

**FAUNISTIC OVERVIEW UPON THE AQUATIC MALACOSTRACANS
(CRUSTACEA, MALACOSTRACA) OF CEFA NATURE PARK
(CRIȘANA, ROMANIA)**

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ABSTRACT

This is a preliminary study on the aquatic epigean malacostracan fauna of the Cefa Nature Park. Four malacostracan species belonging to the orders Amphipoda, Isopoda and Decapoda have been identified. Some discussions about the ecology of the identified species are given. The amphipod species are discussed from a biogeographic point of view. Because they are considered tertiary relicts it is possible that the ecological and geological conditions in the study area were relatively stable in recent geological time and not very affected by anthropic impact, thus making the Cefa Nature Park suitable for the conservation of *Niphargus valachicus*, species declared as "vulnerable" on the IUCN Red List.

RÉSUMÉ: Aperçu sur la faunistique malacostraces aquatique (Crustacea: Malacostraces) de Parc Naturel Cefa (Crișana, Roumanie).

Ce travail est une étude préliminaire sur la faune aquatique Malacostracé épigée du Parc Naturel Cefa. Dans les échantillons ont été identifiés quatre espèces appartenant à la Amphipodes, Isopodes et Décapodes. Aussi, des discussions sur l'écologie des espèces identifiées sont données. Les espèces d'amphipodes sont discutées d'un point de vue biogéographique parce qu'ils sont considérés comme des reliques tertiaires et il est possible que les conditions écologiques et géologiques de la zone d'étude ont été relativement stables dans le temps géologique récente. Par conséquent ces espèces ne sont pas très affectée par l'impact anthropique, ce qui rend le Parc Naturel Cefa approprié pour la conservation de l'espèce *Niphargus valachicus* qui est déclarée «vulnérable» sur la Liste rouge de l'IUCN.

REZUMAT: Studiu faunistic asupra malacostraceelor acvatice din Parcul Natural Cefa (Crișana, România).

Acesta este un studiu preliminar asupra faunei de malacostracee acvatice epigeice ale Parcului Natural Cefa. Patru specii de malacostracee au fost identificate aparținând ordinelor Amphipoda, Isopoda și Decapoda. De asemenea, sunt prezentate câteva discuții asupra ecologiei speciilor identificate. Speciile de amfipode sunt discutate din punct de vedere biogeografic. Deoarece sunt considerate relictate terțiare, probabil condițiile ecologice și geologice din zona de studiu au fost relativ stabile în timpul geologic recent și nu au fost afectate foarte mult de impactul antropic, astfel Parcul Natural Cefa este adecvat pentru conservarea speciei *Niphargus valachicus*, specie declarată vulnerabilă pe Lista Roșie a IUCN.

INTRODUCTION

The Class Malacostraca comprises a wide variety of crustaceans such as crabs, crayfish, shrimp, scud and woodlice that live in marine, freshwater and even terrestrial habitats (Radu and Radu, 1967). They play a major role in the ecosystem functionality, due processes like converting organic matter and detritus into biomass and are also a food source for numerous species (Welton, 1979). Amphipods and decapods are used as biological indicators for water quality because they are sensitive to increased levels of nitrites (Camargo and Alonso, 2006), soluble phosphorus (Pârvulescu and Hamchevici, 2010) and other chemical pollutants (Grabowski and Pešić, 2007). Isopods like *Asellus aquaticus* are tolerant to some pollutants and are therefore used in monitoring water quality (Maltby, 1991).

The distribution and ecology of malacostracans, with few exceptions, was poorly studied in the Romanian territory. High resolution maps regarding species distribution are not available despite their wide occurrence.

This is the first faunistic study conducted on the malacostracan crustaceans from the Cefa Nature Park.

MATERIAL AND METHODS

Cefa Nature Park covers an area of 5002 ha. The park reaches the Romanian-Hungarian border in the north-west, the Târian Canal (a canal that connects the rivers Crişul Repede and Crişul Negru) in the east and the Rădvani Forrest in the south (Fig. 1). The aquatic habitats are represented by fishponds that cover around 700 ha and a mosaic of drainage canals that are common throughout the pannonic steppes and marshes.

Qualitative samples were collected with a 250 µm mesh size benthic net. Specimens were preserved in Eppendorf plastic tubes in 90% ethanol. Decapods were captured using a baited crayfish mesh trap. Collection of the samples took place in March 2010. Species identification was carried out using the identification keys of the following authors: for Amphipoda - Cărauşu et al. (1955), for Isopoda - Radu (1985) and for Decapoda - Băcescu (1967), and Pârvulescu (2009).

