

**First record of the spiny-cheek crayfish
Orconectes limosus (Rafinesque, 1817)
(Crustacea: Decapoda: Cambaridae) in Romania**

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Abstract. Until recently, no invasive crayfish species have been reported in Romania. This is the first record of the cambarid species *Orconectes limosus* on Romanian territory; years after the countries on the upstream stretch of the Danube River reported the presence of the species on their territories. Monitoring activities in the area where the Danube enters Romania show that the extent of the invasion is currently relatively low; the species has been found on 55 of the 1073 km that comprise the Romanian sector of the Danube River.

Key words: non-native crayfish, invasive species, *Orconectes limosus*, spiny-cheek crayfish

At least eight species of non-native crayfish are known to reside in Europe (Chucholl & Daudey 2008). They were introduced either intentionally or accidentally during the 19th and the 20th centuries, and belong to the genera *Orconectes*, *Pacifastacus*, *Procambarus* and *Cherax* (Holdich 2002, Pöckl et al. 2006, Souty-Grosset et al. 2006). These species can spread actively from one area to another through canals and rivers, passively during floods, or through human mediated dispersal mechanisms (Holdich & Pöckl 2007).

The spiny-cheek crayfish is a native of north-eastern USA. It was intentionally introduced to Europe in 1890, when about 90 individuals were bought from Pennsylvania and released into a fishpond in Barnówko, currently in Poland, close to the German border (Hamr 2002). After establishment in Europe, the species has

transferred to other regions, such as Poland, France, Germany and Austria (Henttonen & Huner 1999, Holdich 2002), and its range has spread towards Romania.

Among the countries on the upstream stretch of the Danube River, Hungary has abundant populations of spiny-cheek crayfish, where it spread rapidly downstream (Puky et al. 2005, Puky & Schád 2006). It has recently been found also in the River Tisza as well as in its tributaries (Sallai & Puky 2008). Serbia has also reported this species to be present in the Danube (Pavlović et al. 2006). In Croatia, the species was found in a swamp in the Kopački Nature Park (it probably arrived there from the Danube); in a short time, it has extended onwards into the Drava River (Maguire & Klobučar 2008). In Slovakia, the species has recently been found in the Ipel (along the right bank, at

Salka) and Váh rivers, both tributaries of the Danube (Janský and Kautman 2007, Puky 2009).

Ecological preferences of *O. limosus* include: lowland waters, silty, turbid and muddy environments, such as large rivers, streams, polluted canals and rivers, ponds and lakes. However, in Canada it has been found in stony streams with moderate currents and in Europe, can be found in a wider range of habitats (Ahern et al. 2008, Bohl 1999, Pöckl 1999, Petrussek et al. 2006), including cold, fast flowing waters, even though it displays a preference for deep, calm waters. The species has also been found in ponds and lakes which may be organically rich and polluted (Holdich & Black 2007).

On the 3rd of May 2008, during a didactic expedition in the Baziaş area (the location where the Danube enters Romania), we noticed and subsequently collected one live adult spiny-cheek crayfish (*Orconectes limosus*) (Fig.1). We found it on the Romanian shore of the Danube, at the Balta Nera-Dunăre (the Nera-Danube Pond; 44°49'57"N, 21°22'22"E).

A monitoring program of the Danube River was launched in the Orşova area, along with observations carried out in several upstream points, as shown in the Table 1 and Figure 2. The rangers of the Iron Gates (Porțile de Fier) Natural Park provided additional data by keeping records of the crayfish collected by fisher-men in the region.

