

RESEARCH NOTE

Unusual spurting behaviour of the freshwater mussel *Unio crassus*

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Unio crassus was once the most abundant unionid found in Central Europe,¹ living in unpolluted lakes,² rivers and brooks.¹ However, intensive agriculture and urbanization since World War II has destroyed much of the mussel's habitat and the species is now considered endangered in Switzerland, Germany, France and Austria.

In 1913, Israel³ reported an unusual behaviour in *Unio crassus*, whereby the animals crept up to the shoreline and spurting water into the stream. He interpreted this as the mussels moving to the shore to feed from the surface and that the spurting removed excrement. An alternative explanation for this behaviour was provided by Mentzen,⁴ who suggested that the spurting animals may have been trapped by falling water levels and were suffering from over-heating. Neither of these explanations seems plausible. I have had the opportunity to study this unusual behaviour over several years and offer the following observations and an hypothesis.

Over the course of several years (1998–2004), during early May observations of the spurting behaviour were made in two brooks in Switzerland, one near Zurich, the other near Schaffhausen. Each brook was approximately 2–3 m wide and 20–40 cm deep. I observed that from the late morning onwards and often in full sunshine, individuals of *Unio crassus* crept up to the water line on shores where there was little or no vegetation. In all, 67 spurting individuals were observed. The emergent mussels were orientated so that they were at right angles to the shoreline and with the posterior margin directed towards the water. The emergence was such that the branchial siphon was maintained below the water level, while the anal siphon was above it. These individuals were observed ejecting streams of water into the brook up to 1 m away (Figs 1,2), regularly and about once every minute. No individual was observed resting at the shore without spurting. None of the individuals observed missed the brook, and only a few jets hit overhanging vegetation. This behaviour lasted until the afternoon when they retreated backwards into the water a few centimetres before turning around and creeping into deeper water.

I collected samples from the ejected water and examined them under a hand lens. Twenty-nine out of 31 samples (each from different individuals) examined contained glochidia. Since *Unio crassus* are known to be separate sexes with a 1:1 sex ratio,⁵ it seems likely that the spurting individuals were all female. The observations made herein were at the beginning of the reproductive period,⁶ and Israel's observation during the summer indicates that the spurting behaviour continues throughout the gravid period. Spurting behaviour was not observed during subsequent visits to the brooks after the reproductive period.

I suggest that repeated spurting of jets of water containing glochidia into the centre of the water course may be an adaptation to enhance dispersal and the probability of infecting host fish. Direction towards the main stream is likely to increase the distance the glochidia travel before sinking to the bottom compared with release at the bottom of the brook. It is also possible that the disruption of the water caused by the spurts might help to attract potential host fish, for example minnows (*Phoxinus phoxinus*) and chub (*Leuciscus cephalus*), which might mistake

them for insects. These host fish are active only during the day and at night rest on the bottom of the brooks. Although the spurting behaviour has not been reported in any other unionid, it is known that other Unionidae (not European) use a range of behaviours and mechanisms (e.g. releasing glochidia within conglutinates that mimic fish food items) to enhance infection rates.⁵



Figure 1. A mussel (*Unio crassus*) at the water line. About every minute it ejects a thin beam of water towards the middle of the brook. The trace of creeping to the shore is visible.



Figure 2. A spurting mussel (*Unio crassus*) at the shore of a brook. Downstream there is a swarm of minnows (*Phoxinus phoxinus*), a host-fish species of the mussel.

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It should be noted that this emergent behaviour exposes the mussels on the shoreline during which time they may be at risk from predators. However, there appear to be no natural predators able to exploit this, although they are preyed upon by an introduced species,⁷ the muskrat (*Ondatra zibethica*) which originates from North America.

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