

**Spreading invaders along the Danubian highway:  
first record of *Corbicula fluminea* (O. F. Müller, 1774)  
and *C. fluminalis* (O. F. Müller, 1774) in Hungary  
(Mollusca: Bivalvia)**

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ABSTRACT: New mussel taxa were detected in Hungary in June 1999 during sampling of the Vén-Duna (Baja). The results of a recent sampling program on the Lower Hungarian Danube revealed the present distribution of the invading Molluscs. However, the data provided an acceptable theory referring to both the way of their introduction in our Danube stretch and the possible reason of their colonisation.

**Introduction**

The sudden extension of the range of non-indigenous species was and going to be promoted by the human impact. This paper introduces such an event when the first record of the genus *Corbicula* in Hungary was experienced in the River Danube. A regular biomonitoring program is carried out in the Vén-Duna since the autumn 1997 in the framework of an ecological rehabilitation program of this Danubian side arm sponsored by the RIZA (The Netherlands). The quantitative seasonal sampling of macroinvertebrates lead to these new faunal results in the summer of 1999.

The side arm was blocked by a rock dam at its upper one-fourth stretch in order to decrease the flow rate, and, at the same time to increase the discharge of the main (shipping) Danube arm. Considerable sedimentation took place in the Vén-Duna during the last decades together with extreme water quality situations especially during low Danubian flow rate periods because the water level at middle Danubian discharge did not exceed the level of the rock dam.

The rock dam was reopened in August 1998 in the framework of a common Dutch-Hungarian joint study program aiming the ecological rehabilitation of this side arm. Seasonal hydrobiological investigations are carried out in the region with hydrological survey and regular measurement of sediment transport since 1997 in order to follow up the ecological effects and hydrological consequences of the intervention.

**Material and method**

Quantitative benthon samples were collected in the Vén-Duna side arm using an Ekman-Birge sediment grab on 18 June 1999. The Vén-Duna is situated upstream Baja on the right bank of the Danube between 1480–1483 river km. One of the standard sampling localities is situated near the upstream end, approximately 100 m above the reopened rock dam where right, middle and left bank samples are collected. The depth is 12 m in the middle of the channel.

This considerable depth was developed after dredging and reopening. Further caving of the dredged river bed by the strong current was experienced because permanent high flood period was registered in the first half of the year of 1999. Due to the reopening, well developed discharge is taking place along the side arm since that time at each Danubian flow rate situation.

## Results

Few juvenile *Corbicula* sp. specimens were identified from the benthon samples collected in the middle of the Vén-Duna at site 1 (upstream location) on 18 June. The smallest individuals were not exceeding 1 mm but the largest one had no more than 5 mm body length, as well. It was obvious that the taxa belonged to the genus *Corbicula* but the species determination was not possible due to the lack of experience and lacking appropriate keys.

Many specimens were found on 20 October during low water discharge not only in the middle of the channel but in both bank samples, too. The largest individuals were 15 mm long, the number of juveniles increased up to 5000/m<sup>2</sup>. The taxa were present in the River Danube at 1483 river km, too. The hydraulic conditions for collecting the benthon sample in the Danube was especially perfect due to the extreme low water level and discharge (206 cm at Baja water gauge).

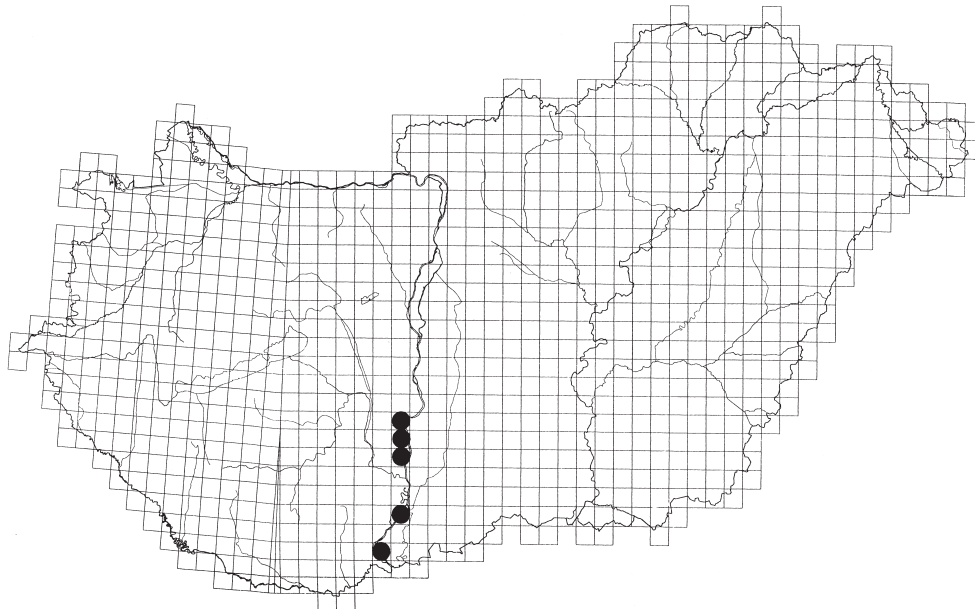
Macroinvertebrate samples were collected in the Lower Hungarian Danube between 1534 and 1440 river km (Paks–Mohács section) in the frame work of an environmental impact study. Approximately 110 m<sup>3</sup>/sec cooling water is taken from the Danube by the Paks Nuclear Power Plant having a nominal electric capacity of 1660 MW for direct cooling (once-through) technology. The outlet of the cooling water channel is situated at 1526 river km, downstream Paks.

Hugh mass of dead and living *Corbicula* taxa were collected *only at the right bank of the river* just in the warm water confluence (1526 rkm), and at the 1525.2 rkm section, respectively (CS36). The mussels were detected at 1523.5 rkm (Uszód) (CS35), 1516 rkm (Gержen–Meszes ferry) (CS35), 1507 rkm (Fajsz–Domboripuszta ferry) (CS34) 1483 rkm (upstream Baja) (CS31), and 1440 rkm (Mohács, ferry) (CR29), too. According to the taxonomical determination, both species, *Corbicula fluminea* (O. F. Müller, 1774) and *C. fluminalis* (O. F. Müller, 1774) were identified (GLÖER and MEIER-BROOK 1994). Abundance and detailed distribution was not the aim of the present study (Map. 1).

## Discussion

These new invading mussel species colonised the downstream section of the warm water outlet of the Paks Nuclear Power Plant together with giant specimens of *Sinanodonta woodiana* (Lea 1834). Their sudden occurrence at the 1526 rkm section and the plume-like distribution following the shore line of the right bank indicates that the origin of them should be the cooling water inlet (cold water) canal of the power plant. Regular transportation takes place by ships when the port is frequently used in the cold water canal. Most probably the mussels were carried to Hungary (and to Paks) by this way.

Proving this theory another sampling program is necessary in the cold water canal. The spreading of mussels could have been in two ways: either by direct migration to the Danube through the inlet of the cold water canal or by passing through the technological pipeline circuits of the condensers which is a remarkable phenomenon.



Map. 1: Distribution of *Corbicula* in Hungary

Until now no specimens of these taxa were detected upstream the confluence of the warm water canal (1526 rkm) and downstream Mohács (1440 rkm) neither were found in the Yugoslavian Danube stretch during a UNEP sampling in August 1999. As far as the predictions are concerned, the two *Corbicula* taxa will probably occur in the near future in that Danubian section, as well.

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#### **Literature**

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