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XENODIVERSITY OF DECAPOD SPECIES (CRUSTACEEA: DECAPODA: REPTANTIA) FROM THE ROMANIAN WATERS

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Abstract. This paper is a synthesis of the faunistic data present in the specialized literature on the alien decapod species identified in the Romanian fauna between 1951 and 2010: *Orconectes limosus* (Rafinesque, 1817), *Callinectes sapidus* Rathbun, 1896, *Rhithropanopeus harrisii* (Gould, 1841), *Eriocheir sinensis* H. Milne Edwards, 1853, *Hemigrapsus sanguineus* (de Haan, 1835), *Palaemon macrodactylus* Rathbun, 1902, *Dyspanopeus sayi* (Smith, 1869).

Résumé. Ce travail présente une synthèse des données faunistiques de la littérature spécialisée sur les espèces allochtones décapodes identifié dans la faune de Roumanie entre 1951 et 2010: *Orconectes limosus* (Rafinesque, 1817), *Callinectes sapidus* Rathbun, 1896, *Rhithropanopeus harrisii* (Gould, 1841), *Eriocheir sinensis* H. Milne Edwards, 1853, *Hemigrapsus sanguineus* (de Haan, 1835), *Palaemon macrodactylus* Rathbun, 1902, *Dyspanopeus sayi* (Smith, 1869).

Key words: alien species, Romania, decapod, Black Sea, lagoons, freshwater.

INTRODUCTION

Freshwater and marine biotas are in a continuous and rapid change worldwide. The Danube River is a main aquatic corridor in Europe, part of the Southern corridor (Rhine-Main-Danube Canal, connecting the North Sea and Atlantic Ocean to the Black Sea) of the invasion of Ponto-Caspian species. The changes which appeared in the Black Sea during the last 75 years have been very deep, especially on the western coast. The Black Sea as well as the Baltic Sea, the Azov Sea, the Caspian Sea, and the Aral Sea are geologically and biologically young seas (Leppäkoski & Olenin, 2000). Today the biotas of these water bodies are exposed to each other, due to the breakdown of geographical barriers by ship traffic, leading to an exchange of species. In addition to their connections through straits with the Mediterranean Sea and the Atlantic Ocean, the Baltic, Black, and Caspian Sea basins are connected to each other by canals and rivers. Anthropogenic translocations of aquatic organisms are associated with this change. In the Black Sea, decapod crustaceans are an important group, representing links in the trophic chain with ecological and economical importance, respectively as environment quality indicator species and for commercial fishing.

Seven new decapod species have been recorded so far on the Romanian territory: *Orconectes limosus* (Rafinesque, 1817) in freshwater, and *Callinectes sapidus* Rathbun, 1896, *Rhithropanopeus harrisii* (Gould, 1841), *Eriocheir sinensis* H. Milne Edwards, 1853, *Hemigrapsus sanguineus* (de Haan, 1835), *Palaemon macrodactylus* Rathbun, 1902, *Dyspanopeus sayi* (Smith, 1869) in the Black Sea and its adiacent lagoons.

Order DECAPODA Latreille, 1802
Infraorder Astacidea Latreille, 1802
Family Cambaridae Hobbs, 1942
Orconectes limosus (Rafinesque, 1817)

This species belongs to *Orconectes* genus, one of the three dominant genera (*Procambarus*, *Cambarus* and *Orconectes*) of freshwater crayfish from North America and presently accounts for approximately 25% of the total North American crayfish fauna. It is one of the most widely distributed non-indigenous crayfish species in Europe (Souty-Grosset et al., 2006) present in at least 20 countries. Native to the eastern part of North America, the spiny-cheek crayfish was introduced for the first time in Europe in 1890 by Max von dem Borne in Germany (Hamr, 2002). In Austria the invasiveness of *O. limosus* is relatively low and in large rivers it can coexist with native species (Pöckl & Pekny, 2002). Numerous populations are currently established in The Netherlands, Switzerland, Italy, Belgium, France, England, Belarus (Holdich & Black, 2007), Croatia (Maguire & Klobucar, 2008). The species is spreading fast in Hungary (Puky & Schád, 2006), is already widely distributed in Czech Republic, Poland, Eastern Germany (Schulz & Śmietana, 2001; Petrusek et al., 2006) and in the Serbian part of the Danube River, which represents the most Eastern place in Europe (Pavlović et al., 2006). In Slovakia (Janský & Kautman, 2007; Puky, 2009) and in Romania (Pârvulescu et al., 2009) the species is just mentioned.

