PRELIMINARY RESULTS ON BENTHIC IMPACT OF CAGE FISH FARMING IN A SEMI ENCLOSED GULF OF EASTERN MEDITERRANEAN

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Abstract

The impact of cage culture of marine fish species on the benthic environment was investigated seasonally at two fish farms of Pagasitikos Gulf, between July 2004 and April 2005. The polychaete *Capitella capitata* was the most dominant species in both farm sites (37% and 65% of the total abundance, respectively), whilst the most dominant species at the control sites of two fish farms was the polychaete *Nephthys hystricis* (11% of the total abundance in both sites). Furthermore, *Nephthys hystricis* was found at the control sites and the 50 m stations, but never at 0 m stations which located under the center of the cages. In all cases structure of macrobenthos in the immediate vicinity of the farms changed, but the spatial extent of this effect was quite limited.

Keywords : Aquaculture, Zoobenthos, Pollution, Aegean Sea.

Introduction

The impact of fish farming on macrobenthos gradually gains interest in the Mediterranean [1 - 4], where fish farming of marine species, particularly sea bream (*Sparus aurata*) and sea bass (*Dicentrarchus labrax*), has grown exponentially during the last 25 years. The objective of this study was to assess the impacts of site specific aquaculture on macrobenthos structure of Pagasitikos Gulf, a semi-enclosed gulf of Eastern Mediterranean where otter trawling is prohibited.

Materials and methods

Four seasonal samplings were carried out from July 2004 to April 2005 (July and October 2004, January and April 2005) from the two marine fish farms (AS: $39^0$07'38" N $23^0$09'17" E, BS: $39^0$07'13" N $22^0$57'53" E). At the area of each fish-farm, three stations were sampled, one was located in the centre of fish farm, the other at a distance of 50 m from the centre and the last one at a distance of 300 m from the fish farm center, taken upstream from the main current direction in each fish farm. Henceforth these are referred to as AS_1, AS_2 and AS_3 for the first fish-farm and BS_1, BS_2 and BS_3 for the second fish farm. Furthermore, AS_1, AS_2, $BS_1$and BS_2 stations were the farm sites while AS_3, BS_3 stations were the control sites. At each sampling station, samples were collected by means of a grab sampler (Eckman-Birge) with an area of 0.0225 m^2. From all sampling stations, three replicate samples were taken during all seasons, in order to determine natural variability within replicates (72 total samples). Samples were sieved through a 0.5 mm mesh sieve and each sample was placed in plastic vials in 10% formaldehyde. Calculations were done by means of PRIMER software package.

Results

A total of 1 193 individuals, belonging to 90 species were identified. In terms of community structure (Table 1), the two areas showed a pattern of spatial change with distance from the cages. The polychaete *Capitella capitata* was the most dominant species in both farm sites (37% and 65% of the total abundance, respectively), whilst the most dominant species at the control sites of two fish farms was the polychaete *Nephthys hystricis* (11% of the total abundance in both sites). Furthermore, *N. hystricis* was found at the control sites and the 50 m stations, but never at the 0 m stations, which were located under the center of the cages.

Discussion

The additional food resource supplied by the farms is likely to be exploited by opportunistic species. The polychaete *Capitella capitata* is an opportunistic macrofaunal species, which is commonly found in polluted marine sediments [2]. A number of authors have reported the presence of this species under fish cages [2, 4, 5]. In some cases *C. capitata* reached almost 75% of the total abundance at the farm sites [2]. In our study, *C. capitata* does not exceed 65%. On the other hand, polychaete *Nephthys hystricis* was present only at the control sites and 50 m stations, but was absent at 0 m stations. This finding may imply that *N. hystricis* is an indicator of not polluted marine sediments, which is in agreement with other authors [2]. In all cases the benthic assemblages in the immediate vicinity showed symptoms of disturbance, but the spatial extend of this effect was quite limited.

Tab. 1. Average relative abundance (%) per station of macrofaunal species comprising more than 1% of the total abundance at any one station over all sampling cruises (+: presence <1%; C: Crustacea, E: Echinodermata; M: Mollusca; P: Polychaeta; S: Sipunculida). Species are arranged by decreasing average abundance at the stations in proximity to the cages and increasing average abundance at the control sites.

Species	Phylum	AS_1	AS_2	AS_3	BS_1	BS_2	BS_3
Capitella capitata	P	37	13	+	65	33	2
Tharyx dorsobranchialis	P	5	7	6	4	7	5
Harpinia dellavallei	C	6	5	5	2	5	5
Paracenis gracilis gracilis	P	3	7	8	3	5	8
Lumbrineris gracilis	P	3	3	2	2	3	3
Ampelisca diadema	C	2	4	4	3	5	5
Podarke pallida	P	3	3	3	2	1	3
Glycera convoluta	P	3	3	5	1	2	5
Chaetozone setosa	P	2	4	+	2	+	1
Apseudes latreilli	C	3	3	1	+	2	2
Onchnesoma steenstrupi	S	3	3	4	+	2	3
Turitella triplicata	M	2	1	+	+	1	2
Aricidea fragilis mediterranea	P	1	1	2	1	1	+
Owenia fusiformis	P	2	1	1	+	2	2
Mytilus galloprovincialis	M				2	4	1
Corbula gibba	M	1	1	4	+	+	4
Amphiura filiformis	E	1	1	3	+	+	2
Prionospio ehlersi	P	1	2	2	+	+	1
Dentalium sp.	M	+	2	3	+	1	3
Notomastus latericeus	P	+	2	2	+	1	+
Nephthys hystricis	P		2	11		2	11
Total		80	67	68	92	81	72

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