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Delivering Arable Biodiversity

Effect of wetting-up ditches on emergent insect numbers

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Materials and Methods

An experiment was undertaken to investigate whether damming sections of agricultural ditch increased the insect food available for farmland birds through the nesting season. Thirty-two ditch sections were selected in the area around the village of Loddington, Leicestershire. Half of the ditches drained arable catchments, half pastoral. Each ditch was bunded and slightly widened to dam up the water behind and, potentially, retain water for longer into the summer. The control section for each ditch was usually located *c.* 50 m upstream of the bunded ditch. The bunded area was typically 5–20 m in length and a similar length was used for the control. Each bunded and control ditch section was set with five insect emergence traps especially designed for the small area available (pyramids of 0.5 mm enviromesh with a triangular base of 30 cm circumference giving a surface area of 0.1 m^2). Traps were spaced approximately equally along the length of the control ditch or bunded feature (Fig. 1). Insects either emerge on the water surface or climb up out of the water prior to emergence and fly or crawl upwards. The trap funnels them into the collecting bottle where they are trapped in the fluid (ethylene glycol/alcohol mix).

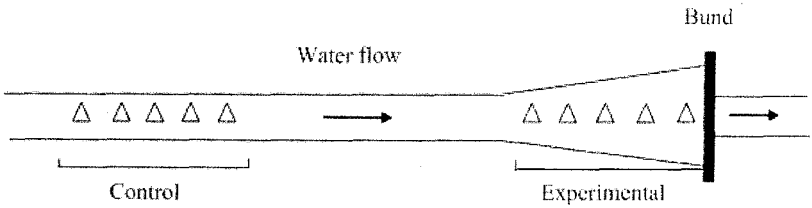

Fig. 1. Layout of emergence traps within the bunded and experimental ditch sections.

All the traps (total = 320) were visited fortnightly between April and August 2005, coinciding with the major period of nesting. On each visit the emergent insects and their preserving fluid were removed from the collecting bottles and any residual individuals were pooted from the trap netting. The sample from each trap was kept separate and sorted in the laboratory into size classes of 2–5 mm, 5–10 mm and > 10 mm. Emergent insects were identified to family level except in the case of Diptera which were assigned a morphotype of either long and thin (primarily Nematocera) or short and fat (other Diptera, primarily Brachycera). Biomass estimates were calculated from published regression equations of length biomass for the two morphotypes of Diptera and for the other aquatic

insect orders (Sabo *et al.*, 2002). A Wilcoxon matched pairs test was used to test the significance of difference in biomass between control and experimental features.

Results

A progressive increase in emergent insect numbers was found throughout the sampling season in all survey sections except for a tailing off at the final visit (Fig. 2). There was an observed relationship between abundance and water depth with the greatest emergence coinciding with surface water disappearing and leaving damp mud. A period of rain prior to the final visit re-flooded most sites and may have resulted in the decline in numbers in the last sampling period. A progressive change was observed in the composition of the insects throughout the season with Nematocera (predominantly Chironomids) being numerically dominant throughout and other Dipteran orders (Brachycera, predominantly Dolichopodidae) increasing dramatically in July. Non-dipteran families such as Nemouridae (Plecoptera) emerged mostly in April and May, Limnephilidae (Trichoptera) in May and June, and Baetidae (Ephemeroptera) in June.

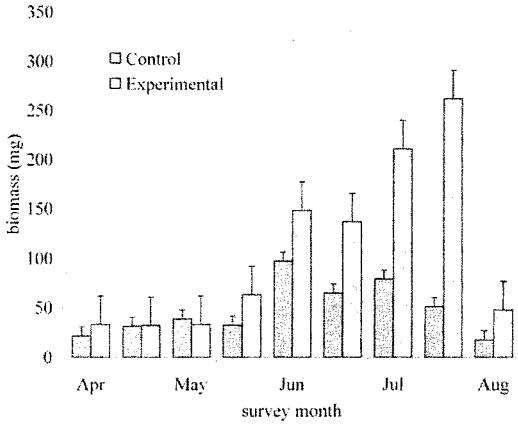

Fig. 2. Comparison of mean emergent insect biomass in experimental and control sections through the survey period.

The bunded 'features', which retained water longer, yielded significantly ($P > 0.005$) greater biomass than the controls, which dried earlier (Fig. 2). On average the production of insects emerging during the sampling season was 10 g dry weight m^{-2} ditch in the bunded sections, compared to 4 g dry weight m^{-2} in the control sections. The non-Dipteran families showed a more mixed response with stoneflies (Plecoptera:Nemouridae) being equally numerous in both features and controls, caddisflies (Trichoptera: Limnephilidae) being more numerous in controls and mayflies (Ephemeroptera: Baetidae) being more numerous in the bunded features.

Reference

Sabo J L, Bastow J L, Power M E. 2002. Length-mass relationships for adult aquatic and terrestrial invertebrates in a California watershed. *Journal of the North American Benthological Society* **21**:336–343.