

# WASTE FLUXES DETERMINATIONS OF AN INTEGRATED MULTITROPHIC FISH FARM BY STABLE ISOTOPES ( $\delta^{13}\text{C}$ AND $\delta^{15}\text{N}$ )

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## Abstract

By analysing the isotopic composition of the cultured fish *Dentex dentex* and *Argyrosomus regius*, filter feeders and their food sources, it was demonstrated that unassimilated food sources could be reduced by using associated filter feeders in an integrative aquaculturemultitrophic method. This assessment has demonstrated a reduction of waste fluxes to the benthic compartment linked with the *Mytilus galloprovincialis* culture mixed with fish cages.

**Keywords:** Aquaculture, Balear Sea, Bivalves

## Introduction

The rapidly increase of marine aquaculture to global sea food supplies implies changes in energy and nutrient fluxes of marine fish farming, impacting on benthic ecosystems by uneaten pellet food and faecal pellets (as the main components of particulate organic matter, POM) affecting habitats and communities such as the seagrass *Posidonia oceanica* (L.) communities [1]. A multitrophic system to reduce the impact of fish farm cages on the water and communities around cages is a possible solution, including primary sources of organic matter, filter feeders and consumers.

## Materials and Methods

Fifteen cultivated specimens of *Dentex dentex* (Linnaeus, 1758), nine of *Argyrosomus regius* (Asso, 1801) and the bivalves *Mytilus galloprovincialis* (Lamarck 1869) and *Chlamys varia* (Linné 1758) were analysed to measure carbon and nitrogen isotope ratio and compared to the food sources supplied. Plankton and the particulated and sedimented organic matter were acidified by adding HCl 2N.

## Results and Discussion

The comparison of the fish species and the filter feeders studied and their food sources was showed in figure 1. The percentage contribution of each source to each stable isotope composition (Mixing Models, Isosource, Fig. 2) indicates that filter feeders feeds on fish farm wastes and presents some variability in the constancy at the bivalves, which could be related to the physiological and biochemical mechanisms occurring through the trophic increase in  $\delta^{15}\text{N}$  values, and to food selectivity [2]. The additional potential input of organic matter into the system by the excretion of faeces and pseudofaeces associated to filter feeders would not have affected the water-column material neither sediment deposition, as it has been demonstrated [3] according to current velocities in the vicinities of the aquaculture station. Furthermore, it has been documented [4] that the association of *Mytilus galloprovincialis* with fish farm cages has a greatly profit from the aquaculture by the increasing mussel size and a reduction of the duration of the production cycle, which has been also demonstrated with the CI values of the bivalves of the present work.

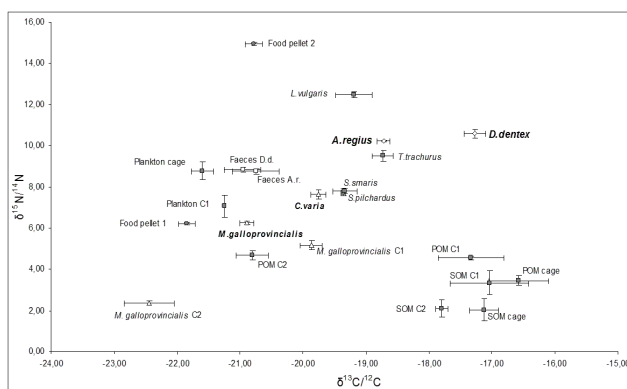


Fig. 1. Distribution of carbon and nitrogen stable isotope ratios (mean  $\pm$  S.E.M.) among the different samples for organic matter fluxes. Food sources (grey squares), filter feeders and occasional species (white triangle), pellet food (grey circle) and cultured fish (white rhombus) are shown.

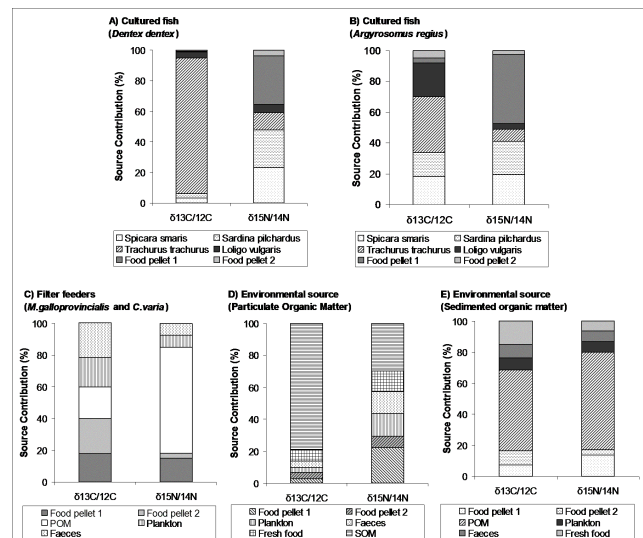


Fig. 2. Isosource analyses of the different compartments. Percentage contribution of the different sources to carbon and nitrogen stable isotopes for *Dentex dentex* (A), *Argyrosomus regius* (B), filter feeders (C) and POM (D).

## References

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