i> C. L. Koch, 1838	-	-	-	-	-	-	-	+	+	-	-	-	-
<i>Trachelipus rathkii</i> Brandt, 1833	+	+	+	+	+	+	+	-	-	-	-	+	+
<i>Trachelipus ratzeburg</i> Brandt, 1833	+	-	-	-	-	-	-	-	-	-	-	-	-

Species/ Sites	1	2	3	4	5	6	7	8	9	10	11	12	13
<i>Trachelipus squamuliger</i> Verhoeff, 1907	-	-	-	-	-	-	-	-	-	+	-	-	-
<i>Armadillidium vulgare</i> Latreille, 1804	+	+	-	+	+	+	-	-	+	+	+	-	+
<i>Armadillidium jaqueti</i> Dollfus, 1897	-	+	+	-	+	-	-	+	-	-	-	-	-
<b>Total species</b>	<b>5</b>	<b>5</b>	<b>4</b>	<b>7</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>4</b>	<b>4</b>	<b>2</b>	<b>3</b>

**Stuied sites:** **1** – Letea Forest, **2** – Periprava Village, **3** – Maliuc Levee, **4** – Caraorman Levee, **5** – Dunavăț, **6** – Sântu Gheorghe Levee, **7** – Sacalin Island, **8** – Popina Island, **9** – Enisala Fortress, **10** – Sălchioara (6 Martie) Forest, **11** – Doloșman Hill, **12** – Gura Portiței, **13** – Lupilor Levee.

### Terrestrial isopod species from the Maliuc Levee

Four species of terrestrial isopods were found in the samples from Maliuc Levee: *Porcellionides pruinosus*, *Trachelipus arcuatus*, *T. rathkii* and *Armadillidium jaqueti*. *T. arcuatus* and *A. jaqueti* (Table 1) were found in relatively large populations.

### Terrestrial isopod species from the Caraorman Levee

Seven terrestrial isopod species were identified in the habitats and microhabitats of the Caraorman Levee, all with different ecological requirements: *Hyloniscus riparius*, *Haphlophthalmus orientalis*, *Clysticus convexus*, *Porcellionides pruinosus*, *Trachelipus arcuatus*, *T. rathkii* and *Armadillidium vulgare* (Table 1). In the dry soil of the Caraorman forests we found numerous individuals of *Armadillidium vulgare*, usually a grassland species. Probably, the higher temperatures in the Delta forests favour the dispersal of *A. vulgare* in this habitat type. We found here large populations of the following species: *Trachelipus arcuatus*, *T. rathkii* and *A. vulgare*.

### Terrestrial isopod species from the Dunavăț Levee

Four terrestrial isopod species were found in the samples collected from the Dunavăț Levee: *Hyloniscus riparius*, *Trachelipus rathkii*, *Armadillidium vulgare* and *A. jaqueti* (Table 1). The following species had large populations: *Trachelipus rathkii* and *Armadillidium vulgare*.

### Terrestrial isopod species from the Sfântu Gheorghe Levee

Three terrestrial isopod species were identified in the samples collected from the Sfântu Gheorghe Levee: *Hyloniscus riparius*, *Trachelipus rathkii* and *Armadillidium vulgare* (Table 1). We found here large populations of the following species: *Trachelipus rathkii* and *A. vulgare*.

### **Terrestrial isopod species from the Sacalin Island**

Two terrestrial isopod species were identified from the samples collected on Sacalin Island (Table 1): *Orthometopon romanicus* n. sp., collected only from very humid soil patches covered with rush and sedges, *Trachelipus rathkii*, collected from areas covered with plant detritus. *O. romanicus* had large populations, with hundreds of individuals per square meter.

### **Terrestrial isopod species from the Popina Island**

Three terrestrial isopod species were identified from the samples collected on Popina Island: *Porcellionides pruinosus*, *Trachelipus nodulosus* and *Armadillidium jaqueti* (Table 1). *P. pruinosus* and *T. nodulosus* had large populations.

### **Terrestrial isopod species from the Enisala Fortress**

Three terrestrial, grassland isopod species were found in the samples collected at Enisala Fortress: *Porcellionides pruinosus*, *Trachelipus nodulosus* and *Armadillidium vulgare* (Table 1). All three species had small populations.

### **Terrestrial isopod species from the Sălcioara (6 Martie) Forest**

Four terrestrial isopod species were identified in the samples collected in the Sălcioara (6 Martie) Forest: *Protracheoniscus politus*, *Porcellium collicola*, *Trachelipus squamuliger* (newly mentioned species for Romania's fauna by Tomescu et al. 2015) and *Armadillidium vulgare* (Table 1). *P. collicola* and *T. squamuliger* had large populations.

### **Terrestrial isopod species from the Doloşman Hill**

Four terrestrial isopod species were identified in the samples collected from the Doloşman Hill: *Hyloniscus riparius*, *Haplophtalmus orientalis*, *Porcellionides pruinosus* and *Armadillidium vulgare* (Table 1).

### **Terrestrial isopod species from Gura Portiţei**

Two terrestrial isopod species were identified in the samples collected from Gura Portiţei: *Orthometopon romanicus* and *Trachelipus rathkii* (Table 1). *O. romanicus* lives in microhabitats that are similar to those from Sacalin Island. Here too, its population counts hundreds of individuals per square meter.

### Terrestrial isopod species from Lupilor Levee

Three terrestrial isopod species were identified in the samples collected from Lupilor Levee: *Orthometopon romanicus*, in habitats similar to those on Sacalin Island and Gura Portiței, *Trachelipus rathkii* and *Armadillidium vulgare* (Table 1).

The researches in continental Dobruja mentioned more terrestrial isopod species. Tăbăcaru and Boghean (1989) mentioned 30 species, Giurginca and Ćurčić (2003) mentioned 41 species. Thus, terrestrial isopod communities from continental Dobruja are more ecological diverse than the Danube Delta ones (Table 1).

### Conclusions

Fourteen isopod species were identified in the 13 investigated study sites, located in the Biosphere Reserve “Danube Delta”, of which one, *Orthometopon romanicus*, has been described as new for science by Tomescu and Teodor in 2016.

Species widely spread in the investigated sites were: *Hyloniscus riparius*, *Porcellionides* (= *Metoponorthus*) *pruinus*, *Trachelipus rathkii* and *Armadillidium vulgare*.

Species with a limited spread in the investigated sites were: *Haplophthalmus orientalis*, *Cylisticus convexus*, *Porcellium collicola*, *Trachelipus nodulosus*, *T. ratzeburgi*, *T. squamuliger* and *Orthometopon romanicus*.

The number of terrestrial isopod species varies in the different investigated sites according to the number of habitat types and microhabitats, and with the ecological requirements of the species. A relatively large number of species were identified on the Caraorman Levee – seven species – Letea Forest and Periprava Village - each with five species – Maliuc and Dunavăț levees, Sălchioara Forest and Doloșman Hill– each with four species.

The species: *Hyloniscus riparius*, *Orthometopon romanicus*, *Porcellionides pruinus*, *Trachelipus rathkii* and *Armadillidium vulgare* had large populations in the habitats they inhabit.

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