

## Research Article

## North American freshwater limpet *Ferrissia fragilis* (Tryon, 1863) (Gastropoda: Planorbidae) – a cryptic invader in the Northern Black Sea Region

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### Abstract

In the 2002 North American freshwater limpet *Ferrissia fragilis* (Tryon, 1863) was recorded for the first time in the continental waters of Black Sea Region. This is considered to be a continuation of invasion in the Black Sea Region as this species was previously introduced into Crimean Peninsula reservoirs in the early 20th century. A juvenile form of *F. fragilis* found in Central Crimea was previously described as the freshwater limpet *Ancylus lacustris brevis* (Puzanov 1925). According to the rules and recommendations (8B and 8.3) of the International Code of Zoological Nomenclature we point that this information can not be used as nomenclatural act (recommendation of ICZN about providing of first publication with nomenclature act as printing on paper). Since 2002, *F. fragilis* has been sampled in the freshwaters of the Dniestr Delta. It was observed that this invader could sustain the extreme conditions of an unusually cold winter (2005-2006).

**Key words:** molluscs, alien species, Black Sea Region, *Ferrissia fragilis*, invasion, synonymy

### Introduction

Studying of the alien freshwater limpets in Europe presents many fascinating problems to the investigator, who has to consider their distribution, invasive history, descent, and chronology of their spread. Alien freshwater limpets have been identified variously from different European and Asian countries under several names: *Pettancyclus petterdi* (Johnston, 1879), *P. australicus* (Tate, 1880), *Ferrissia wautieri* (Mirolli, 1960), *F. clessiniana* (Jickelli, 1882) (reviewed in Starobogatov and Prozorova 1990, Walther et al. 2006). During the 20th century different authors considered this species as invasive, either from Australia (Starobogatov and Prozorova 1990) or Central Asia (Falkner and Proschwitz 1995) or alternatively as a native European species, which had not been identified earlier because of small size of this species and similarity to *Acroloxus lacustris* (Linnaeus, 1758) (Kinzelbach 1984, Baur and Ringeis 2002). A recent investigation using molecular taxonomical methods (Walther et al. 2006) has revealed that these small European Ancyliidae are

in fact single Nearctic (North American) species, *Ferrissia fragilis* (Tryon 1863). In English-written literature, findings in Germany of an “enigmatic” freshwater limpet as early as 1949 indicate the first European record of *F. fragilis* (Walther et al. 2006). However, labeled specimens of this particular species exist in the collections of Zoological Institute (St. Petersburg): “Gallia, Vermont” (19th century) and “surroundings of St. Petersburg” (1919) (Starobogatov and Prozorova 1990). So, it can be recognized that these limpets occurred in European waters earlier than were recorded as invasive species.

### Material and methods

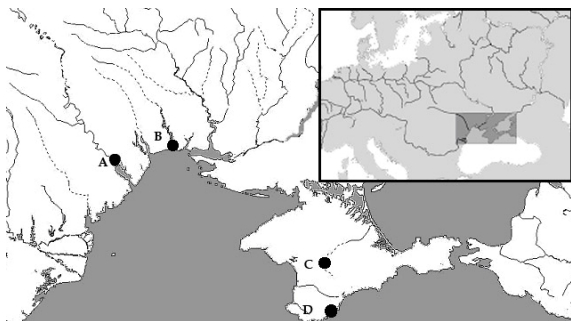
This paper is based mainly on material collected by the author in the Dniestr River Basin (South-Western Ukraine) and also from ornamental aquaria. This is deposited in the mollusc collection of the Odessa Branch Institute of Biology of the Southern Seas (OB IBSS). Some samples were collected by E. S. Dyatlova



**Figure 1.** *Ferrissia fragilis* (Tryon 1863) (Photo: Mikhail O. Son).



**Figure 2.** Young translucent *Ferrissia fragilis* from ornamental aquarium (Photo: Mikhail O. Son).



**Figure 3.** New records of *Ferrissia fragilis*. Map of Europe showing Northern Black Sea Region (inserted); detailed map indicating (A) Lake Beloje and Dniestr Delta (B) Tiligul'skij Liman (C) Simpheropol (Crimean Peninsula) (D) Southern coast of Crimea.

(Odessa National University), and by A. I. Koshelev (OB IBSS). All newly collected material was fixed in 70% ethanol. The specimens in Figures 1 and 2 were photographed using a stereomicroscope DM-143 with digital camera.

All aquatic biotopes present in the Dniestr Delta (river channel, lakes, springs, pools, and estuary) were investigated annually from 1999 to 2006. Field research was undertaken according to standard methods (Zhadin 1965).

### Expansion of *Ferrissia fragilis* in Continental Ukraine and Moldova

In continental Ukraine *F. fragilis* was recorded for the first time in summer 2002 (Lake Beloje in the Dniestr Delta). During 2005-2006 *F. fragilis* invaded different parts of the Dniestr Delta (Ukraine and Moldova) (Figure 3). In 2006 one mollusc was collected in saline pool on the southern coast of Tiligul'skij Liman (estuary of the Tiligul River, SW Ukraine). This second record may indicate casual spread of *F. fragilis* because conditions of this biotope incompatible with ecological characteristics of freshwater species. All these specimens were collected in natural biotopes excepted the Crimean records.

