Lagergren, O. Ragnar. 2000. Antipredator defences in *Eubosmina* waterfleas

Animal Ecology, Department of Zoology, University of Göteborg, Box 463, SE 405 30 Göteborg, Sweden

Key words: zooplankton, predation, swimming, escape efficiency, inducible defences, *Eubosmina coregoni*, *Eubosmina longispina*, *Leptodora kindtii*, Cladocera, hydrodynamics, temperature, *Bosmina*

Abstract

For zooplankton, the ability to avoid predation greatly affects individual fitness. In most lakes, predators include both invertebrates and vertebrates. Invertebrate zooplankton predators that are able to coexist with fish are usually not much larger than their prey. Threfore, differences in prey morphology greatly affect the ability of such predators to catch, handle and ingest the prey. By developing morphological defence traits such as spines, helmets, unwieldy size or shape, zooplankton may reduce their vulnerability to invertebrate predators. This thesis aims to clarify morphological variation in *Eubosmina* (Cladocera) in relation to predation, in particular by the predaceous cladoceran *Leptodora kindtii*.

In laboratory experiments, the antennule length of *Eubosmina* significantly affected the likelihood of escaping *Leptodora* after being caught. Of three species compared, the two possessing very long antennule both had about six times greater escape success than the species with short antennule.

When the subspecies *Eubosmina coregoni gibbera* was cultivated in the presence of chemical cues from *Leptodora*, carapace height and antennule length became significantly larger than in the control groups. As the abundance of *Leptodora* varies seasonally, this may explain why the antennule length and carapace height of *E. gibbera* are larger during periods of high population size of *Leptodora*.

Morphological defences may also incur costs. The swimming speeds of *E. longispina* and *E. gibbera* were compared in a laboratory experiment. *E. longispina* has a low carapace and short antennule and is significantly more vulnerable to predation by *Leptodora*, than is *E. gibbera*, with its high carapace and long antennule. *E. gibbera* had greater drag and swam more slowly than *E. longispina*. As swimming speed most likely influences food intake, this result suggests that morphological defence may entail costs that select against the defence when predator pressure is low.

The hydrodynamic cost is affected by temperature. At low temperature it is more expensive to wear large morphological defences that increase body surface area. This may be one reason why shape and morphological defences of zooplankton are dependent on temperature in most cases.

Another aspect of cost is the extra amount of energy, nutrients or brood chamber space required to produce young. This kind of cost might be reflected in a correlation between investment in predator defence and clutch size. I found such a relationship for antennule length but not for carapace height in *E. gibbera*.

In summary, this thesis suggests that morphological defence traits in *Eubosmina* are the outcome of a trade-off that may be determined by the abundance and species composition of predators as well as environmental conditions as temperature and food abundance. The results help to explain the great morphological variation found in the genus *Eubosmina*.