

УДК 594.38:574.2

Małgorzata Strzelec,  
Professor, Head of Department of Hydrobiology  
(University of Silesia, Katowice, Poland)

### THE THREAT OF NATIVE MOLLUSCS BY THE NEW ZEALAND MUD – SNAIL (*POTAMOPYRGUS ANTIPODARUM* (GRAY))

*Potamopyrgus antipodarum* був інтродукований в солоні та прісні води Європи, можливо, в першій половині 19 ст., коли регулярне суднохідне сполучення з'єднало з 1840 р. Британські острови з Новою Зеландією. Тому ці молюски можуть виживати тільки у воді з 24,6% солоності, транспортування індивідуумів на зовнішній частині корабля неможливе (Стжелец, 1996).

Therefore one may suppose that they could be brought in tanks or barrels to which drinking water was drawn from natural sources (rivers, streams, ponds and s.o.) in New Zealand. By the renewal of water supply in the Thames estuary the parthenogenetic survivors could become the founders of the European populations.

It is noteworthy to add that when in bisexual populations in New Zealand the diploid chromosome number amounts to 34, in unisexual it amounts to 46 or 52, as in all populations in Europe studied (Wallace, 1992).

The significant biological difference between these genetical strains is that whereas the level of infection by parasitic trematodes is very high in bisexual populations, the flukes are rare (in New Zealand) or absent (in Europe) in parthenogenetic ones (Lively, 1992).

In XXth century the expansion of *Potamopyrgus antipodarum* takes place in continental Europe. Recently it lives almost exclusively in fresh waters, what is probably due to the lower oxygen demands in fresh than in brackish environments (Lumby, 1958). In the second half of XX century it colonised the great areas of North America (Strzelec, Serafiński, 1996).

In fresh waters of northern and central Poland it is known from 1933, but in the southern regions of the country it has appeared not before the two last decades. From 1985 the rapid expansion of this species takes place in Upper Silesia (Strzelec & Krodkiewska, 1994), similar to that found by Frank in Austria and Hungary by Roth in Rhine catchment and by Cejka in Slovakia.

Probably the great thermal tolerance and relatively high resistance to sewages and other pollutants facilitate the colonisation of new areas (Strzelc, 1999).

The occurrence of *Potamopyrgus antipodarum* in Upper Silesia mainly in anthropogenic water bodies and small rivers (Strzelec & Krodkiewska, 1994) has confirmed the views of Hauser et al. (1992) and of Jovett et al. (1991) that it prefers these types of habitats. In some such habitats, in spite of generally unfavourable environmental conditions *P. antipodarum* occurs very numerously, forming permanent populations.

In last years the big populations of *P. antipodarum* inhabiting two neighbouring water bodies were studied. In the first of them (Rybnik dam reservoir) water is polluted thermally by discharge of warm water from a power plant, whereas in the second one (Gzel reservoir) it is thermally undisturbed. In both reservoirs these snails have appeared in 1994 and during two years became the dominant in snail fauna (Strzelec, 2000). Similarly as in other water bodies the increase in population size was very rapid. In the first year only few individuals were found, whereas in the next years the mass occurrence was observed in all studied cases as a rule (Strzelec, 1993; Strzelec & Krodkiewska, 1994; Strzelec & Serafiński, 1996). This fact results from parthenogenetical reproduction and great fecundity of these snails as well as from early-achieved maturity and ability to rapid expansion in newly colonised regions.

The present study has shown the influence of elevated water temperature in Rybnik dam reservoir on growth rate of *Potamopyrgus antipodarum* (Gray) as well as on its fecundity both real and potential one.

The fecundity of this species is greater in heated Rybnik reservoir than in thermally natural Gzel reservoir, despite of fact that in all months the percent of individuals with embryos in brood pouch is smaller in the first of them.

It seems that the higher water temperature accelerates the pubescence of individuals in *P. antipodarum*.

The main reproductive period in both reservoirs falls in spring.

Maximal size of shells as well as maximal number of embryos per snail in population from heated reservoir are still smaller than observed in populations living at home – in New Zealand.

