

=== SHORT COMMUNICATION ===

Contributions to the knowledge of amphipod fauna (Crustacea, Amphipoda) from the Danube Delta, Romania

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*Article history: Received 8 April 2020; Revised 7 December 2020;
Accepted 10 December 2020; Available online 20 December 2020.*

Abstract. The amphipod species *Pontogammarus maeoticus* (Sovinskij, 1894) was identified in two locations from the Danube Delta, Romania (Sfântu Gheorghe and Sulina beaches) in July 2019. This is an eurybiont species, able to withstand high salinity variations characteristic to mixing fresh and sea waters. The individuals presented a special character in their morphology, a depression on the basis of pereopod V. The present paper contributes to the knowledge of existing amphipod fauna from the Danube Delta, in the Black Sea coast area.

Keywords: monospecific community, *Pontogammarus maeoticus*, varying intraspecific character.

Introduction

Amphipods (Order Amphipoda, Supraorder Peracarida, Class Malacostraca, Väinölä *et al.*, 2008) are a group of crustaceans with key roles in water quality assessment, ecological or ecotoxicological studies (Glazier, 2014). They are considered bioindicators due to their large distribution, their ecological role in the food chain, their susceptibility to pollutants, and due to their effortless reproduction in new environments (Neuparth *et al.*, 2002; Alonso *et al.*, 2009;

Grabowski *et al.*, 2014). From an ecological perspective, amphipods have an important role in aquatic ecosystems as they contribute to nutrient recycling, they participate in the process of water purification and they represent a high-quality source of food for a variety of animals (Muskó, 1990; Väinölä *et al.*, 2008; Glazier, 2014).

The Danube Delta is located in the northern part of the Romanian Black Sea coast, being the largest wetland in Europe (Gâstescu and Ştiucă, 2008), and the newest land formation in Romania. Previous data on the Danube Delta amphipod fauna were included in more extensive research dealing with benthic invertebrate communities (Graf *et al.*, 2008, 2014; Stoica *et al.*, 2014; Pavel *et al.*, 2017) or multiple biological communities (Cristescu *et al.*, 2003; Tudorancea, 2006; Stoica *et al.*, 2013).

The present paper reports data on amphipods from two locations in the Danube Delta, near the Black Sea coast: a monospecific community was found in all sampling points, probably due to a highly variable salinity in the seashore habitat near the Danube mouth, suitable only for an eurybiont species.

Materials and methods

Amphipods were collected from two locations in the Danube Delta, Sulina and Sfântu Gheorghe, on the 6th and 9th of July 2019. Sulina beach begins at the homonymous channel discharge point and expands South (INCDPM, 2014). while Sfântu Gheorghe beach is located North from the mouth of the homonymous Danube channel (Savu and Comănescu, 2008).

Seven sampling points (A to G) were considered on Sulina beach (45.0859N, 29.4132E) and 7 points (1 to 7) on Sfântu Gheorghe beach (44.5401N, 29.3724E) (Fig. 1). On both locations, six points were situated on the Black Sea coast, on a 2 km long stretch, and one was situated on the Danube River shore (point G in Sulina and point 7 in Sfântu Gheorghe) (Fig. 1). The qualitative samples were collected using a 300 µm mesh size net and they were preserved in the field in 96 % ethanol. Physico-chemical parameters (Total Dissolved Solids TDS, conductivity and pH) were measured from a total of 6 water samples (3 from Sulina and 3 from Sfântu Gheorghe), using a Hanna HI98194 multiparameter. Taxonomical identifications were performed in the laboratory, using a Nikon SZM 645 dissecting microscope and a Nikon YS100 microscope, and appropriate keys (Cărăușu *et al.*, 1955).

