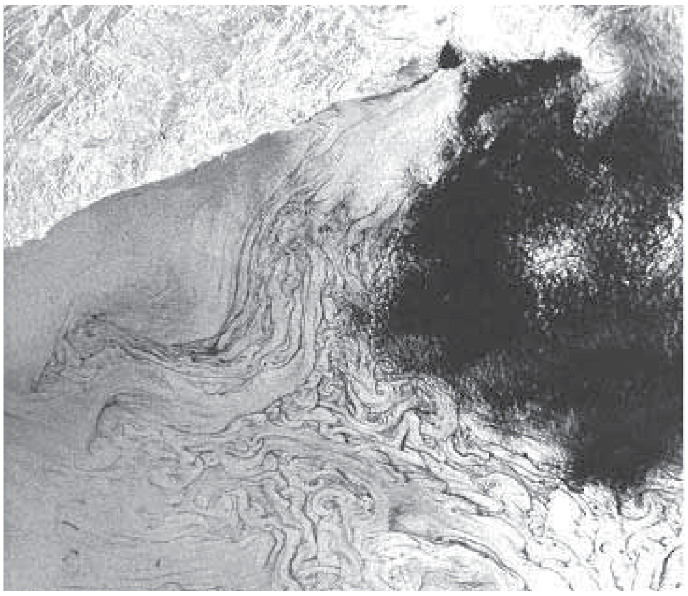

Figure 2. Example of a figure inserted in the main text.

3. Conclusions

By using the multifractal "Box counting Algorithm" and a suitable non dimensional Damkholer time, based on the local dissipation in the ocean surface, it is possible to estimate the local values of horizontal eddy diffusivity and to deduce the persistence of oil spills and skicks in the ocean. The eddy structure and local characteristics are invaluable when a prediction of tracer or surfactant path has to be made. In current numerical models that do not account for the strong spectral content at R= N h/f, with N the Brunt Vaisalla frecuency and f the Coriolis parameter, only Gaussian order predictions are available, on the other hand intermittency and higher order dose and persistency predictions are needed for practical remedial situations.

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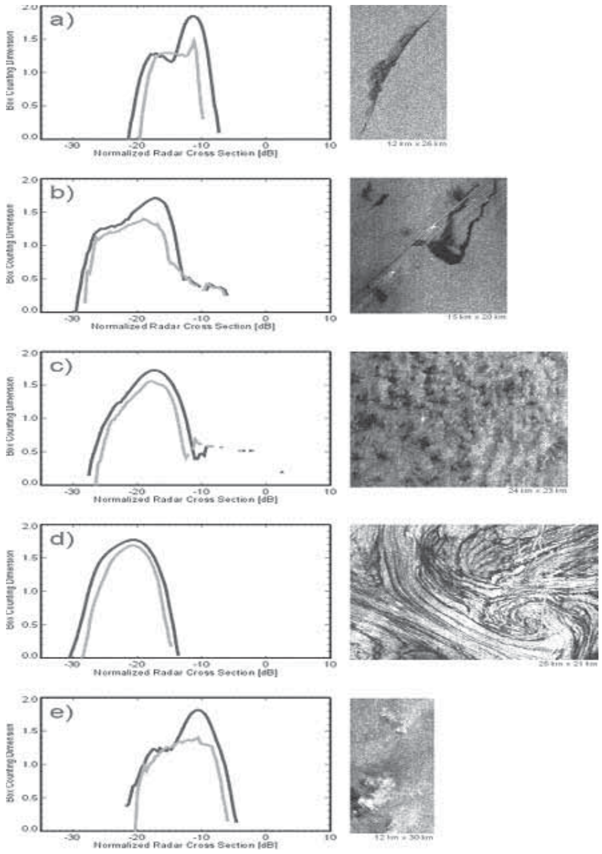

Figure 3. Multifractal D(i) curves for different features in SAR images [7].a,b) spills,c) convection, d) eddy, e)rain.

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A SIMPLIFIED MODEL FOR BOTTOM TRAWL FISHING GEARS

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Keywords: Bottom trawl fishing gears, numerical simulation, modelling

Bottom trawl fishing gears are complex systems in which the different constitutive components (net, sweeps, otterboards and warps) are intimately coupled. Information on gear response has been traditionally inferred from empirical experience and scaled prototypes in flume tank experiments (Fiorentini et al. 2004). In addition to empirical studies, a number of theoretical models of increasing complexity have also emerged in parallel with the development of computational capabilities (software DYNAMIT, IFREMER, 2000).

A simplified model of the gear that mainly affects to the net is proposed (Folch et al. 2007). The model is constrained to steady towing conditions, flat seabed and gear symmetry. Simulations provide a number of relevant outcomes like distribution of tensions at the warp, balance of forces at the otterboards or spread under different haul conditions such as depth or towing speed. Based on the above, the objective of the present study was to describe and implement the model and thus to predict the consequences of changing some gear components. This objective could have been fulfilled through extensive sea trials to cover all the different haul conditions of interest.