In the Dniestr Delta *F. fragilis* was found in flowing waters, mostly on stone substrates and on reed (*Phragmites australis*).

One ecological aspect of this expansion is very interesting. Water temperature is very often an important factor limiting the expansion range of alien species. It is especially usually for species which have spread as a result of the of aquarium trade. These species in Europe (except more southern regions such as Mediterranean, Balkans, Southern Ukraine, Crimea and Caucasus) inhabit mostly artificial warm-water habitats (reservoirs-coolers, reservoirs of botanical gardens etc). Despite this, *F. fragilis* survived outside its native range during the abnormal cold winter 2005-2006 when the air temperature in Southern Ukraine reached minus ten degrees Celsius. As the invader has been found mostly in shallow waters (<10 cm) which are the first to freeze, it means that of this species could sustain freezing (possible in the egg capsules' stage).

## Identification of “Mystery” Freshwater Limpet in Crimea (Ukraine)

The Crimean Peninsula is a region with reduced freshwater species richness due its geographically isolated character (Figure 3). Before the 1950s the hydrofauna of Crimea was separated from that of the main continental waters. Most of widespread in Europe freshwater molluscs were absent in Crimean waters. The construction of the North-Crimean Channel and the subsequent introduction of freshwater species to Crimean reservoirs had a destructive effect on the zoogeographical barriers between the Crimean Peninsula and continental Ukraine. From the 19th century until recently, macroinvertebrate investigations in Crimea produced only two freshwater limpet records. Juvenile limpets were collected from artificial reservoirs near Simferopol (now capital of the Autonomous Republic of Crimea, Ukraine) by D. E. Beling in 1919 and following years by I. I. Puzanov (first published records, Puzanov 1925). I.I. Puzanov (1925) discussed differences between this limpet and the native European *A. lacustris*. The Crimean limpets had well-developed concentric sculpture, smaller size and were different in terms of proportions of shell and body. Other characteristics important for identification of freshwater limpets (sculpture and bend of apex) could not be determined by I.I. Puzanov in young translucent individuals, such as those shown in Figure 2. Probably due to the lack of taxonomical information on other small-sized species of freshwater limpets at this time, the author described these molluscs as a new sub-species of the above mentioned *Acroloxus* (former *Ancylus*) species – *Ancylus lacustris brevis* Puzanov, 1925 (with note that this new taxa probably must have higher taxonomic range than subspecies).

For many years it was not known where I.I. Puzanov's non-inventoried collections were situated. When this collection was found, relevant information became available on the snail fauna of Crimea before the construction of the North-Crimean Channel (Son 2005). Unfortunately, the box containing type material of *Ancylus lacustris brevis* had become damaged over time and the shells were in fact lost.

Using many characteristic attributes, which separate *F. fragilis* from *A. lacustris* (smaller and flatter shell, more developed concentric sculpture, small translucent body) we now consider *Ancylus lacustris brevis* Puzanov, 1925

as junior synonym of this cryptic invader to Europe – *Ferrissia fragilis* (Tryon, 1863). According to rules and recommendations (8B and 8.3) of International Code of Zoological Nomenclature (1999) we point that this information can not be used as nomenclatural act (ICZN recommend to provide first publication of nomenclature act as printing on paper; in this article we use disclaimer of nomenclature act for further publication according rules of zoological nomenclature).

For many years after I.I. Puzanov's investigations, no special malacological studies in Crimean waters took place. The next malacological studies in Crimean waters, showed the occurrence of *F. fragilis* in ponds on the southern coast of Crimea (Stadnichenko 1987) and the absence of *A. lacustris* on the all Crimean area (Stadnichenko 1979).

Sporadic records of *F. fragilis* in the Crimea there this species or have been present since early XX century or had same separate invasions and rapid mass invasion in the Dniestr Delta showed very significant difference. It can be explained by hydrographical conditions of Crimean Peninsula and continental part of Black Sea Coast. On the Crimean Peninsula undeveloped natural freshwater limnic conditions whereas continental part of Black Sea Coast have enormous space of river deltas with high diversity of limnic and slow-flowing biotopes what correspond to ecological preferences of *F. fragilis*.

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### Annex

New records of *Ferrissia fragilis* (Tryon, 1863) in the Black Sea Region

Location	Record coordinates		Record date	Species abundance, indiv.	Collector
	Latitude, °N	Longitude, °E			
Turunchuk River (branch of Dniestr Delta)	46°28'	30°21'	13.08.2005	10-20	M. O. Son
Alexandrovs kij Erik	46°24'	30°15'	14.08.2005	10-50	M. O. Son
Alexandrovs kij Erik	46°40'	30°25'	Summer 2006	10-50	M. O. Son
Lake Beloe	46°27'	30°10'	26.08.2002	1	E. S. Dyatlova
Dniestr River, Site 1	46° 42'	30°17'	Summer 2006	10-50	M. O. Son
Dniestr River, Site 2	46°41'	30°14'	Summer 2006	10-50	M. O. Son
Dniestr River, Site 3	46°41'	30°13'	Summer 2006	10-50	M. O. Son
Brackish pool on the southern coast of Tiligul'skij Liman	46°38'	31°10'	Spring 2006	1	A. I. Koshelev
Lake Beloe	46°27'	30°10'	Summer 2006	1	E. S. Dyatlova