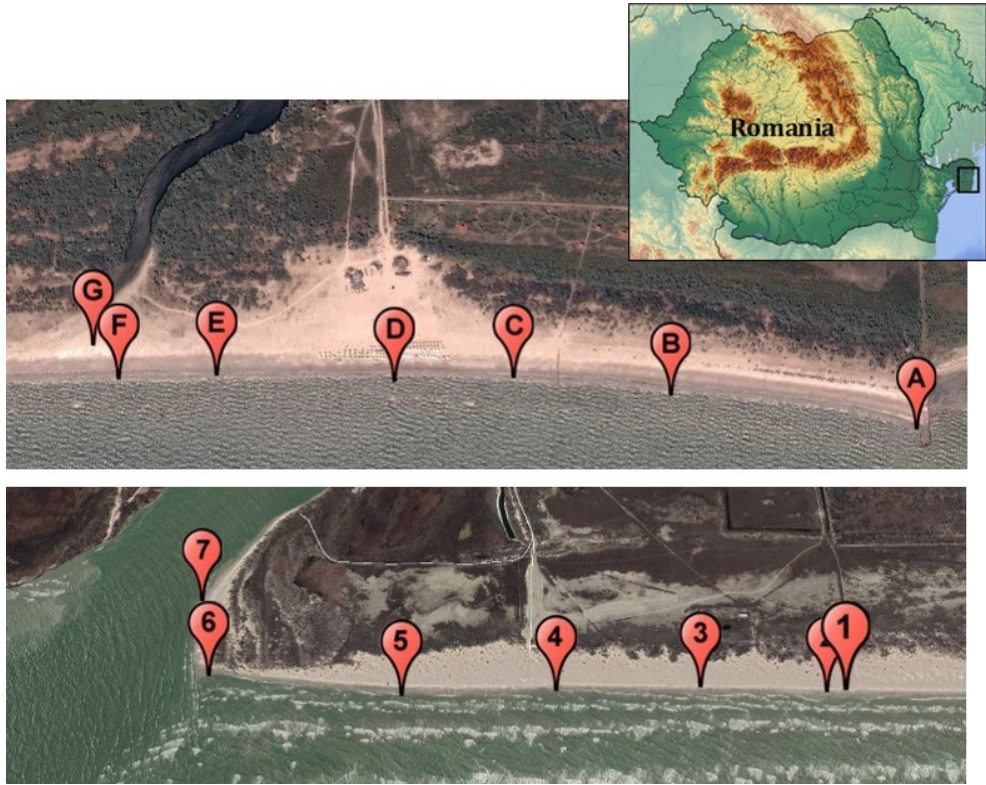


Figure 1. The two sampling locations: Sulina beach (top) – points A to G; and Sfântu Gheorghe beach (bottom) – points 1 to 7 (Image source: Google Earth Pro - 7.3.2.5491).

Results and discussions

Salinity (expressed as TDS) recorded the highest variations between the sampling points (Fig. 2), due to the mixture of sea and freshwater. Lower salinity values at Sfântu Gheorghe sampling points were caused by higher discharge of the Danube compared to Sulina channel (Tockner *et al.*, 2009). pH had circumneutral values in both locations, with slight alkaline ones in Sfântu Gheorghe.

A total number of 5442 individuals (2561 from Sulina beach and 2881 from Sfântu Gheorghe beach) were identified (Table 1), adults and juveniles, all belonging to one species, *Pontogammarus maeoticus* (Sovinskij, 1894). This species is part of Family Pontogammaridae, Suborder Senticaudata (Lowry and Myers, 2013, 2017), and represents a Ponto-Caspian endemism (Cristescu *et al.*, 2003; Nahavandi *et al.*, 2013). *P. maeoticus* distribution comprises the Black,

Caspian, and Azov Seas as well as the Danube, Dniester, Don and Bug Rivers (Barnard and Barnard, 1983; Stock *et al.*, 1998). In Romania, *P. maeoticus* is found alongside sandy beaches (Vasile Roaită, Agigea, Mamaia, Midia, Portița), around Danube’s estuaries (Sacalin Island seashore, Sărățuri belt), in the Danube Delta, and in Lake Siutghiol (Cărăușu *et al.*, 1955). *P. maeoticus* is an eurybiont species that lives in the sand of fresh, brackish, and marine waters, buried from 0 to 10 cm deep (Cărăușu *et al.*, 1955). *P. maeoticus* individuals were observed to emit bioluminescence in Sfântu Gheorghe and Sulina, both in dead and alive individuals (Copilaș-Ciocianu and Pop, 2020).