In Romania *O. limosus* was reported by Pârvulescu et al. in 2009 from Caraş-Severin district, on the left shore of the Danube River, part of the Iron Gates Natural Park (located in SW Romania, near the Serbian border) in four localities between Baziaş and Berzasca (Fig. 1).

Orconectes limosus acts as a vector of the crayfish plague (Vey et al., 1983), caused by the oomycet fungus *Aphanomyces astaci* Schikora, 1903, an obligate parasite. As the spiny-cheek crayfish is capable of rapid and strong expansion, it represents a potential danger to the indigenous crayfish which are highly susceptible to the crayfish plague and cannot act as a permanent host (Chybowski, 2007).

Infraorder Brachyura Latreille, 1802
Family Panopeidae Ortmann, 1893
Rhithropanopeus harrisii (Gould, 1841)

Rhithropanopeus harrissii is a xanthoid crab native to the American Atlantic coast from Cape Cod to Brazil. The first European record dates back to before 1874, when it was described as a new species from the Zuiderzee in The Netherlands (Wolff, 2005).

In the Black Sea it was introduced from Zuiderzee Bay, North Sea probably by ballast water and/or ship hull fouling. First it was discovered by Makarov (1939) in the liman (estuary) of the Dnieper and South Bug Rivers. Now it is widely distributed in the low salinity (less than 15‰) Black Sea areas. It is distributed in all the Sea of Azov and the Caspian Sea (first record dates from 1958 when the species was accidentally introduced from the Sea of Azov via the Volga-Don Canal) (Zaitsev & Ozturk, 2001).

R. harrissii is an alien species in the Romanian Black Sea (Micu & Micu, 2006). Its presence was recorded for the first time in the brackish waters of Razelm-

Sinoe Lagoon Complex by Zemiankowski in 1951 and Băcescu in 1952. In 1954 Băcescu mentioned that after that winter frost it was the most common crab species in the Black Sea at Tăbăcărie. This species was considered as rare in 1980 by Guțu, but in 1995 Petrescu and Bălășescu pointed out a larger distribution of the species south to Constanța by adding 4 new collecting points (Agigea, Mangalia, 2 Mai and Vama Veche) and stated that this oligobrackish species can be considered frequent. Its areal reaches upstream as far as Cernavodă (Micu & Micu, 2006) (Fig. 1).

Although treated like an alien species it succeeded to establish a self-maintaining population near the Black Sea.

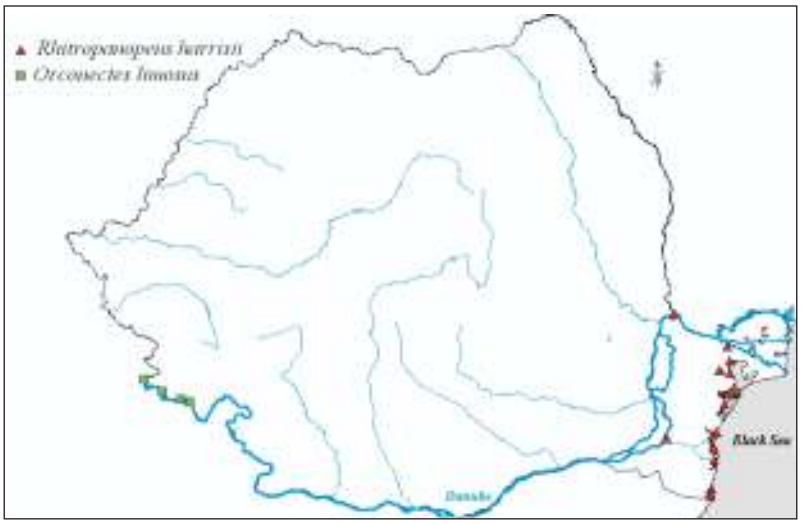

Fig. 1 - Romanian distribution map of *Rhithropanopeus harrisii* and *Orconectes limosus*.

