Offshore wind farms acting as Artificial Reef, Fish Aggregation Devices and/or Marine Protected Area for species of commercial interest and conservation[12]

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Introduction

Offshore wind farm foundations create new hard substratum below the sea surface [1]. These foundations can have similar functions to those of Fish Aggregation Devices (FADs) and Artificial Reefs (ARs). Due to the restrictions of uses at the surrounding area of the offshore wind farms, mainly in the limitation of fishing activities, and to the access and anchorage of boats and ships they can act analogously to a Marine Protected Area, influencing in the spatial distribution of pelagic and migratory species. Species aggregate to the new substrate and increase their biomass, abundance rates and sizes. These new habitats created by the installation lead to an increase on the biodiversity of the vicinity mostly on benthic species and other pelagic with aggregation behavior. The main objectives were to i) design and construct a Remote Observation Platform (ROP), which allowed data acquirement and processing on a real time remote basis, ii) create an experimental design to assess the effects of offshore wind parks on marine biota applying fractal dimensions as a proxy to substrate addition by future OWP and iii) perform biological and ecological quantifications of offshore platforms.

Material and Methods

Fractal dimensions of fish aggregating devices (FADs) and benthic artificial reefs (BARs), and a combination of both have been calculated [2] in order to evaluate the aggregating properties of substrate addition due to offshore wind farms. A remote observation platform integrating acoustic and visual detection systems has been designed and constructed to study the aggregating effects produced by hard substratum on marine species. This platform has been remotely operated from land and real time results are obtained. Acoustic censuses with echosounders provide biomass quantifications of the aggregating species, while visual censuses with a waterproof camera are used to identify species in the echograms.

Results

Calculation of the fractal dimension for the FADs gives a fractal value of 1.054. BARs have the highest calculated fractal dimension with a fractal value of 3 while BARs combined with FADs have an intermediate value of 2,027. When applying fractal dimensions we would expect two possible models (Fig. 1).

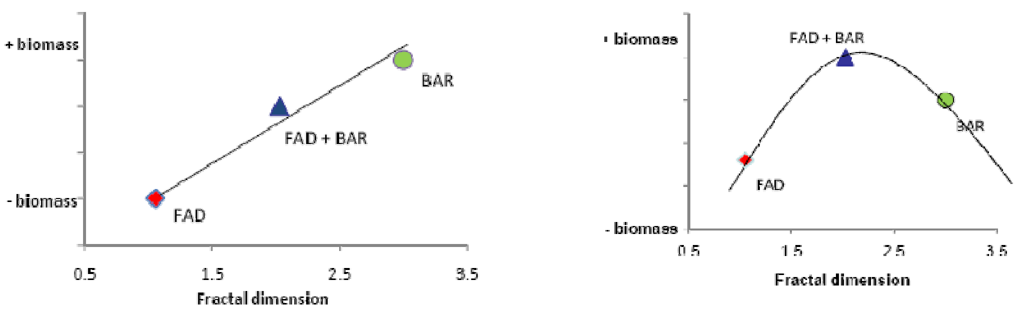

Fig. 1. (Left) Theoretical regression model for habitat substrates acting as AADs. (Right) Model 2 for aggregated fish biomass, the highest aggregated biomass is around the combined experimental set.

[12] Poster presented at EWEA Congress, The Netherlands 2011.

Discussion

The number of cover units making up the holding habitat capacity of the different AADs drops with increasing hole size. Bigger fractal dimensions mean more crevices but with a smaller size; less niches available for bigger organisms and more niches available for smaller organisms. Theoretically, as a bigger fractal means smaller size holes but more holes, therefore more niches, we would expect to find a higher aggregation of biomass. Low fractal coefficients suggest that the surfaces are well adapted to offer shelter to animals of medium to large size [3], meanwhile, higher fractal coefficients suggest surfaces adapted to animals of a smaller size.

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