PARTICLE FLUXES UNDERNEATH FISH FARMS IN A SEMI-ENCLOSED GULF OF EASTERN MEDITERRANEAN

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Abstract

A field study was carried out at two fish farms of Pagasitikos Gulf in October 2005 in order to determine particle fluxes during feeding. Sediment trap deployments revealed that sedimentation fluxes of particulate matter (PM) and organic carbon (OC) were higher below the farms compared to the control sites located 300 m away. PM fluxes underneath fish cages ranged between 6.51 and 7.33 g m^{-2} day^{-1}, while OC fluxes ranged between 0.74 and 1.46 g m^{-2} day^{-1}. In all cases, the spatial extend of this effect was observed to be relatively limited.

Keywords : Aquaculture, Particle Flux, Aegean Sea.

Introduction

Little is known of the fish farming impacts in the Mediterranean [1, 2], 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 most widely documented process associated with intensive mariculture is the accumulation of PM on the seabed due to the deposition of solid waste from undigested feed [3, 4, 5]. The objective of this study was to determine particle fluxes underneath two fish farms of Pagasitikos Gulf, a semi-enclosed gulf of the Eastern Mediterranean.

Materials and methods

The study was carried out in the Pagasitikos Gulf, central Greece, at two marine fish farms (AS: 39°07'38" N 23°09'17" E, BS: 39°07'13" N 22°57'53" E) between the 11^{th} and 26^{th} of October 2005. Sea bream *(Sparus aurata)* and sea bass *(Dicentrarchus labrax)* are intensively cultivated in these farms by using pelleted and extruded diets. The average annual standing stocks were 130 t and 92 t, while the Food Conversion Ratio (FCR) was 1.7 and 2.0 for the AS and BS farms, respectively. Sampling was carried out at two stations, in each fish-farm area. The first station was located in the centre of the fish farm and the second at a 300 m distance from the fish farm center, upstream from the main current direction. Henceforth, these stations are referred as Cage and Control, respectively. At each sampling station, particulates sinking to the seabed were collected with a sediment trap, for a 15 day-period time, in order to determine PM and OC fluxes. Each sediment trap consisted of a PVC tube (diameter = 13 cm; height = 76 cm) with a detachable particle collector at its lower end. The sediment trap was attached to a floating buoy vertically oriented in the water column by means of an anchor. The opening of the sediment trap tube was situated 5 m above the seabed. This depth was chosen in order to measure particle fluxes as close as possible to the seabed and yet prevent artifacts from sediment re-suspension [4]. Sample analysis was performed according to the protocol described in [4].

Results and discussion

PM and OC results are shown in Figure 1. These results show that both PM and OC fluxes were higher at the farm sites compared to the control ones. The above indicated that a considerable amount of uneaten food and faeces reached the seabed, contributing significantly to the overall solid waste production from fish cage systems. The accumulation of uneaten food and faeces below the fish cages may result in organic enrichment [6], thereby affecting the benthic community regarding macrofaunal succession with large differences in the spatial and temporal extend of the impacts [2]. Similar studies have shown that the environmental impacts of fish cage farming vary greatly, according to the site-specific characteristics [3]. During the course of this study, we concluded that the spatial extend of this effect was observed to be relatively limited.

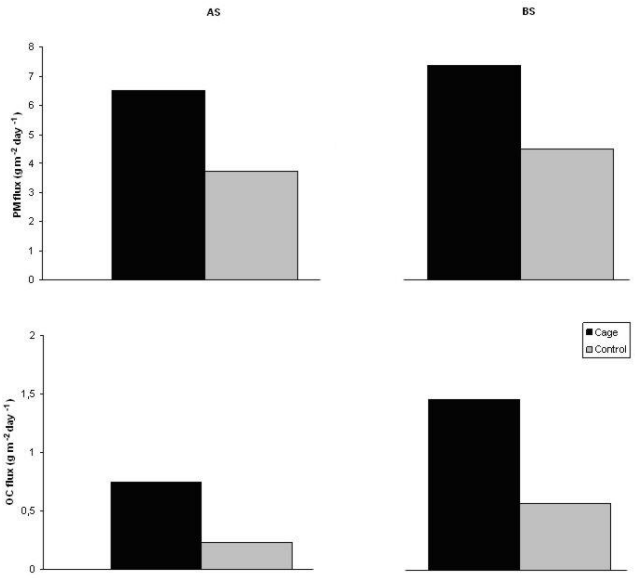

Fig. 1. Sedimentation fluxes of particulate matter (PM) and organic carbon (OC) recorded in two fish farms (AS and BS).

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