Dyspanopeus sayi (Smith, 1869)

Dyspanopeus sayi is a very common species along the American Atlantic coasts, from Florida to the Gulf of St. Lawrence (Rathbun, 1930) and to Canada (Mistri, 2004), where it got into the ports and estuaries characterised by small variations of the salinity and the temperature. The species is able to stand particularly low temperature values. In Europe, the first recording of the species was made in Swansea, on the sandy South West Wales Coast by Naylor in 1960. In Italy, it was first reported in 1993 by Froglia and Speranza but had been in the Venice Lagoon since the 1980s (Mizzan, 1995), according to local fishermen. It is currently the most widespread crab in many areas of the Lagoon (Occhipinti, 2000), slowly spreading south along the Adriatic coast of Italy: Valli di Comacchio and Po River Delta, Varano Lagoon in Apulia (Florio et al., 2008).

The first record of *D. sayi* from the Romanian Black Sea belongs to Micu et al. (2010 b), when six specimens (two females and four males) where captured by scuba diving from Constanța Harbour, below the sluice gates of the Danube-Black Sea Canal and from Agigea Bay. The Constanța Harbour is an estuarine environment with variable salinity while in the Agigea Bay there are clean open coastal waters with stable salinity (Fig. 2).

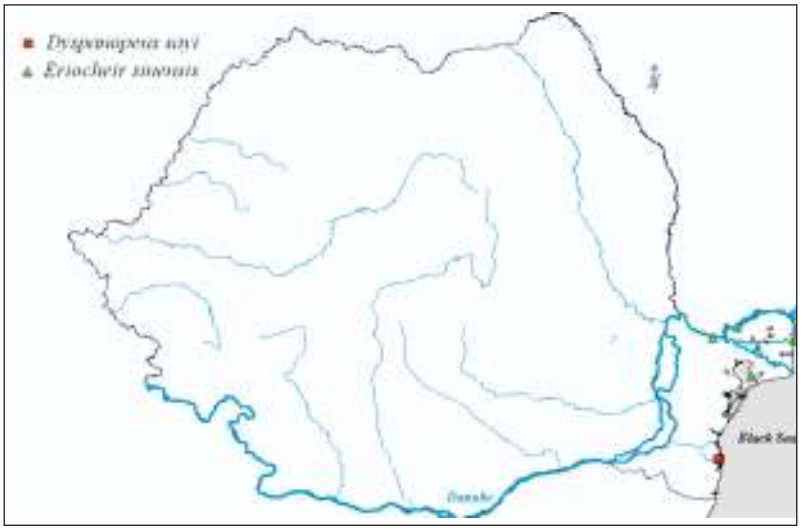

Fig. 2 - Romanian distribution map of *Dyspanopeus sayi* and *Eriocheir sinensis*.

Family Portunidae Rafinesque, 1815
Callinectes sapidus Rathbun, 1896

It is native in the North American coast of the Atlantic Ocean from Cape Cod to Florida and Gulf of Mexico. A possible pathway of introduction of the species in the Black Sea is represented by ship's ballast waters and/or hull fouling, but it is also possible that the species migrated from the Mediterranean Sea, where it was introduced by ships, probably in the 1960s (Zaitsev & Ozturk, op. cit.). It was also recorded in the Northern Aegean Sea, Mediterranean coast of Turkey and Sea of Marmara (Zaitsev & Ozturk, op. cit.), German North Sea estuaries of Elbe and Weser (Nehring et al., 2008). Other citations include the Lagoon of Patok (South-East Adriatic Sea) (Beqiraj & Kashta, 2010), Cantabrian Sea (Cabal et al., 2006), France, The Netherlands and Belgium (Wolff, 2005).

In the Black Sea, it was firstly discovered in 1967 on the Bulgarian shelf by Bulgurkov (1968). Later, in the 1970s, it was found in the Kerch Strait and in 1984 once again on the Bulgarian coast, but in each case only isolated individuals were observed (Gomoiu & Skolka, 1998).

In 1998, a male of *C. sapidus* was collected in the southern part of the Romanian coast (Gomoiu & Skolka, op. cit.) from shallow waters, near 23 August (N of Mangalia). In 1999 a female adult specimen was captured near Mangalia in fishermen nets. The female of *C. sapidus* is depozited in the collection of "Grigore Antipa" National Museum of Natural History, Bucharest (Petrescu et al., 2000). Until today only these two specimens have been discovered at the Romanian Black Sea Coast (Fig. 3). It appears that this species has not yet established a self-maintaining population in the Black Sea.

