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What has the beaver got to do with the freshwater mussel decline? A response to Rudzīte (2005)

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In this journal, Rudzīte (2005) presented data on the status of the freshwater mussel *Margaritifera margaritifera* populations in Latvia. In it, the author claimed that the Eurasian beaver (*Castor fiber*) presented "a threat for the pear mussel population and therefore [its presence is] unacceptable in streams inhabited by *M. margaritifera*" (Rudzīte 2005; pp. 126). This message was repeated in the discussion, summary and abstract of the paper. This is a strongly worded condemnation of beavers in Latvia and therefore the author should present clear data to back-up this claim. However, the evidence presented by Rudzīte was at best anecdotal.

Rudzīte presented data from seven rivers in Latvia with some detailed information on the body lengths of mussels from two rivers (the Ludze and the Rauza). The latter two rivers were subdivided into two sections ('a' and 'b') of these, the upper section of the Ludze river (Ludze b) is the most heavily affected by beaver activities such as damming. Indeed, this section may be the only one that actually contained beavers at the time of study, however this was not clear from the manuscript. Rudzīte stated that beaver dams cause silting, warm water, increased eutrophication and shading. The inference presented by the author here is that beavers are intrinsically 'bad' for freshwater mussel populations. Indeed, it does seem logical that freshwater mussels would not survive in a beaver-pond since they prefer fresh flowing water and sandy substrate stabilised with large boulders (Vannote, Minshall 1982). However, no evidence to support this statement was provided. Of the various indicators of population quality, Rudzīte only presented one when comparing the 'beaver' and 'beaver-free' sections of the Ludze river (which as an aside, represents a sample size N = 1 and thus can only be regarded as anecdotal). The measure used is body length (a surrogate of age class; Rudzīte 2005; Fig. 1). From this presented data, there appears to be no evidence that the mussel populations in the beaver section of the river are in any worse condition than those in the beaver-free section. Indeed, the four smallest mussel specimens measured in Ludze river were all found in the beaver section. Small mussel specimens are generally considered a good sign since this represents recent recruitment into the population (Skinner et al. 2003; Rudzīte 2005). It seems then that Rudzītes ambiguous claim that beavers are bad for the endangered freshwater mussel is based upon the assumption that since beaver ponds are bad, so must the beaver be.

The last sentence might appear to be logical, but is in fact quite the opposite when we examine the behaviour of the beaver and the consequences of dam building in further

detail. Beavers damming behaviour is affected by habitat characteristics and thus not all beaver colonies will build dams (Collen, Gibson 2000). Furthermore, beaver activity will only affect a proportion of the stream length that can range from < 1 % to 50 %, the latter being recorded in the North American beaver (*C. canadensis*; Rosell et al. 2005). This means that habitat can be available for freshwater mussels between beaver ponds. Freshwater mussels require clean oligotrophic flowing water but severe flooding or very low summer flows have a detrimental impact on populations, as can high sediment loads (Skinner et al. 2003). By slowing river flow and retaining water at ponds, beaver dams can retain sediment, pollutants and nutrients as well as regulate flow so that the water quality downstream is improved, extreme water fluctuations are avoided and stream sediment load is reduced (Gurnell 1998; Rosell et al. 2005). Though the total impacts of a beaver dam will depend on the physical characteristics of each site, it would appear that beaver dams might actually benefit mussel populations, downstream at least.

Freshwater mussels have been experiencing a decline throughout their range (Skinner et al. 2003). Simultaneously, it would appear, both the Eurasian beaver and the North American beaver have been experiencing a rapid increase in range and population (Halley, Rosell 1998; Larson, Gunson 1983). A worrying correlation, one might think. However, the decline of the mussel has been evident in countries which currently have no wild beaver populations, such as the United Kingdom (Halley, Rosell 1998; Skinner et al. 2003). Moreover, beavers of either species were once found throughout temperate Eurasia and North America. One must assume that the range of the freshwater mussel overlapped that of the beaver significantly and that during this period, both species were able to coexist. Correlation is not causation and a much better study is required to determine the real influences of beaver dams on freshwater mussel population.

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