HORSES AS A MAJOR CAUSE OF MORTALITY IN *COENAGRION PUELLA* (L.) (ZYGOPTERA: COENAGRIONIDAE)

The aim of this short communication is to show the dramatic effect on the susceptibility to predation of a population of emerging damselflies when the emergent vegetation in the pond is greatly reduced by grazing vertebrates.

In a two year study of the population dynamics of *C. puella*, at a pond in northern England, we monitored larval densities monthly, and measured and marked individually, almost every adult emerging from the pond. The pond is roughly circular with a radius of about 10 m. The aquatic vegetation consists of *Nuphar lutea* and *Potamogeton crispus*, while the emergent vegetation around the margins of the pond is *Glyceria* sp. The pond is situated in a small field which was ungrazed in 1983 but grazed in 1984.

Larval densities were estimated from bin sampling, approximately 1 m from the water's edge. For the purpose of this note, we are concerned with the two bin samples immediately prior to emergence in 1983 and 1984; both were taken in the last week of April, with emergence beginning in mid-May. In 1983, the larval densities were 90 m ^{2} (± 57 S.E.) and in 1984, 84 m ^{2} (± 50 S.E.). In other words numbers of larvae immediately prior to the beginning of emergence were very similar in the two study years.

However, the total numbers of adults that successfully dispersed from the pond during the month following the onset of emergence were greatly different. In 1983, the figure was 3756 compared with 2456 in 1984. The larval numbers in 1984 prior to emergence were 93% of the 1983 figure; the adult numbers successfully dispersing were 65% of the 1983 figure. This huge loss at emergence is higher than any figure quoted by P.S. CORBET (1962, *A biology of dragonflies*, Witherby, London). What were the causes of this mortality?

The difference in emergence success in the two years can be attributed directly or indirectly to the presence of two horses which were permitted to graze in the field during the 1984 emergence period.

There were three ways in which the horses influenced emergence. First, by simply eating *Glyceria* on which adults were emerging, they either ate the larvae inadvertently, or caused the larvae to fall and thus fail to complete emergence successfully. Second, after prolonged grazing of the bankside and emergent vegetation, there are insufficient sites on to which the larvae can climb to emerge. Consequently many try to emerge on inadequately tall pieces of vegetation and a higher percentage than is normal fail to successfully complete emergence. The third, and most important, source of mortality caused indirectly by the horses was that, by the gross thinning of the vegetation round the pond, the emergence sites became far more accessible to avian predators than in 1983. In the first year of the study, we observed some predation by house sparrows (*Passer domesticus*), but certainly less than 5% of emerging adults were taken. However, in 1984, the sparrows, (which were apparently oblivious to our presence) must have consumed something in the region of one thousand plus adults or about 30% of the population. These observations emphasise the

role that the number and quality of emergence sites play in the dynamics of odonate populations.

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