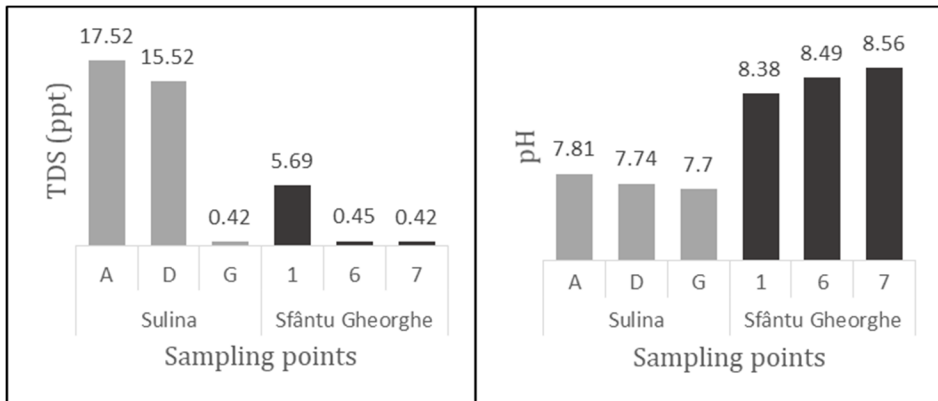


Figure 2 Total Dissolved Solids (TDS) and pH values of water samples from Sulina and Sfântu Gheorghe sampling points

Table 1 Number of collected *Pontogammarus maeoticus* individuals (No. ind.) from each sampling location

Location	Sampling point	No. ind.	Observations
Sulina	A	259	numerous juveniles
	B	638	
	C	599	3 individuals with a depression on the basis of pereopod V
	D	517	1 individual with a depression on the basis of pereopod V
	E	251	3 individuals with a depression on the basis of pereopod V
	F	297	3 individuals with a depression on the basis of pereopod V
	G	0	
Sfântu Gheorghe	1	810	
	2	161	
	3	898	
	4	192	
	5	202	
	6	595	
	7	23	

The key features of *P. maeoticus* are depicted in Figure 3. The body is robust and has a tall curve (Cărbăușu *et al.*, 1955; Kokataş, 2003). Antenna I is slightly shorter than the second one and has a robust peduncle, especially its first segment. The peduncle of antenna II has a comb-like appearance (Fig. 3a). The mandibular palp is characteristic, with long, fine setae on the ventral margins of second and third segments (Fig. 3b). Gnathopods have all segments covered in numerous setae, the propodus has multiple long, curved setae on the ventral side (Fig. 3c). Uropod III has a long endopodite, almost reaching half of the exopodite, with setae on the interior margin. Its exopodite is surrounded by long setae, with two series of external spines (Fig. 3d). The telson is composed of two lobes that have 3-4 apical spines and a pair of fine setae on their surface (Fig. 3e). Pereiopod V has an oval basis; its posterodistal corner is well developed, with short setae on the posterior margin (Fig. 3g) (Cărbăușu *et al.*, 1955; Kokataş, 2003). A total number of 10 individuals presented a depression on the posterior margin of the basis of pereiopod V (Fig. 3f). This character appeared on one or both pereiopods. The other specimens did not present such depression, having a relatively plain margin. This feature could be interpreted as a varying intraspecific character.