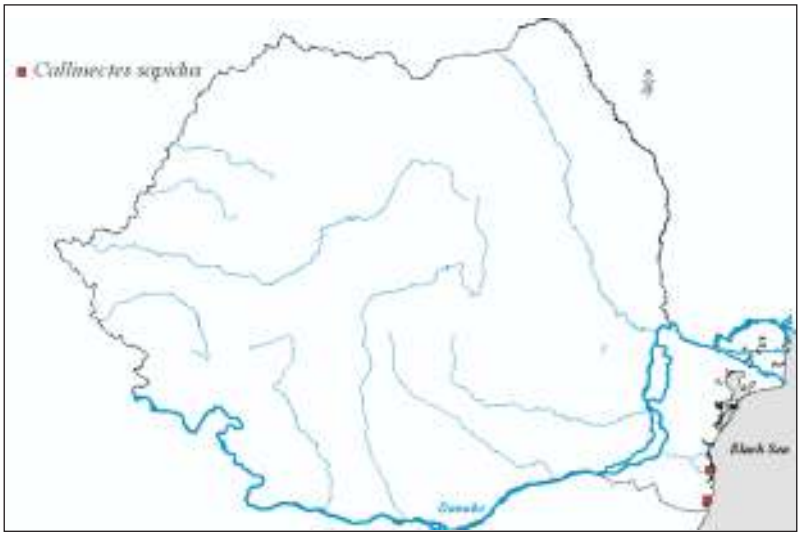

Fig. 3 - Romanian distribution map of *Callinectes sapidus*.

Family Varunidae H. Milne Edwards, 1853
Eriocheir sinensis H. Milne Edwards, 1853

The species originates from the eastern Asia estuaries and coastal marine waters (the South China Sea and Yellow Sea), from the Province of Fukien, China northwards to Korean Peninsula.

After reaching the European shore via ballast waters from container vessels in Germany in 1912, it spread rapidly throughout Europe (Finland, Sweden, Russia, Poland, The Netherlands, Belgium, England, France, Portugal, Czech Republic, Lithuania) (Herborg et al., 2003; Clark et al., 1998; Normant et al., 2000; Gomoiu & Skolka, op. cit.; Bacevičius & Gosiūnaitė, 2008). Only a single male specimen was caught in May 1998, in the northeastern part of the Azov Sea (Murina & Antonovsky, 2001). In 1998 and 1999 Zaitsev mentions about the capture of a male in the Black Sea at east of Odessa Gulf and a female crab near the Bolshoy Fontan Cape, south of Odessa Gulf (Zaitsev & Ozturk, op. cit.).

The presence of this species in the Romanian Black Sea was noted for the first time in 1934 by Vasiliu, but later on Băcescu (1967) invalidated this citation. In 1997, an adult female carrying eggs was captured in Musura Bay, near Sulina, in the Danube Delta Biosphere Reserve area (Gomoiu & Skolka, op. cit.). Between 1997 and 2004, Oțel (2004) found four specimens of the species (one of them being partially destroyed) from Danube River, caught with fishing nets in four different locations: Potelu Lake (from Somova-Parcheș Complex), Chilia Arm (Danube), Holbina Lake and Sulina Bay (Fig. 2).

Based on the recent record of *Eriocheir sinensis* from the Serbian part of Danube River (Paunovic et al., 2004) and the existing information from the fishermen operating in the Danube Delta it is very likely that the chinese mitten crab has established populations in the Romanian stretch of Danube River, the Danube Delta and prodelta (Skolka & Gomoiu, 2004; Micu & Micu, 2006).

Hemigrapsus sanguineus (de Haan, 1835)

The species is indigenous to the western North Pacific, Sakhalin Island, Korea, Japan, North China and Taiwan (McDermott, 1998). Outside its native area, it was first discovered on the east coast of the United States, in New Jersey in 1988 (Lohrer, 2001). Since then *H. sanguineus* has become abundant along a large portion of the mid-Atlantic and southern New England coast.

In 1999, the species reached the European coasts by way of ship ballast waters, in Le Havre, France and the former estuary "Oosterschelde" in The Netherlands (Breton et al., 2002) were it has established stable populations (Faasse, 2004). In 2003 a single adult male of *H. sanguineus* was recorded from the northern Adriatic Sea (Schubart, 2003) and this remains the only known Mediterranean record to date. Since then it has been recorded from western Scheldt (close to Belgium) and at Knokke Heist in 2006 in Belgium (d'Udekem d'Acoz, 2006). *H. sanguineus* is today known from the west coast of Cotentin Peninsula in the English Channel, to the Lower Saxony, state of Schleswig-Holstein, Germany (d'Udekem d'Acoz & Faasse, 2002; Obert et al., 2007; Dauvin, 2009; Dauvin et al., 2009).