As the result of our studies is the statement that after introduction of *P. antipodarum* to some anthropogenic water – bodies the native snails are progressively eliminated from habitat. E. g. In several sand pits in Upper Silesia *P. antipodarum* has reduced during four years the abundance of local snail species and some of them have been completely disappeared. In one sand-pit from among 5 snails species occurred there before the introduction of *P. antipodarum* two species became extinct and the other three reduced in number. The same event was observed in other water – bodies. In observations repeated after two years the mass occurrence of mud snails has been found, by the complete absence of native snail species, from among even the ubiquitous *Radix peregra* has not sustained the competition of this exotic newcomer.

In all countries colonised by *P. antipodarum* any effective treatment to completely eliminate it was not invented. Thus this species is the potential threat to existing wherever aquatic mollusc communities.

The detailed studies carried out in rivers of Yellowstone National Park suggest that native mollusc may be reduced in abundance or eliminated entirely in running water too. So the threat of freshwater fauna by *P. antipodarum* may prove the world-wide event.

## REFERENCES

1. Hauser L., Carvalho G. R., Hughes R. N., Carter R. E. (1992). Clonal structure of the introduced freshwater snail *Potamopyrgus antipodarum* (Prosobranchia: Hydrobiidae) as revealed by DNA finger – printing. – Proc. Roy. Soc. London B 249: 19-25.
2. Jowett J.G., Richardson J., Biggs J. F., Hickey C. W., Quinn J. M. (1991). Microhabitat preferences of benthic invertebrates and the development of generalised *Deleatidium* ssp. habitat suitability curves applied to four New Zealand rivers. – N. Z. Mar. Freshwater Res. 25: 187-200.
3. Lively C. M. (1992). Parthenogenesis in a freshwater snail: reproductive assurance versus parasitic release. – Evolution 46: 907-913.
4. Lumbye J. (1958). The oxygen consumption of *Theodoxus fluviatilis* (L.) and *Potamopyrgus jenkinsi* (Smith) in brackish and fresh water. – Hydrobiologia 10: 245-262.
5. Strzelec M. (1993). Snails (Gastropoda) of anthropogenic water environments in Silesian Upland. – Prace Naukowe Uniwersytetu Śląskiego no 1358: 1-104 (in Polish with English and German summaries).
6. Strzelec M. (1999). Effect of artificially elevated water temperature on growth and fecundity of *Potamopyrgus antipodarum* (Gray) in anthropogenic water bodies in Southern Poland (Gastropoda: Prosobranchia: Hydrobiidae). – Malak. Abh. Mus. Tierkd. Dresden 19: 25 pp 266-272.
7. Strzelec M. (2000). The changes in the freshwater snail (Gastropoda) fauna of dam reservoir Gzel (Upper Silesia) and their causes. Folia Limnologica 7: 173-180.
8. Strzelec M., Krodkiewska M. (1994). The rapid expansion of *Potamopyrgus jenkinsi* (E. A. Smith, 1889) in Upper Silesia (Southern Poland) (Gastropoda: Prosobranchia: Hydrobiidae). – Malak. Abh. Mus. Tierkd. Dresden 17: 83-86.
9. Strzelec M., Serafiński W. (1996). Population ecology of *Potamopyrgus antipodarum* (Gray, 1843) in a recently colonized area: Upper Silesia (Southern Poland) (Gastropoda: Prosobranchia: Hydrobiidae). – Malak. Abh. Mus. Tierkd. Dresden 18: 75-82.
10. Wallace C. (1992). Parthenogenesis, sex and chromosomes in *Potamopyrgus*. J. moll. Stud. 58: 93-107.

Матеріал надійшов до редакції 12.09.01.

### **Стжелец М. Угроза для местных моллюсков со стороны новозеландского слизня.**

*Potamopyrgus antipodarum* был интродуцирован в соленые и пресные воды Европы, возможно, в первой половине 19 столетия, когда регулярное судоходное сообщение связало с 1840 г. Британские острова с Новой Зеландией. Поэтому эти моллюски могут выживать только в воде с 24,6% соленостью, транспортировка индивидуумов на внешней части корабля невозможна (Стжелец, 1996).

### **Małgorzata Strzelec The threat of native molluscs by the New Zealand mud – snail (*Potamopyrgus antipodarum* (gray)).**

*Potamopyrgus antipodarum* has been introduced to brackish and fresh waters of Europe probably in the first half of XIXth century, when the regular clipper lines have connected from 1840 the British Isles with New Zealand. Because these snails can survive in water to 24.6% salinity only, the transportation of individuals on outer parts of ship is impossible (Strzelec, 1996).