

The first records of Marmorkrebs [*Procambarus fallax* (Hagen, 1870) f. *virginalis*] (Crustacea, Decapoda, Cambaridae) in Ukraine

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During last decades expansions of three invasive alien decapods (*Rhithropanopeus harrisi* (Gould, 1841), *Eriocheir sinensis* Milne-Edwards, 1853 and *Macrobrachium nipponense* (De Haan, 1849)) have been reported from Ukrainian inland waters (Son *et al.* 2013).

In 2015 two localities of a new alien species – Marmorkrebs or marbled crayfish *Procambarus fallax* (Hagen, 1870) f. *virginalis* were observed (Fig. 1). Marmorkrebs is a triploid parthenogenetic form of *Procambarus fallax* (Hagen, 1870) discovered originally in the aquarium trade (Martin *et al.* 2010a, 2016). Wild sexual form are known from Florida and Georgia, USA (Taylor *et al.* 1996).

This species is known as non-native species with high invasive potential occurring in such European countries as the Netherlands, Germany, Italy, Slovakia, Croatia, and Sweden (Holdich *et al.* 2009; Nonnis Marzano *et al.* 2009; Martin *et al.* 2010b; Chucholl *et al.* 2012; Bohman *et al.* 2013; Liptak *et al.* 2016).

In the first locality of the localities in Ukraine, – an old flooded quarry in Dnepropetrovsk City (“J3.3: Recently abandoned above-ground spaces of extractive industrial sites” according EUNIS Habitat Classification) several alive and dead specimens were sampled in autumn 2015. According to personal communication with local citizens the species appeared in the reservoir in 2014 and was abundant already in the spring of 2015.

Two female with eggs were caught on 23 October 2015 in water of temperature below 10°C.

In the second locality – a cascade of ornamental ponds (“J5.5: Highly artificial non-saline fountains and cascades” according EUNIS Habitat Classification) in Odessa City three alive individuals were observed in June 2015. The reservoirs is a common target for introduction of ornamental species by aquarium hobbyists – a lot of aquarium fishes, turtles and others live there during warm season (and some species also survive the winter).

The most probable pathway of invasion to these localities is the trade of aquarium pets. Marbled crayfish is popular in large pet markets of Odessa and Dnepropetrovsk and in online trade, where they are cheaper than other exotic cambarid species. The parthenogenetic breeding mode, unique for decapod crustaceans and rapid growth (Martin *et al.* 2010a) make it population difficult to control even in aquaria. This may lead to market saturation, which promotes illegal releases of commercially unprofitable and unwanted juveniles to urban waters.

Interesting, that in regions of southwestern Ukraine, that analyzed in modelling of the Marmorkrebs distribution (Churcholl 2014) urban reservoirs with high risk of introductions often are isolated from natural freshwater ecosystems with high risk of establishment, because major cities (especially, Odessa) were

formed as seaports away from freshwater stretches of large rivers. On the contrary, in the case of the Dnepropetrovsk locality, the reservoir is located near the Dnieper River that promote possibility of further expansion.



Figure 1. *Procambarus fallax* (Hagen, 1870) f. *virginalis* and its localities in Ukraine: 1 – old flooded quarry in Dnepropetrovsk City (48°30'19.15 N; 35°06'08.56" E); 2 – cascade of ornamental ponds (46°26'53.85 N; 30°45'12.54" E) in Odessa City.

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