Freshwater Mussels in BULGARIA

Institute of Biodiversity and Ecosystem Research
Bulgarian Academy of Sciences

Project DO 02-283/2008
National Science Fund
Ministry of Education, Youth and Science

The mussels are mollusks with double-sided, symmetrical body and shell, composed of 2 valves. The 2 valves are joined together by an elastic ligament, which keeps them open. The valves usually articulate with one another using teeth-like structures called hinges. The mussels have no head, their soft body is enclosed in a mantle and composed of a sac with internal organs and a single axe-shaped foot. The breathing organs are 2 pairs of gills. In most mussels they are used for filtering the food and for the incubation of the eggs. The mussels have two siphons – incurrent for bringing water in, and excurrent for expelling water.

The Bulgarian freshwater mussels belong to 4 families, 8 genera and 25 species. Three of the species are invasive alien species and one is an invasive species of native origin.

During the last 70 years, many water bodies in Bulgaria have been exposed to drastic human impact (water abstraction, hydrotechnical changes, pollution). The most affected are the middle and lower reaches of the rivers, the lakes and the wetlands. As a result of this, the populations of native mussels have declined drastically. The invasive alien species have also contributed to this strong negative impact, which is illustrated by displacement of native species, changes in the communities and economic losses.

Family UNIONIDAE

Seven species are found in Bulgaria. The individuals are dioecious (with separate males and females), and reach sexual maturity after the 3rd year. The eggs are fertilised from the end of April to June. The incubation of the eggs, their development into a larva in the gills of the mussels, and their discharge into the water continue until August. The larvae are parasitic – glochidia, using different fish species as hosts. The mussels feed by filtering detritus and plankton. The life span of the larger specimens is a few decades.

Depressed river mussel
(Pseudanodonta complanata)

The shell is oval, very flat, with characteristic concentric ridges. It reaches a length of up to 82 mm and a height of around 43 mm. It inhabits stagnant water bodies and the lower reaches of rivers. A burrowing filter-feeder, it prefers sandy-muddy bottoms.
The depressed river mussel has a relatively limited distribution in Bulgaria – it is found mostly in the Danube River, adjacent wetlands and the lowermost reaches of the Danube tributaries, from 0 to 50 m a.s.l. The species is included as Vulnerable in the IUCN Red List.

Thick shelled river mussel
(Unio crassus)

The shell is thick and oval, with its larger radius (thickness) being at the centre. The length is twice that of the height. The hinge-teeth are massive, strongly pronounced and of pyramidal shape. The mussel reaches a length of up to 70–78 mm and a height of up to 30–37 mm. Inhabits mostly the middle reaches of rivers. A burrowing filter-feeder, it prefers muddy-clay bottoms. It is found everywhere in Bulgaria – the Danube, Black Sea and Aegean Sea basins, from 0 to 930 m a.s.l. The species is of high conservation concern – included as Endangered in the IUCN Red List, and protected by the EU Habitats Directive (92/43/EEC) and by the Biological Diversity Act in Bulgaria (2002).

Painter's mussel
(Unio pictorum)

The shell is elongated with almost parallel upper and lower margins. Its larger radius (thickness) is in the anterior 1/3. The length is more than 2 times the height. The hinge-teeth are thin and plate-like. The mussel reaches a length of up to 80–92 mm and a height of up to 35–42 mm. It mostly inhabits the lower reaches of rivers and some stagnant water bodies. A burrowing filter-feeder, it prefers a muddy-clay-sandy substrate. It is found in the Danube, Black Sea and Aegean Sea catchments, from 0 to 500 m a.s.l.

Swollen river mussel
(Unio tumidus)

The shell is wedge-shaped with a curved anterior and narrow and sharpened posterior end. Its larger radius is in the anterior 1/3. The hinge-teeth are plate-like. The species reaches a length of up to 79–84 mm and a height of up to 34–40 mm. Inhabits mostly the lower reaches of rivers and some stagnant water bodies. A burrowing filter-feeder, it prefers muddy-clay substrates. It is found mostly in the Danube River basin, from 0 to 200 m a.s.l.

Duck mussel
(Anodonta anatina)

The shell is thin without a hinge, only with a ligament. The umbonal rugae are wavy, not always extending to the edge of the shell, crosswise to the growth lines. The upper hind margin of the shell is wing-shaped. The mussel reaches a length of up to 150 mm and a height of over 85 mm. It inhabits the lower reaches of rivers and stagnant water bodies. A burrowing filter-feeder, it prefers sandy-muddy and muddy bottoms. It is found everywhere in Bulgaria from 0 to 800 m a.s.l.

