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The effect of microbenthic grazing by an amphipod, Bathyporeia pilosa, Lindström

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Introduction

Bathyporeia pilosa, a dominating member of the macrofauna in shallow, exposed sand bottoms in the Öresund (The Sound), lives off the microflora of the sand grains (NICOLAISEN and KANNEWORFF 1969). Our purpose was to investigate a possible relationship between *B. pilosa* and microbenthic algae and to study food selectivity in *B. pilosa*.

Material and methods

The uppermost layer (1 cm) of sand and specimens of *Bathyporeia pilosa* were collected from a moderately exposed bottom (depth 0.5 m, salinity ca. 10‰)in the central part of the Öresund. We introduced different densities of *B. pilosa* (0–214) into plexiglass cylinders (area 80 cm^2) with washed sand (to remove non-sessile organisms) and filtered seawater. The cylinders were incubated in the laboratory and exposed to daylight. Range of temperature was 16–18° C. Chlorophyll a content (LORENZEN 1967) and primary production (^{14}C-uptake, GRÖNTVED 1960) were measured in the top 5 mm of sand once a week. Two experiments were conducted: December-January, 1979–80 (A), and May-June, 1980 (B).

To study the composition of the diatom species in the sand, stomach contents and faecal pellets we prepared permanent microscope slides. 500 diatom frustules per slide were identified and counted. The relative abundance was expressed as percentage occurrence. Selectivity was determined using IVLEV's (1961) electivity coefficient. This index ranges from −1 to +1.

Results and discussion

The two experiments showed the same general tendency, i.e. increased chlorophyll a content and primary production with decreasing numbers of *Bathyporeia pilosa* (Fig. 1). This tendency became evident after one week in Experiment A, and after three weeks in Experiment B. Thus the microbenthic flora seems to be limited by grazing by *B. pilosa*.

Our results are mainly in accordance with those of BRANCH and BRANCH (1980), NICOTRI (1977) and PACE et al. (1979). However, in Experiment B the highest increase in primary production occurred with the lowest animal density i.e. 1/4 of the density at the sampling site. PACE et al. (ibid.) also found that a low level of grazing stimulated the microflora, whereas HARGRAVE (1970), COOPER (1973) and others found that natural densities of grazers enhanced the primary production of the benthic microflora.

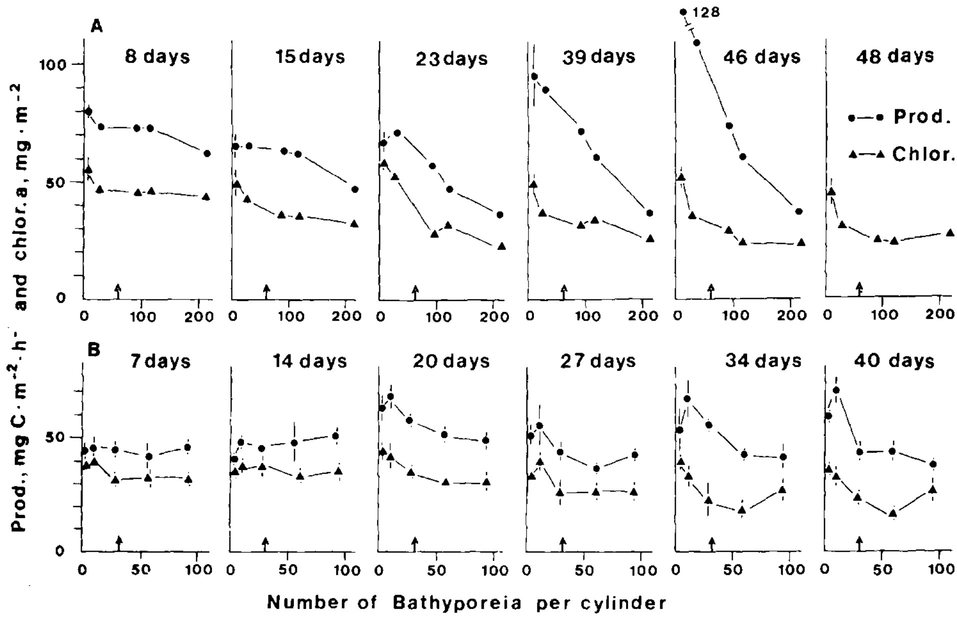

Figure 1

The effect of varying densities of *Bathyporeia pilosa* on the primary production and chlorophyll a content of the microbenthic flora in the two experiments. Bars show the range of two parallels. Arrows show the density of *B. pilosa* at the sampling site.

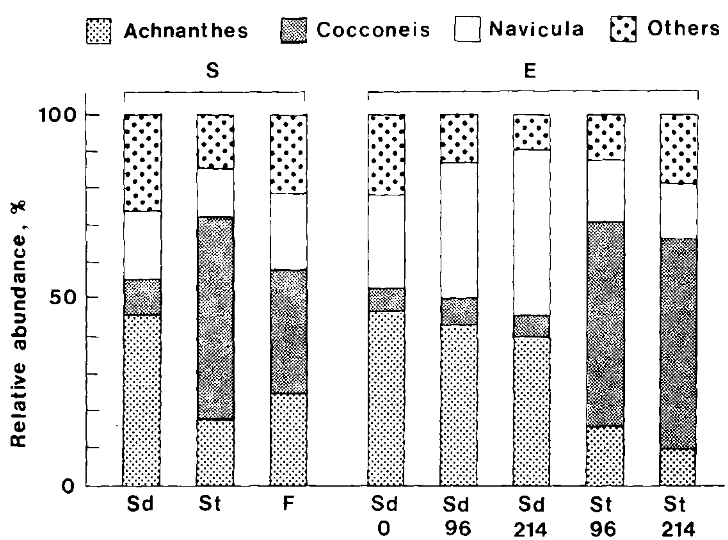

Figure 2

The relative abundance of the three commonest diatom genera in the sand (Sd) and in the stomach contents (St) and faecal pellets (F) of *Bathyporeia pilosa*. S represents conditions at the sampling site (December, 1979) and E conditions at the end of Experiment A. Figures show the animal densities per cylinder.

The microflora of the sand was dominated by small pennate diatoms (mean cell length 10 μm) such as *Achnanthes hauckiana* Grun., *A. lemmermannii* Hust. and *Navicula* spp. from the group Naviculae lineolatae. Altogether approx. 60 species were identified.

In Experiment A about half of the microflora ingested by *Bathyporeia pilosa* were *Cocconeis* spp., in particular *C. scutellum* Ehr. (Fig. 2). The electivity coefficient was 0.64–0.84 based on relative abundance. NICOTRI (1977) suggests that passive selection by diatom grazers results from differences in the morphology and accessibility of the species. McELHONE (1980), working with oligochaetes, found a positive correlation between ingestion and large cell volume. The large numbers of *Cocconeis* spp. ingested by *B. pilosa* in Experiment A could be explained both by the size (mean cell length 20 μm) and by the location on the sand grains. As *Cocconeis* spp. attach themselves firmly to the surface of the sand grain they are often found in exposed positions thus being more accessible than species found in the cavities of the sand grain.

The reason for lack of selectivity in Experiment B may be the lower relative abundance (4 % as against 9 %) and the smaller size (12 μm as against 20 μm) of *Cocconeis* spp. in the sand.

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