Seven sampling stations were investigated (Fig. 1). The sampling stations with a short description and GPS coordinates are listed below:

1. Ateaş pond, muddy substrate, GPS: 46°55'26''N, 21°36'56''E;
2. Ateaş drainage canal - average depth 2 m, width approximately 10 m, scarce aquatic vegetation, muddy and sandy substrate, GPS: 46°55'16''N, 21°36'30''E;
3. Canal 3 - average depth 1 m, width around 3 m, muddy substrate, GPS: 46°54'40''N, 21°38'34''E;
4. Canal 4 - average depth 1 m, width around 6 m, muddy substrate, GPS: 46°55'20''N, 21°37'29''E;
5. Canal that supplies lake 14 with water - average depth 1.5 m, width around 3 m, muddy substrate, GPS: 46°54'33''N, 21°39'26''E;
6. Lake 14, muddy substrate, GPS: 46°54'15''N, 21°38'50''E;
7. Canal near the Rădvani Forrest - average depth 0.5 m, width around 2.5 m, muddy substrate covered with leaves, GPS: 46°54'08''N, 21°39'15''E.

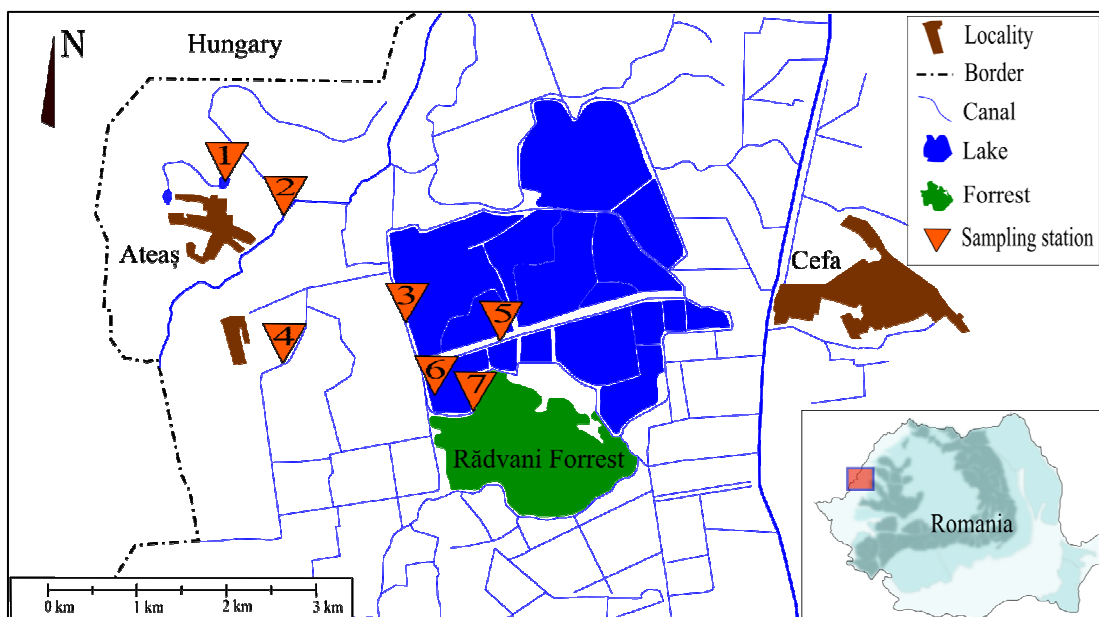


Figure 1: Distribution of the sampling stations in Cefa Nature Park study area.

RESULTS AND DISCUSSION

A total of four malacostracan species were identified: two species of amphipods belonging to the families Niphargidae - *Niphargus valachicus* Dobreaanu and Manolache 1933 and Crangonictyidae - *Synurella ambulans* Müller 1846, one isopod species belonging to the family Asellidae - *Asellus aquaticus* Linnaeus 1758, and one decapod species belonging to the family Astacidae - the narrow-clawed crayfish *Astacus leptodactylus* Eschscholtz 1823. Similar assemblages of species were reported by Hungarian authors in nearby Hungarian regions, representing the same lowland habitat (Lantos, 1986, Puky et al., 2005, Borza et al., 2010). The association between *N. valachicus*, *S. ambulans* and *A. aquaticus* is common throughout the lowland regions of Romanian territory, in ponds, lakes and slow running waters (Cărăușu et al., 1955, Copilaș, unpublished data). This type of association was previously reported in Turkey (Akbulut et al., 2001).

Table 1: Species presence/absence in the Cefa Nature Park.