The left shore of the Danube River, between Baziaş and Gura Văii, is part of the Porțile de Fier Natural Park. The park is located in SW Romania, near the Serbian border, and stretches over the southern part of the Locvei and Almăjului Mountains, as well as over the south-western portion of the Mehedinți Plateau. A great number of streams emerging from these mountains flow directly into the Danube and are home to the stone crayfish - *Austropotamobius torrentium* (Schrank, 1803), as seen Figure 2 (Pârvulescu 2007, Pârvulescu 2008). This species is rated as a « priority species » in the Council Directive 92/43/EEC and is also listed as « vulnerable » (IUCN 2008). Thus, a series of management measures are necessary steps, amongst which the periodic

Table 1. The state of the invasion in the Danube is as follows, compared to the native species of crayfish (January 2009):

	Locality					
	Baziaş	Moldova Veche	Sichevița	Berzasca	Ieșelnița	Orşova
latitude	44°49'57"N	44°43'37"N	44°39'27"N	44°38'12"N	44°40'49"N	44°42'32"N
longitude	21°22'22"E	21°36'52"E	21°51'01"E	21°57'46"E	22°21'38"E	22°24'43"E
distance*	1073	1048	1025	1018	961	954
<i>Astacus leptodactylus</i>	Present	Present	Present	Present	Present	Present
<i>Orconectes limosus</i>	Present	Present	Present	Present	Absent	Absent

* Kilometres river distance from Sulina (the mouth of the river in the Black Sea)



Figure 1. *Orconectes limosus*, captured in Baziaș (SW Romania) on the 3rd May 2008.

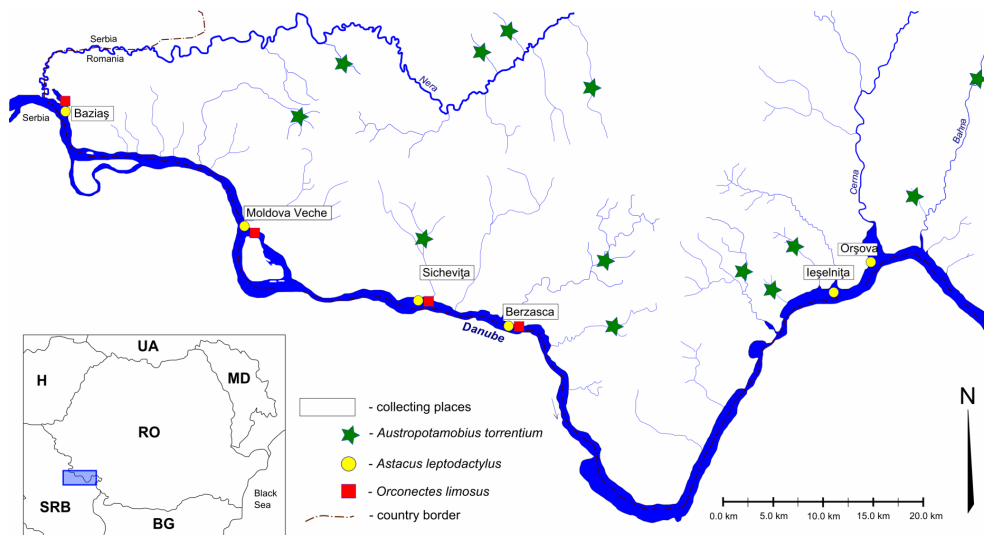


Figure 2. The presence of *Orconectes limosus* versus indigenous crayfish distribution in SW Romania, as revealed by recent data.

measurement of population size is of great importance (Holdich et al. 2002). Nevertheless, the stone crayfish remain vulnerable to various threats, including overexploitation, habitat modification, pollution, and the spread of non-native crayfish species or crayfish plague (Holdich & Pöckl 2005).

When a non-native crayfish species is introduced and stabilized in a new waterbody, it has an impact on the autochthonous biota (Holdich & Pöckl 2007). As the spiny-cheek crayfish is capable of rapid and strong expansion, it represents a potential danger to the indigenous crayfish. The most serious is its ability to carry the pathogen of crayfish plague, the parasitic saprolegnious oomycete *Aphanomyces astaci* Schikora, 1903 (Vey et al. 1983, Kozubíková et al. 2006, 2009). This pathogen, of North American origin, is usually lethal for crayfish species from other parts of the world (Unestam 1969, Alderman et al. 1987), and still causes mass crayfish mortality, including the stone crayfish, in Central Europe (Kozubíková et al. 2008) and elsewhere (number of references available, if necessary). Alongside concerns about its role in transmitting disease, spiny-cheek crayfish as aggressive competitors seem able to replace native species in direct competition (Schulz et al. 2006).