As a preliminary test, we use experimental data from a set from the

Central Adriatic Sea (Sala et al. 2007). Due to the high cost of such trials we chose to use sea trials carried out at two different bottom depths at which two different towing speeds were tested (named WL450 and WL200 the first and the second cruise respectively). Then we applied the computer-based simulation program to make a preliminary comparison with experimental results collected. In order to set up the model it is first necessary to characterize the net resistance and the horizontal net opening for this particular gear (see PREMECS-II 2006; Sala et al. 2007). As a starting point we have compared the horizontal door spread and the total gear drag with experimental data (see Figure 1). Preliminary results of the model suggest a correlation with general behaviour of experimental data. The model results reacted in a similar way when the warp lenght/depth or towing speed was changed. We found the average relative difference to be less than 11% between model results and experimental data. The

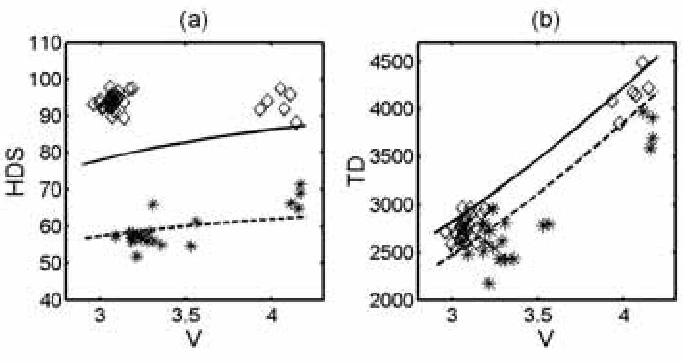

Figure 1: Horizontal door spread HDS (m) and total drag TD (kg) as a function of towing speed V (kn). Solid line/dashed line from results of the model and diamonds/stars from experimental data (WL450/WL200 resp.).

principal sources of discrepancies in our opinion are the model assumptions and the use of a different trawl door.

In summary, we have shown the potential of the model to analyze a bottom trawl fishing gear. A relevant feature of the model is that it skips a detailed simulation of the net and hence provide approximate results at negligible computational cost. The model results obtained are considered satisfactory, and we think that at present computer simulation methods for fishing dynamics can estimate fishing net shape configurations and loads in as much detail as flume tank tests. We are aware, however, that further comparison with data is necessary before reaching definitive conclusions.

Acknowledgements: This research has been developed under the Spanish PETRI project "Optimización informática para el diseño, construcción y prueba de artes de pesca de arrastre" (PTR1995-0735-OP). We wish to thank to J. Fernández from MAPSA S.L. for his invaluable collaboration.

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LINKING SHAPE, TAXONOMY AND FUNCTION IN TELEOST FISH: A MACHINE LEARNING APPROACH

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1. Introduction

Teleosts, with an estimated 23,600 extant species [1], are the most diverse group of vertebrates. Teleosts have a great taxonomic diversity which is accompanied by a wide variety of morphological patterns and adaptations to different freshwater, brackish, and marine habitats all over the world [2]. The form constrains the use of resources through performance of important tasks and resource availability helps in constructing the form. This occurs via the evolution by determining which tasks are the most important for the increase of the fitness [3]. A method to predict the habitat use based solely on the fish morphology may be based on the ecomorphological approach [4]. To overcome sparse or absent habitat use information in determining suitable habitat criteria, especially for rare fishes or communities, a statistical approach can be used to obtain a generalized model that share similar morphological, physiological and behavioural constraints. The aim of this study is to find a model to predict ecology and phylogeny of Teleosts only from their external body shape. Finally, a sensitivity analysis of the neural network model was conducted to evaluate the relative importance of each predictive variable.

2. Results and Discussion

The morphological traits of 1203 selected species were analysed with two types of statistical comparative and quantitative analysis: the geometric morphometry and the artificial neural networks (ANN) (Multilayer Perceptron). The ANN training was performed using the most common training algorithm, i.e. the error back-propagation algorithm. The best architecture of the ANN was empirically defined after a set of test runs in which different numbers of hidden layers nodes were used. The final ANNs, had 38+n input nodes (19 x y landmarks coordinates + n grouping variables), 20 nodes in the hidden layer and n output nodes (n grouping variables) [5]. For each species a total number of 19 landmarks were identified (Fig. 1) as reported by Costa and Cataudella (2006). Landmarks are defined as homologous points which bear information on the geometry of biological forms [6]. Points were digitized using the software TPSdig [7] applied to the left side of each specimen.

Results on the relationship between body shape and phylogeny show their co-variation according to morpho-functional aspects described by Webb [8]. ANN sensitivity analysis on the taxonomical order suggests that this variable is especially influenced by the relative position of three morphological characters: the pectoral, the dorsal and the anal fins (Fig.2).