Species	Sampling stations						
	1	2	3	4	5	6	7
<i>Niphargus valachicus</i> Dobreaanu and Manolache 1933	-	+	+	+	+	-	+
<i>Synurella ambulans</i> Müller 1846	+	+	+	+	+	+	-
<i>Asellus aquaticus</i> Linnaeus 1758	+	+	+	+	+	+	+
<i>Astacus leptodactylus</i> Eschscholtz 1823	-	+	-	+	-	-	+

Niphargus valachicus

Due to its morphological particularities *N. valachicus* (Fig. 2) is probably a basal, primitive niphargid. Because of the characteristics of its habitat, it is possible that *N. valachicus* is an euryoecious species, but competitively weak and linked to a degree of conservatism (Sket, 1981). Its geographical range is large and fragmented, being distributed from Slovenia, across Croatia, Hungary and Romania, up to Turkey and Iran (Fišer et al., 2009). This area also corresponds to the extension of former Paratethys Sea during Miocene/Pliocene. From here, the species, probably spread into continental waters through costal lagoons (Sket, 1981). *N. valachicus* is one of the few epigean species that comprise this genus, the majority of niphargids being hypogean (Sket, 1999).

During this study, the species was present only in the canals of Cefa Nature Park, missing from the ponds and lakes (Tab. 1). It was more frequently collected near the banks of the canals in the dense submerge vegetation and between the roots of riparian plants where it finds shelter.

Synurella ambulans

It is the most euryoecious amphipod species of central Europe (Meijering et al., 1995), being common through the lowlands in lakes, ponds, ditches and slow running waters from Central and Eastern Europe to the Middle East (Cărăușu et al., 1955, Konopacka and Blazewicz-Paszkowycz, 2000, Akbulut et al., 2001). It can also be found at higher altitudes if the environmental conditions are adequate, being reported at an altitude of 1600 m (Cărăușu et al., 1955). *Synurella ambulans* (Fig. 2b) can also be found in hypogean waters, it was reported from wells in Hungary and Romania in association with *Asellus aquaticus* and planarians (Cărăușu et al., 1955). This species prefers large densities of macrophytes because its main diet consists of detritus and algae that it consumes from vegetation or from the water bottom (Lantos, 1986).

In the present study, this species was found in every sampling station except the canal near the Rădvani Forest (sampling station number 7). The species was frequently collected from macrophytes alongside the banks of the canals and the benthic zones of lakes and ponds.

Asellus aquaticus

Asellus aquaticus (Fig. 2c) is wide spread throughout the West Palearctic. It is present in a large variety of freshwater habitats like rivers, lakes, springs and even subterranean and brackish waters (Gruner, 1965). It generally avoids marine saline and oligotrophic freshwater habitats like fast-flowing mountain streams (Verovnik et al., 2005). The species is highly tolerant to organic pollution and therefore it is used as an indicator for water quality (Whitehurst, 1991). It is a polyphagous species, spending most of its life on aquatic vegetation but can also be found on the bottom of water bodies (Lantos, 1986).

Due to its ecological plasticity it was encountered at every sampling station during the present study.

Astacus leptodactylus

Indigenous to the Ponto-Caspian areal, its distribution area occupies almost all the Europe, due to its introduction in Western Europe (Souty-Grosset et al., 2006). In Romania, this species is present throughout the lowland regions from large rivers to canals, lakes and fish ponds (Băcescu, 1967). It lives in slow running waters, burrowing in muddy banks or hiding in dense aquatic vegetation or under submerged objects. In lagoons and deltas, it can withstand brackish and even saltwater. *Astacus leptodactylus* (Fig. 2d) is active both day and night, feeding upon a wide array of animal and vegetal food (Souty-Grosset et al., 2006).

In comparison with the other three species mentioned above, *A. leptodactylus* was not so frequently encountered at the sampling stations. The species was captured at only three locations: sampling stations no. 2, 4 and 7 (Tab. 1).