We propose including the spiny-cheek crayfish in national monitoring programs and adapting management measures in all of the protected areas that are located on the downstream stretch of the Danube River or that are crossed by its first degree tributaries. We also propose the use of the Romanian term « rac dungat » (literally « striped crayfish ») to designate the *Orconectes limosus* species, which as of now, is present in the Romanian fauna.

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References

- Ahern, D., England, J., Ellis, E. (2008): The virile crayfish, *Orconectes virilis* (Hagen, 1870) (Crustacea: Decapoda: Cambaridae), identified in the UK. *Aquatic Invasions* 3 (1): 102-104.
- Bohl, E. (1999): Crayfish stock situation in Bavaria (Germany) - attributes, threats and chances. *Freshwater Crayfish* 12: 765-777.
- Churchill, C., Daudey, T. (2008): First record of *Orconectes juvenilis* (Hagen, 1870) in eastern France: update to the species identity of a recently introduced orconectid crayfish (Crustacea: Astacida). *Aquatic Invasions* 3 (1): 105-107.
- Hamr, P. (2002): *Orconectes*, Pp. 585-608. In: *Biology of Freshwater Crayfish*. Holdich, D.M. (ed.) Blackwell Science.
- Henttonen, P., Huner, J.V. (1999): The introduction of alien species of crayfish in Europe: A historical introduction, Pp. 13-22. In: Gherardi, F., Holdich, D.M. (eds.) *Crayfish in Europe as alien species. How to make the best of a bad situation?* Crustacean Issues 11, A.A. Balkema, Rotterdam.
- Holdich, D.M. (2002): Present distribution of crayfish in Europe and some adjoining countries. *Bulletin Français de la Pêche et de la Pisciculture* 367 (4): 611-650.
- Holdich, D.M. (2003): Crayfish in Europe - an overview of taxonomy, legislation, distribution, and crayfish plague outbreaks. Pp. 15-34. In: Holdich, D.M., Sibley, P.J. (eds.) *Management & Conservation of Crayfish*. Proceedings of a conference held in Nottingham on 7th November, 2002. Environment Agency, Bristol.
- Holdich, D.M., Reynolds, J., Edsman, L. (2002): Monitoring in conservation and management of indigenous crayfish populations. *Bulletin Français de la Pêche et de la Pisciculture* 367: 875-879.
- Holdich, D.M., Black, J. (2007): The spiny-cheek crayfish, *Orconectes limosus* (Rafinesque, 1917) [Crustacea: Decapoda: Cambaridae], digs into the UK. *Aquatic Invasions* 2 (1): 1-15.

