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GENERAL BIOLOGY

The Don River Basin Is a New Stage of Expansion of *Potamopyrgus jenkinsi* (Smith, 1889) (Gastropoda, Hydrobioidea) in Europe

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The role of invasions has been repeatedly discussed and elucidated in Russian and foreign literature [1–4]. Problems related to invading species are especially acute in water bodies of arid zones, manly closed water bodies, such as the Caspian Sea, the Sea of Azov, and formerly the Aral Sea. The Sea of Azov and its catchment area are among the most vulnerable ecosystems. This is mainly because the sea is relatively (incompletely) isolated (a continental body of water) and has an unstable hydrological and hydrochemical regimen, which allows invaders with a potentially wide capacity for osmoregulation to adapt. This is entirely true for the catchment areas of the above seas (including the Don, Kuban', Volga, Ural, Kuma, Syr-Darya, and smaller rivers). These rivers serve as a reserve of the Pontocaspian relict fauna, which is very sensitive to all environmental changes, including invasions. The expansion of invading species may be strikingly rapid. One example is the finding of *Potamopyrgus jenkinsi* in the Don basin in June and July of 2007.

Potamopyrgus Stimson, 1865 was first found in Europe in the late 19th century (the species *Potamopyrgus jenkinsi* (Smith, 1889) described from the Themes mouth). During the 20th century, *Potamopyrgus* was found in many regions of Europe.

The species composition of the genus *Potamopyrgus* in the area of invasion is still a matter of discussion. It has been hypothesized that all European *Potamopyrgus* belong to the same New Zealand species *P. antipodarum* (Gray, 1843), that there are several species in Europe [5], and that two discrete lineages (clones) have invaded Europe in different periods from different local populations of New Zealand [6, 7].

The existence of a number of European species (probably, pure parthenogenetic strains) of *Potamopyrgus* differing in ecology and salinity preferences that have no analogues in the New Zealand fauna, as well as some paleontological data, allowed Anistratenko [5] to hypothesize that they are autochthonous in Europe. Anistratenko regards ecologically different strains of *Potamopyrgus* as separate species *P. jenkinsi*; *P. alexenkoae* Anistratenko in Anistratenko et Stadnichenko, 1995; and *P. polistchuki* Anistratenko, 1991.

Molecular genetic studies on *Potamopyrgus* from some Western European habitats demonstrated the existence of two strains both genetically and morphologically differing from each other [6, 7]. They are assumed to have invaded from isolated habitats on the North Island of New Zealand in different periods of time. *Potamopyrgus* may also form new pure strains or species in the area of invasion (saltatory speciation, which is possible for clonal invading species) [8].

The first *Potamopyrgus* in the Sea of Azov–Black Sea basin were found in 1951, simultaneously in the Razim lagoon [9] and the Dnieper estuary [10].

Later, they were found in a number of marine and mesohaline localities (the Dnieper–Bug and Berezan' estuaries, Shabolatsky (Budak) Liman, and Razim lagoon); however, there were no rapid spread or formation of large colonies until recently. Currently, these mollusks are extremely rapidly expanding in fresh and oligohaline waters. Between 2003 and 2007, they were found in many new sites, including the Stentsovsko-Zhebriyanski Plavni wetland of the Danube River, Lake Yalpug, the upper Sukhoi Liman and rivers flowing into it, the Dniester estuary and springs flowing into it, and the Kuchurganski Liman [8]. In most of them, *Potamopyrgus* are abundant (more than 1000 specimens per square meter).

Potamopyrgus are highly eurybiontic (highly tolerant to drying and variations in oxygen concentration and salinity) and have a specific reproduction strategy

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The general appearance of a specimen of *Potamopyrgus jenkinsi* (Smith, 1889) from the Gnilovskii Brook (Rostov-on-Don).

(parthenogenesis and hypogenesis from the clutch), which allows them to easily invade unsaturated water ecosystems, including springs, small rivers, brackish ponds, and shoals.

Until recently, findings of *Potamopyrgus* in Russia were restricted to desalinated areas of the Baltic Sea [11]. In the summer of 2007, they were found in a spring stream flowing into the Don River and on the shoal in the Don itself near the mouth of this stream, as well as in a spring in the Botanic Garden of Southern Federal University (Rostov-on-Don), where they were as abundant as 2000 specimens per square meter. In total, about 300 specimens were collected. This population of *Potamopyrgus* was the first to be found in the Russian part of the Sea of Azov–Black Sea basin.

The diversity of *Potamopyrgus* in this habitat is narrower than in the Sea of Azov–Black Sea basin as a whole: only one strain, *P. jenkinsi* sensu stricto, has been found there, whereas *P. polistchuki*, a clone with distinct conchological differences from *P. jenkinsi*, is as abundant as the latter in springs of the northern Black Sea basin.

Note that this species has all possibilities to spread over the lower Don basin (and later, probably, the lower Volga basin) owing to the large catchment area, numerous small rivers, and intense navigation. The potential geographic range of *P. jenkinsi* covers the entire Cis-Caucasus region, with its well-developed network of canals.

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