

# **Biomass acoustical selection system.**

# **Fact Sheet**

Project Information		
Grant agreement ID: MA.2.542		Funded under Community research and coordination programmes
Project closed		(EEC) in the fisheries sector, 1988-1992
		Total cost
<b>Start date</b> 1 January 1991	End date 1 January 1994	No data
		EU contribution
		No data
		Coordinated by
		France

### Objective

The aim of the project is to set up an automatic species classification method, using advanced echo processing techniques. Echoes will be automatically classed according to species or family (gadoids, clupeoids, horse mackerels, etc). It will be then possible to define a system to carry out echointegration, the tried and tested standard method of acoustic stock estimation, by species class, rather than by depth layer, the present method, which in many cases has no deterministic relationship with species. The need for trawling will be much reduced allowing faster surveys of the same stock. Acoustic surveys will be a much more precise tool for the quick and cost effective evaluation of mixed pelagic resources and thus for stock management.

The BIOMASS PROJECT objective is to set up an automatic fish species classification method using advanced echo processing techniques. Echoes will be automatically classed according to species or family (eg gadoids, clupeoids, horsemackerels, etc). It will be then possible to define a system to carry out echo integration, the tried and tested standard method of acoustic stock estimation, by species class, rather than the depth layer, the present method, which in many cases has no deterministic relationship with species.

A series of wide band experiments were conducted in 1992 at Loch Duich on the west coast of Scotland. Frequency response data was collected both by the Marine Laboratory wide band system between 27 kHz and 54 kHz and the ICPI-IFREMER system between 20 kHz and 80 kHz. A series of 10 experiments on cod, haddock, saithe and horse-mackerel were completed during the period. Sophisticated signal processing techniques have been carried out on data collected during Loch Duich experiments from 3 species (ie mackerel, saithe and 2 sizes of cod). The main problem encountered was to find an analysis method providing a global information on fish aggregation. In the wide band case such information has not been found using time frequency signatures or constant-Q analysis. But this has been found in the spectral characteristics of the multiple echoes registered. A classification task has been performed using a Multi Layer Perception neural network. The global classification performances are very encouraging as the best results give 91% success on test set. A better classification is obtained if the 2 classes of cod are regrouped giving a classification of at least 97.3% between the 3 species. This result is encouraging but obtained on more or less laboratory conditions and further investigations must be done on at sea data.

Working with narrow band equipment special software is used for extracting school descriptors. It calculates a great number of parameters in relation with the shape, morphology, depth and density of the schools. Data analyzed in the Bay of Biscay concern 11 surveys between 1989 and 1993. Only detections issued from the area where pure trawl catches were done have been selected for further analysis. A data bank has been constituted comprising 7500 schools of sardine, anchovy, horsemackerel and blue whiting. The general conclusion is that when mixing all the data from different areas and seasons, a fair automatic classification is quite impossible to reach. In the Bay of Biscay anchovy and horse-mackerel appear to be difficult to discriminate. But locally in a restricted area and during a short period it has been demonstrated that acoustic stock evaluation by species or group of species are possible using school descriptors extracted from narrow band signals. Acoustic surveys are conducted routinely by many countries in the European Community, using narrow band echo sounders. The information collected during those routine surveys by the participants will be used to establish a primary classification scheme, taking into account mainly the geometric information from the echograms. Shoal morphology and vertical position within the water column can be extracted from existing echo sounder records. Fish behaviour produces distinctive

shapes and patterns of shoal that an experienced fisherman already attempts to use to identify species. Wideband echo sounders are also potentially capable of species recognition from the returned echoes. It is proposed to use information extracted using modern signal processing capabilities of a wideband echo sounder to provide a species classification system.

Preliminary works have already pointed out the possible advantages of a wideband system: possibility of species classification from shoal spectral signatures; derivation of species proportions from mixed species layers; improved precision in echo integration of shoals and layers because of an increase in independent samples; and improved near seabed detection of fish using coherent processing. This part of the project will concentrate on improvements in precision and species classification afforded by the wideband system.

This project is directed primarily at identifying shoaling pelagic fish but also in the longer term scattered fishes. The BIOMASS research program has been divided into 4 main tasks: classification of individual fish; classification of aggregations of fish; collection of data at sea; and data processing and interpretation. All of the tasks are closely linked. Understanding the wideband response of single fish and shoals in controlled situations (tasks 1 and 2) will lead to the selection of suitable criteria for the analysis of data collected during sea trials. Selection of morphology and spatial parameters defining shoals will isolate the echoes required for species signature analysis from sea data. The conclusion of the project will be a set of spatial and frequency domain criteria for purely acoustic species identification.

## Fields of science (EuroSciVoc) 3

natural sciences > computer and information sciences > software

engineering and technology > electrical engineering, electronic engineering, information engineering > electronic engineering > signal processing

natural sciences > biological sciences > zoology > ichthyology

natural sciences > computer and information sciences > data science > data processing

natural sciences > computer and information sciences > artificial intelligence > computational intelligence

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### **Programme(s)**

FP2-FAR - Community research and coordination programmes (EEC) in the fisheries sector, 1988-1992

# Topic(s)

Data not available

## Call for proposal

Data not available

## **Funding Scheme**

Data not available

### Coordinator



### IFREMER - INSTITUT FRANÇAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER EU contribution No data Total cost

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EU contribution

No data

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Iraklion - Crete

#### No data

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France

EU contribution

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Address



Total cost

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#### Scottish Office Agriculture, Environment and Fisheries Department

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EU contribution

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