- IUCN (2008): Red List of Threatened Species, <http://www.iucnredlist.org>. Cambridge, accessed at: 2009. 02. 12.
- Janský, V., Kautman, J. (2007): Americký rak *Orconectes limosus* (Crustacea: Decapoda: Cambaridae) už aj na Slovensku. [North American spiny-cheek crayfish *Orconectes limosus* (Crustacea: Decapoda: Cambaridae) also in Slovakia.] Acta Rerum Naturalium Musei Nationalis Slovaci 53: 21-25.
- Kozubíková, E., Petrusek, A., Ďuriš, Z., Kozák, P., Geiger, S., Hoffmann, R., Oidtmann, B. (2006): The crayfish plague in the Czech Republic – review of recent suspect cases and a pilot detection study. Bulletin Français de la Pêche et de la Pisciculture, 380/381: 1313-1324.
- Kozubíková, E., Petrusek, A., Ďuriš, Z., Martín, M.P., Diéguez-Urbeondo, J., Oidtmann, B. (2008): The old menace is back: recent crayfish plague outbreaks in the Czech Republic. Aquaculture 274: 208-217.
- Kozubíková, E., Filipová, L., Kozák, P., Ďuriš, Z., Martín, M.P., Diéguez-Urbeondo, J., Oidtmann, B., Petrusek, A. (2009): Prevalence of the crayfish plague pathogen *Aphanomyces astaci* in invasive American crayfishes in the Czech Republic. Conservation Biology: In press [DOI: 10.1111/j.1523-1739.2009.01240.x]
- Maguire, I., Klobučar, G. (2008): Appearance of *Orconectes limosus* in Croatia. Crayfish News 25(3): 7.
- Pavlović, S., Milošević, S., Borković, S., Simić, V., Paunović, M., Žikić, R., Saičić, Z. (2006): A report of *Orconectes (Faxonius) limosus* (Rafinesque, 1917) [Crustacea: Decapoda: Cambaridae: *Orconectes*: Subgenus *Faxonius*] in the Serbian part of the River Danube. Biotechnology & Biotechnological Equipment 20 (1): 53-56.
- Pârvulescu, L. (2007): *Austropotamobius torrentium*. Pp. 47-49. In: Combroux, I., Thiry, E., Ţoia, T. (eds.) Caiet de habitate și specii - Fișe pilot. Editura Balcanic, Timișoara. [in Romanian].
- Pârvulescu, L. (2008): The aquatic malacostracean fauna (Crustacea: Malacostraca) from the Mehedinți Plateau Rivers. Studia Universitatis Babeș-Bolyai – Biologia 53 (2): 17-24.
- Petrusek, A., Petrusková, T. (2007): Invasive American crayfish *Pacifastacus leniusculus* (Decapoda: Astacidae) in the Morava River (Slovakia). Biologia 62 (3): 356-359.
- Petrusek, A., Filipová, L., Ďuriš, Z., Horká, I., Kozák, P., Polícar, T., Štambergová, M., Kučera, Z. (2006): Distribution of the invasive spiny-cheek crayfish (*Orconectes limosus*) in the Czech Republic. Past and present. Bulletin Français de la Pêche et de la Pisciculture 380-381: 903-917.
- Pöckl, M. (1999): Distribution of crayfish species in Austria with special reference to introduced species. Freshwater Crayfish 12: 733-750.
- Pöckl, M., Holdich, D.M., Pennerstorfer, J. (2006): Identifying native and alien crayfish species in Europe. European Project Craynet Publication, Poitiers, France.
- Puky, M. (2009): Confirmation of the presence of the spiny-cheek crayfish *Orconectes limosus* (Rafinesque, 1817) (Crustacea: Decapoda: Cambaridae) in Slovakia. North-Western Journal of Zoology 5 (1): 214-217.
- Puky, M., Reynolds, J.D., Schád, P. (2005): Native and alien decapoda species in Hungary: distribution, status, conservation importance. Bulletin Français de la Pêche et de la Pisciculture 376-377: 553-568.
- Puky, M., Schád, P. (2006): *Orconectes limosus* colonises new areas fast along the Danube in Hungary. Bulletin Français de la Pêche et de la Pisciculture, 380-381: 919-926.
- Sallai, Z., Puki, M. (2008): A cifrarák (*Orconectes limosus*) megjelenése a Közép-Tisza-Vidéken. Acta Biologica Debrecina Supplementum Oecologica Hungarica 18: 203-208.
- Schulz, H.K., Smietana, P., Maiwald, T., Oidtmann, B., Schulz, R. (2006): Case studies on the co-occurrence of *Astacus astacus* (L.) and *Orconectes limosus* (Raf.): snapshots of a slow displacement. Freshwater Crayfish 15: 212-219.
- Souty-Grosset, C., Holdich, D.M., Noël, P.Y., Reynolds, J.D., Haffner, P. (eds). (2006). Atlas of Crayfish in Europe. Muséum National d'Histoire Naturelle, Paris, (Patrimoines naturels, 64).
- Vey, A., Söderhäll, K., Ajaxon, R. (1983): Susceptibility of *Orconectes limosus* Raff. to the crayfish plague, *Aphanomyces astaci* Schikora. Freshwater Crayfish 5: 284-291.

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