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Medium-term impacts of hydraulic clam dredgers on a macrobenthic community of the Adriatic Sea (Italy)

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Abstract Hydraulic dredging targeting the bivalve *Chamelea gallina* in the northern and central Adriatic Sea has been taking place for over 30 years. In the period 2000–2001, 73 commercial dredgers harvested the resource within the sandy coastal area of the Ancona Maritime District (central Adriatic Sea). Despite this, no study aimed at investigating the impact of the fishery on the macrobenthic community of the area has ever been carried out. Sampling was done at 6 monthly intervals in an attempt to relate the impact of hydraulic dredging to different levels of fishing intensity. Data regarding two depth strata (4–6; 7–10 m) were analysed separately by means of permutational multivariate analysis of variance. The results revealed an overall condition of moderate disturbance within the benthic community, especially so within the 4–6 m depth stratum. The response of the benthic community to varying intensities of fishing activity was rapid, occurring within 6 months. Differences in the response of benthic community to differing intensities of fishing activity were found between the two depth strata considered. Significant differences in multivariate location of the benthic community were revealed between the three disturbance levels in both depth strata. Differences in multivariate dispersion were detected above a threshold level of fishing intensity, only within the shallow community. Differences were found between depth strata relating to species diversity and evenness, with significant differences between levels of fishing intensity being evident only within the 4–6 m depth stratum. The results em-

phasised that, even in a benthic community that is typical of a moderately disturbed environment, the effects of fishing on community structure were still discernible over and above the natural variation.

Introduction

Bottom fishing is the most widespread anthropogenic activity aimed at exploiting the living resources within the marine environment (Jennings and Kaiser 1998); trawling and dredging having been reported from 75% of the continental shelf worldwide (Kaiser et al. 2002). Amongst bottom fishing activities, shellfish dredging and hydraulic dredging are probably responsible for causing the greatest disturbance to the seabed (Eleftheriou 2000; Kaiser et al. 2002).

Hydraulic dredges not only scrape the surface of the substratum but also dig into it, resuspending significant amounts of sediment. It has been found that hydraulic dredging contributes to destabilisation and partial modification of sediment conditions, resulting in an overall decrease in habitat complexity with direct implications for the benthic community (Godcharles 1971; Meyer et al. 1981; Brambati and Fontolan 1990; Pranovi and Giovanardi 1994; Tuck et al. 2000; Kaiser et al. 2002). Drastic reductions in abundances of infaunal organisms are widely reported as a consequence of mechanical, suction and hydraulic dredging (Hall et al. 1990; Hall and Harding 1997; Pranovi and Giovanardi 1994; Tuck et al. 2000). Shifts in benthic community structure in favour of a few dominant opportunistic species have been observed (Dayton et al. 1995; Pranovi and Giovanardi 1994). This is a condition that Warwick (1986) associated with disturbance.

Short-term effects of inshore fisheries such as hydraulic dredging are widely reported in the literature (Godcharles 1971; Hall et al. 1990; Hall and Harding 1997; Tuck et al. 2000). Communities living in

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