260 mm

Swan mussel
(Anodonta cygnaea)

The shell is thin, without a hinge. The umbonal rugae coincide with the growth lines, reaching the margin of the shell, sometimes interrupted. The upper hind margin of the shell is not wing-shaped, upper and lower margins are nearly parallel. It reaches a length of up to 260 mm and a height of up to 130 mm. The largest native mussel. It inhabits stagnant waters and the lower reaches of rivers. A burrowing filter-feeder, it prefers muddy-sandy bottoms. It is found less frequently than *A. anatina,* everywhere in Bulgaria from 0 to 800 m a.s.l.

Chinese pond mussel
(Anodonta woodiana)

200 mm

The shell of the mussel is swollen with distinct and rough umbonal rugae, which differentiates it from the native *Anodonta* species. Because of its height, the mussel looks rounded. The interior of the shell has a pink or yellow colour as opposed to the native mussels, which have a white-blue colour. It reaches a length of 220 mm and a height of 160 mm. It inhabits the lower reaches of rivers and some stagnant water bodies. A burrowing filter-feeder, it prefers a muddy bottom.

Invasive alien species. Its native range includes Southeast Asia. The invasion of the species into the European waters was associated with the introduction of Asian carps, which had been infested by glochidia of the mussels. The species was first recorded in Bulgaria in 2005 in the Danube River and later in the lowest reaches of the Iskar River. Currently, it is found in the entire stretch of the Danube, and has spread upstream of its tributaries – Iskar (in 2011 it was found 50 km upstream of the mouth), Yantra, Rusenski Lom, from 0 to 100 m a.s.l.

Negative impact: It competes with and displaces native species from the genus *Anodonta,* sometimes from the genus *Unio.*

Family DREISSENIDAE

Two *Dreissena* species are found in Bulgaria. They are characterised by planktonic larvae and attached adult forms. The mussels attach to hard substrates with the aid of byssal threads. Filter-feeders, feeding on plankton. *Dreissena* mussels are recognised among the most aggressive aquatic invaders worldwide with strong ecological, economic and social impact. Their invasion is associated with ship ballast waters, canals, transport with fish stocking material, fishing or recreational equipment.

Zebra mussel
(Dreissena polymorpha)

The shell is triangular with symmetrical valves and a flattened ventral surface. It has a distinct angle (carina), located ventrolaterally. It has usually a dark-brown colour with a zigzag striped pattern. The species reaches a length of around 50 mm. It prefers stagnant and slow-running water. With the aid of byssal threads it attaches to hard substrates, stones, vegetation, shells of other mussels and snails.

Invasive species. The native range of the species in Bulgaria includes the Danube River and the Black Sea coastal rivers and lakes. Over the last 15 years the mussel has spread rapidly into the inland water basins of Bulgaria. Currently, around 60 water bodies (reservoirs, lakes, river sections) in the Danube, Black Sea and Aegean Sea basins have been infested by the zebra mussel.

Quagga mussel
(Dreissena bugensis)

The shell is with a rounded triangular shape, with clearly asymmetrical valves and a convex ventral surface. It has an indistinct rounded angle (carina), located laterally. The species reaches a length of around 50 mm. It prefers stagnant water bodies and slow-running water. It attaches to hard substrates and forms mixed colonies with the zebra mussel. Prefers deeper waters.

Invasive alien species. The native range includes Dnieper-Bug Liman. In Bulgaria, the first specimens were found in 2005 in the Danube River. Currently, it is found along the entire Bulgarian stretch of the river, in the reservoirs Ogosta and Asparuhov Val, from 0 to 200 m a.s.l.

Negative impact: As a result of their filtering and fouling activities, The *Dreissena* mussels have potential for severe negative impact on the biodiversity and ecosystem functions in the infested water bodies. When found in large quantities, they can drastically influence the water physichochemical parameters, phytoplankton, zooplankton, benthic invertebrates and fish. As major biofoulers, they can interfere with vital water supply intakes and navigation structures and thus affect thermoelectic and nuclear power plants, drinking water treatment plants, irrigation facilities and various industries.

Family CORBICULIDAE

The family is characterised with a plankton larval stage. The species inhabits lower reaches of rivers and lakes. Burrowing filter-feeders, feeding on plankton. *Corbicula fluminea* and *C. fluminalis* are aggressive invasive species with potential negative impact on the native communities. The invasion of these species is associated with the ship ballast water, fish stockings, canals and irrigation systems. One *Corbicula* species is found in Bulgaria.