At the Romanian Black Sea, one adult male of *Hemigrapsus sanguineus* was collected inside Tomis Marina, Constanța (Micu et al., 2010 a). The author assumes that yachts have been the vector of introduction in the Black Sea (Fig. 4).

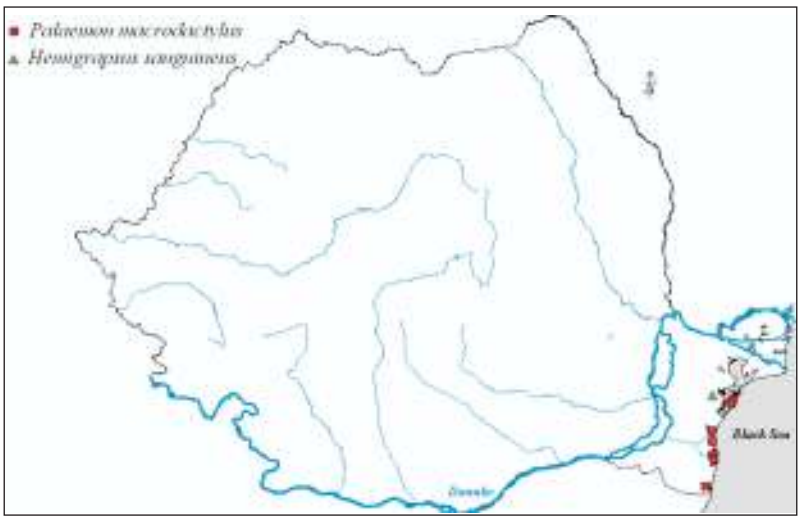

Fig. 4 - Romanian distribution map of *Hemigrapsus sanguineus* and *Palaemon macrodactylus*.

Infraorder Caridea Dana, 1852
Family Palaemonidae Rafinesque, 1815
Palaemon macrodactylus Rathbun, 1902

It is native to Japan, Korea and China (Holthuis, 1980). In the 1950s, this shrimp species was accidentally introduced in the eastern Pacific, in San Francisco Bay, California (Newman, 1963) where it is now a common and well-established

species. It has also been found in Australia (Poore, 2004). Since the end of the 1990s, *Palaemon macrodactylus* has been found in several European waters: in Spain (Guadalquivir and Guadalete Estuaries, Salado River, San Pedro River) (Cuesta et al., 2004; González-Ortegón et al., 2006), in England (Orwell, Stour, Medway and Thames) (Ashelby et al., 2004; Worsfold & Ashelby, 2006), in the Southern Bight of the North Sea (The Netherlands, Belgium and northern France) (d'Udekem d'Acoz et al., 2005; De Blauwe, 2006; Rappé, 2007; Soors et al., 2010), in the Gironde Estuary in France (Beguer et al., 2007), and in Portugal (Chicharo et al., 2009).

The first record of the species in the Black Sea belongs to Micu et al. in September 2009, when 909 specimens of *P. macrodactylus* were collected by scuba diving from seven locations along the Romanian Black Sea coast: Periboina, Edighiol, Midia Harbour, Mamaia Bay, Constanța Harbour, Eforie Marina, Mangalia Lake (Fig. 4). The vector of introduction was ship ballast water. All introduction points reported until now worldwide are in, or near major international harbours, and Constanța is the largest maritime traffic hub in the Black Sea (Micu & Niță, 2009).

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XENODIVERSITATEA SPECIILOR DE DECAPODE (CRUSTACEA: DECAPODA: REPTANTIA) DIN APELE ROMÂNEȘTI

REZUMAT

Această lucrare reprezintă o sinteză a datelor faunistice existente până în prezent în literatura de specialitate în ce privește speciile de decapode străine identificate în fauna României între anii 1951 și 2010: i*Orconectes limosus* (Rafinesque, 1817), *Callinectes sapidus* Rathbun, 1896, *Rhithropanopeus harrisii* (Gould, 1841), *Eriocheir sinensis* H. Milne Edwards, 1853, *Hemigrapsus sanguineus* (de Haan, 1835), *Palaemon macrodactylus* Rathbun, 1902 și *Dyspanopeus sayi* (Smith, 1869).

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