Effects of adding barley straw to a saline lagoon on benthic invertebrate food supply for birds at Minsmere RSPB Reserve, Suffolk, England

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SUMMARY

The effects of adding organic matter (barley straw) on aquatic invertebrate food supply for waterbirds in an artificial saline lagoon in eastern England was investigated. The addition of barley straw resulted in an increase in benthic invertebrate biomass the following year, but was not considered a successful long-term management strategy to boost invertebrate populations.

BACKGROUND

A possible reason for low biomass of benthic invertebrate food supply for waterbirds in saline lagoons is lack of organic matter in the substrate. The effects of adding organic matter on invertebrate food supply for waterbirds in an artificial saline lagoon was investigated at Minsmere RSPB Reserve (National Grid ref: TM 474672) Suffolk, eastern England, using a replicated experiment involving addition of barley straw.

The lagoon in which the experiment took place was created by excavation in 1962 and has subsequently been extended in area and now covers about 8 ha. The substrate of the lagoons is a mixture of sand and silt. The lagoon has not been found to contain any rare saline lagoon specialist invertebrates or plants.

ACTION

Straw addition: The effect of adding barley straw at Minsmere was determined using a randomised block experiment in a saline lagoon known as East Scrape. Six blocks were set up in September 1998. Each block contained four 5 x 5 m plots with the following treatments randomly allocated to:

i) Rotovated to a depth of 12.5 cm.

ii) 100 g dry weight per m² of barley straw (equivalent to about 1/6 of a 48 x 36 x 1,100 cm bale) evenly rotovated into the top 12.5 cm of the substrate.

iii) 300 g dry weight per m² of barley straw (equivalent to about 1/2 of a 48 x 36 x 1,100 cm bale) evenly rotovated into the top 12.5 cm of the substrate.

iv) Control - no straw added.

The quantities of straw incorporated were chosen to be similar to the quantity of plant matter that could be reasonably be added, from previous experience, to the lagoon by drying it out and re-flooding any vegetation that colonised it.

Invertebrate sampling and sorting: Benthic invertebrates were sampled by wet sieving benthic cores. Seven, 59.4 cm² (surface area) x 5 cm deep cores were taken from random locations. Cores were taken within the central approx. 2 x 2 m of each plot to reduce possible 'edge effects'. Only the upper 5 cm of the substrate was sampled as virtually all the biomass of benthic invertebrates in saline lagoons is found within the upper 5 cm of the substrate (Robertson 1993). Sorting consisted of wet sieving samples through a 0.5 mm mesh using a high pressure water jet, and then emptying the sievings into a white tray. Any invertebrates found were removed and their dry weight determined.

Organic content and coarse detritus: In 1999 the total organic content and weight of

coarse detritus in the benthos were determined from five 5.7 x 5.7 cm (surface area) by 5 cm (deep) benthic cores taken from within each plot. Total organic content was estimated by determining loss on ignition. Coarse detritus in the rest of the sample was removed by wet sieving the sample through a 1 mm gauge sieve.

Substrate softness: Penetration resistance (softness) of the substrate was determined by measuring the depth to which a 14.8 g metal skewer penetrated the substrate when dropped down a plastic tube from a height of 75 cm. Eight measurements were taken per plot.

CONSEQUENCES

Organic content: The quantity of organic matter in the benthos prior to the addition of barley straw is shown in Table 1 (attached). Rotovation had no significant effect on the quantity of organic matter in the top 5 cm of the benthos. Addition of 100 or 300 g of straw had a negligible effect on the total organic matter of the benthos. However, it substantially increased the proportion of coarse detritus in it.

Invertebrate biomass: Addition of 300 g/m² of barley straw resulted in a higher total biomass of benthic invertebrates the following year (see Table 2). This was mainly due to an increase in biomass of ragworms *Hediste diversicolor*.

There was no effect of adding 300 gm/m² of straw on benthic invertebrate biomass during the second year of the experiment (Table 3). Ragworms, which had shown the largest difference in biomass between treatments after the first year, were only present at extremely low densities in East Scrape during the second year of the experiment.

Softness of the benthos: Rotovation did not have any long-lasting effect on the penetration resistance (softness) of the surface of the substrate (see Table 4).

Conclusions: The addition of barley straw was not considered a successful long-term management strategy to boost invertebrate populations, but if applied on a year to year basis might prove beneficial to invertebrate populations, and hence some target wading bird species.

REFERENCES

Robertson P. (1993) The management of artificial coastal lagoons in relation to invertebrates and avocets *Recurvirostra avosetta* (L.). PhD thesis, University of East Anglia, UK.