Asian clam
(Corbicula fluminea)

The shell is thick, oval-triangular, and its height is less than its length. It reaches a length of around 40 mm, a height of 38 mm and a width of 25 mm. The species prefers large water bodies with a sandy, sandy-gravelly and stony substrate.

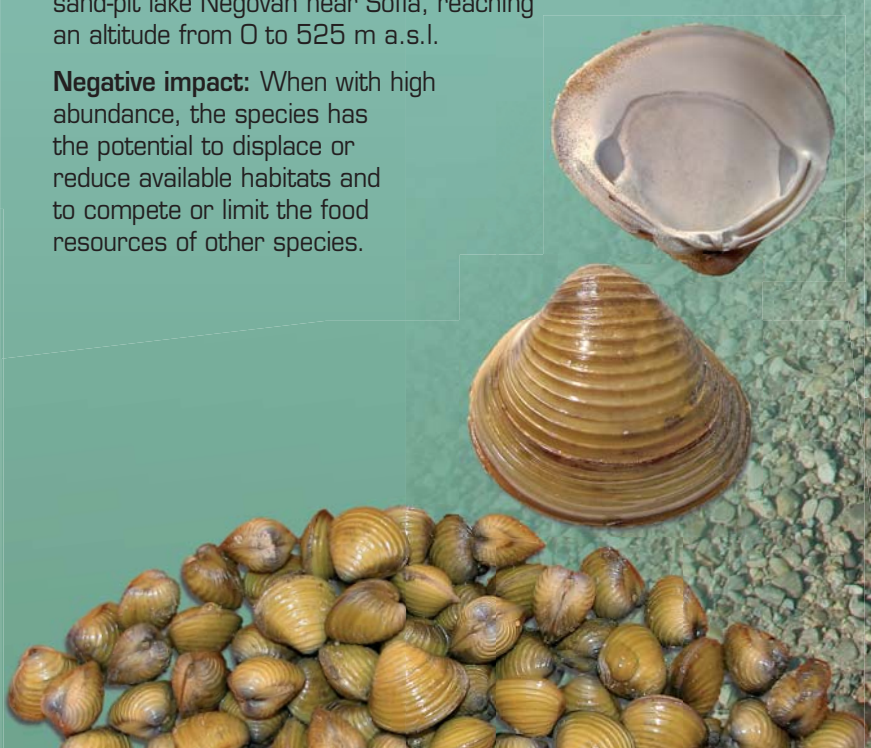
Invasive alien species. Its native range includes Central and South-east Asia. It appeared in Europe in the early 1980s. In Bulgaria, the first specimens were recorded in 2001 in the Danube River, and in 2004, in the Iskar River. Currently, the species is found along the entire Bulgarian section of the Danube, and it is rapidly spreading upstream of the Danube tributaries – Tsibritsa, Ogosta, Iskar (in 2011 it was found 80 km upstream), Vit, Osam and Yantra. It was also found in the reservoirs Valchovets and Gorni Dabnik, and the sand-pit lake Negovan near Sofia, reaching an altitude from 0 to 525 m a.s.l.

Negative impact: When with high abundance, the species has the potential to displace or reduce available habitats and to compete or limit the food resources of other species.

Family SPHAERIIDAE

In Bulgaria, 15 species belonging to 3 genera – *Pisidium, Sphaerium* and *Musculium* are found. Most of the species are small and difficult to identify. The largest species found in Bulgaria *(Sphaerium rivicola)* reaches a length of around 25 mm and height around 18 mm. The shells are thin and oval. In some species one pair of the gills is reduced. The representatives of the family are hermaphrodites. Development is short (without metamorphosis) and occurs in brood sacs on the gills.

The adult mussels are filter-feeders, which burrow in the bottom substrate or attach to submerged vegetation. They feed on detritus. Found everywhere in Bulgaria.



Contacts:
Institute of Biodiversity and Ecosystem Research
Bulgarian Academy of Sciences
Tel.: **(02) 989 6997**
trichkova@zoology.bas.bg; trichkova@gmail.com
http://www.dreissena.info ***http://www.esenias.org***

Text: Zdravko Hubenov, Teodora Trichkova
Photos: Lyubomir Andreev, Teodora Trichkova, Asen Ignatov
Design: Lyubomir Andreev, **Printed in BULGARIA**