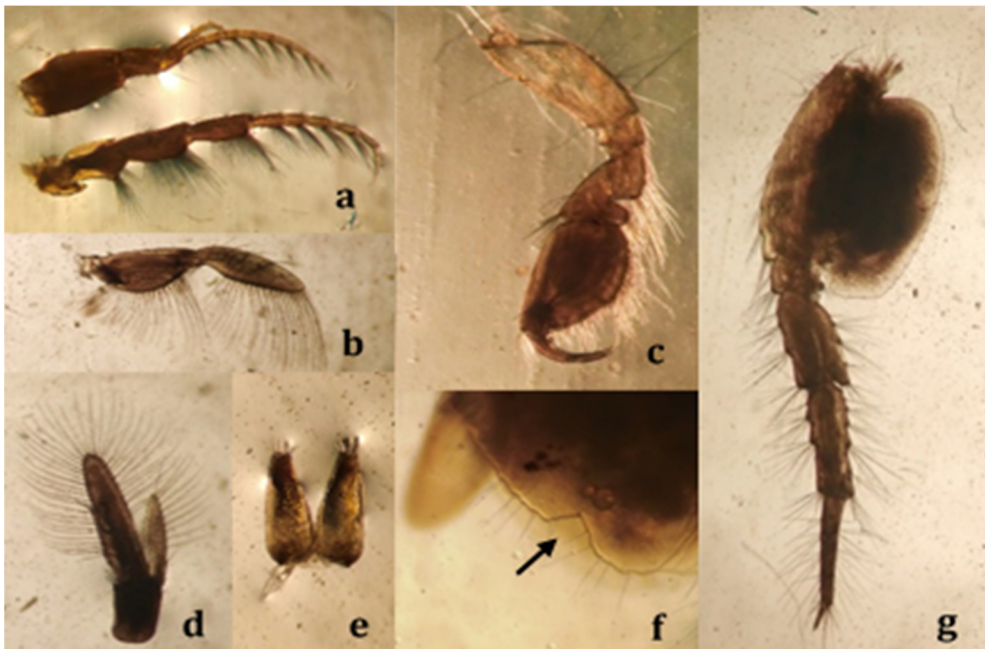


Figure 3. Key identification characters of *Pontogammarus maeoticus* (male): **a.** antennae (I, II); **b.** mandibular palp; **c.** gnathopod II; **d.** uropod III; **e.** telson; **f.** depression on the basis of pereiopod V; **g.** pereiopod V.

The presence of only one species in the samples collected from Sulina and Sfântu Gheorghe disagrees from previous data from the literature. Pavel *et al.* (2017) identified 10 amphipod species in the Sfântu Gheorghe freshwater meanders, with *Chelicorophium curvispinum* (G.O. Sars, 1895) as the most abundant. The Joint Danube Survey reports on macroinvertebrate also cited more than 10 amphipod species in the lower Danube River (Graf *et al.*, 2008, 2014). At the confluence of the Danube with the Black Sea, near Sfântu Gheorghe locality, Stoica *et al.* (2013, 2014) found 3 amphipod species that dominated the macroinvertebrate communities in terms of abundance: *C. curvispinum*, *Dikerogammarus villosus* (Sowinsky, 1894) and *D. haemobaphes* (Eichwald, 1841). Cristescu *et al.* (2003) identified *P. maeoticus* in the Black Sea at Sulina and Sfântu Gheorghe, and *Pontogammarus robustoides* (Sars, 1894) in the Danube River at the same locations.

The monospecific amphipod community found in Sulina and Sfântu Gheorghe can only be explained by the variable salinity values caused by the mixing of fresh and seawaters, suitable only for eurybiont species as *P. maeoticus*. This species is known to withstand high salinity and temperature variations (Soldatova, 1986; Casties *et al.*, 2019), and is therefore considered to have the potential of a successful invasive species (Baltazar-Soares *et al.*, 2017). However, the absence of the species in the Danube River mouth should be investigated further.

Conclusions

The present paper found that the amphipod fauna of Sfântu Gheorghe and Sulina beaches consists of only one eurybiont species: *P. maeoticus*. Both adult and juvenile individuals were identified, few presenting a varying intraspecific character on the basis of pereopod V.

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