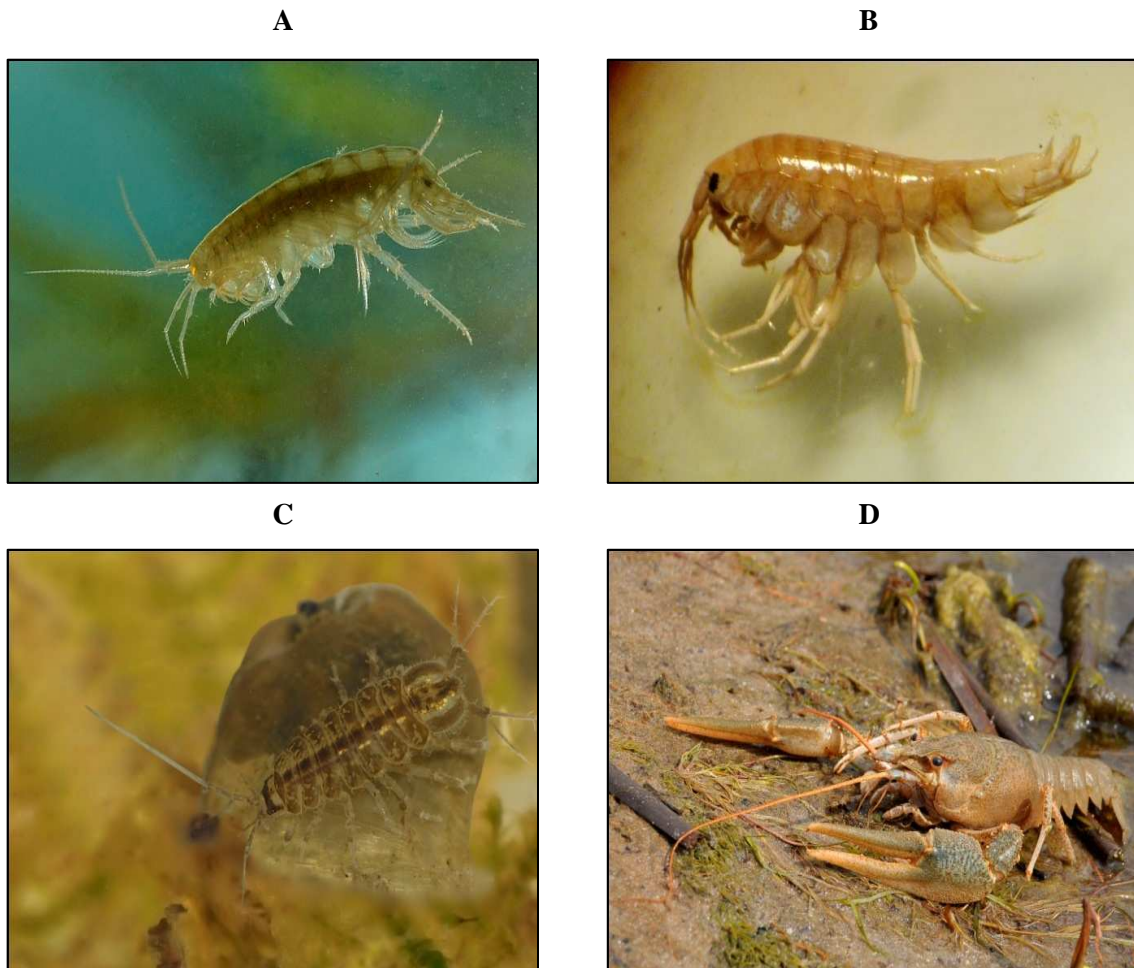


Figure 2: The malacostracan species of Cefa Nature Park photographed by the authors:
 A. *Niphargus valachicus*, B. *Synurella ambulans*,
 C. *Asellus aquaticus*, D. *Astacus leptodactylus*.

This survey revealed four malacostracan species present in the studied area, a small number compared to the around 120 aquatic malacostracan species that occur in Romanian waters, almost 70 being epigeal (de Jong, 2011). Nevertheless, these species are important from a phylogeographic point of view. The association between the amphipods *Niphargus sp.* and *Synurella sp.* is described as being very old, dating back approximately 50 million years ago, since Eocene, as suggested by the discovery of Baltic amber with fossilized remains (Coleman, 2004, 2006; Jażdżewski and Kupryjanowicz, 2010). The encasing of these species in amber suggests that they were living near the water surface like nowadays *N. valachicus* and *S. ambulans*. Dedyu (1980) considers that *S. ambulans* is an ancient freshwater species. The same can be plausible for *N. valachicus* because its

distribution range corresponds to the extension of the Paratethys Sea during the Miocene – Pliocene transition. The wide occurrence of these amphipod species at Cefa Nature Park probably indicates a relative stability of the habitats during recent geological time and that the species were not significantly affected by anthropic impacts over time.

Asellus aquaticus is widespread throughout the Pannonian Basin (Verovnik et al., 2005). The habitats at Cefa Nature Park are suitable for its ecological demands as suggested by the wide occurrence of the species throughout the sampling stations.

The presence of *A. leptodactylus* within the study area indicates a relative good water quality. Like other crayfish species, it does not tolerate chemical pollution, although it is less sensitive to oxygen deficit and temperature variations (Schultz et al., 2002). The dense aquatic vegetation, stagnant and slow running waters and muddy substrate offer a suitable habitat for this species. The presence of the invasive spiny-cheek crayfish *Orconectes limosus* Rafinesque, 1817, a species carrying crayfish plague, on the Romanian and Hungarian territories (Pârvulescu et al., 2009, Puky and Schád, 2006) does not pose a threat for the moment.

According to the IUCN Red List of Threatened Species *N. valachicus* is listed as a Vulnerable species (Sket, 1996) and *A. leptodactylus* is listed as a species of Least Concern (Gherardi and Souty-Grosset, 2010). *Synurella ambulans* and *Asellus aquaticus* are not listed, except for a few subspecies of the latter. Sket, 1996a, b, c.

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