

## COUNTRY: SPAIN

**Project Title:**

GLOBEC Spain

**Source of Information:**

Celia Marrase, December 2003

**National Representative/Contact:**

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**Spanish GLOBEC Projects:**

Details of all Spanish GLOBEC projects are included below, even where they are already completed as details were not published in the previous edition of the GLOBEC Activities Report.

**1. Development of a numerical model for predicting the dispersion of eggs and larvae stages of fishing species of commercial interest in the Biscay Bay.****Source of Information:**

Fundación AZTI

**National Representative/ Contact:**

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Fundación AZTI

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**Project Description:**

The objective of this model is to develop a 3D transport model for the Bay of Biscay, to simulate the dispersion of eggs and larval stages of commercial fish species. The model will take into account the combined effects of wind, tide, and freshwater runoff on the physical transport of the eggs and larvae. The spatial and temporal evolution of the sea water temperature, salinity and chlorophyll are variables which will be used for the biological part of the model, i.e. the growth and mortality of the fish in its early stages of life.

**Website:**

<http://www.azti.es>

**System Types Studied:**

Oceanography and fishing resources

**Target Organisms:**

Bay of Biscay commercial fish species, particularly the anchovy

**Physical Processes Examined:**

Currents originated by the wind, tide and freshwater runoff to study the dispersion (advection-diffusion) of fish eggs and larvae. Historical records of sea water temperature, salinity and chlorophyll.

**Key Questions, Hypotheses and Issues:**

The biological behavior of the each fishing species is the most important question to answer. The principal assumption is to consider a passive physical behavior for the eggs and larvae stages because their possible swimming ability is minimum and unknown.

**Number of scientists and fte: 60**

**Participating Institutions: Fundación AZTI**

**Duration: From 01/01/02 until 31/12/04**

**Budget: 30,000 Euros**

**Funding Agency: Departamento de Agricultura y Pesca del Gobierno Vasco**

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## **2. Mesopelagic (ref. Cicyt MAR97-1036)**

### **Source of Information:**

Universidad de Las Palmas de Gran Canaria

### **National Representative/ Contact:**

Santiago Hernández-León (shernandez@dbio.ulpgc.es)

### **Project Description:**

The project studied the effect of the physical structure of the water column and of the interzonal diel vertical migrators on the structure of the communities of the pelagic system of the subtropical gyre, from microplankton to micronekton. Such a study was carried out in the physical gradient which is observed from the upwelling area off West Africa to the well stratified waters west of the Canary Islands. The study of the deep scattering layer and on their associated diel vertical migrants was of special interest because they increase the amount of predators in the surface layers by night. This fact produced a top-down effect which structured the pelagic system in different ways depending on the mesopelagic biomass and faunistic composition observed in areas of different stratification. The effect of the different community structures on the so-called biological pump and on the active flux was also assessed. The project reached the following objectives: (1) Historical data review, (2) The development of a model to simulate the diel vertical migrations, (3) The study the vertical structure of biomass, size and faunistic composition of plankton and micronekton, and (4) The effect of biomass and community structure on the active flux.

### **Website:**

<http://www.ulpgc.es/webs/cbm>

### **System Types Studied:**

Oceanic

### **Target Organisms:**

Zooplankton, diel vertical migrants

### **Physical Processes Examined:**

Water column stratification

### **Key Questions, Hypotheses and Issues:**

The importance of diel vertical migration in structuring the pelagic realm and in driving the active flux.

**Number of scientists and fte: 15**

**Participating Institutions:**

Facultad de Ciencias del Mar de la Universidad de Las Palmas de Gran Canaria  
Instituto Canario de Ciencias Marinas  
Facultad de Ciencias Biológicas de la Universidad de La Laguna  
Museo de Ciencias Naturales de Tenerife  
Instituto Español de Oceanografía

**Duration: 1997-2000****Budget: EUR 124,271****Funding Agency: Comisión Interministerial de Ciencia y Tecnología, Spain**

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**3. Pelagic (ref. Cicyt MAR97-1036).****Source of Information:**

Universidad de Las Palmas de Gran Canaria

**National Representative/ Contact:**

Santiago Hernández-León (shernandez@dbio.ulpgc.es)

**Project Description:**

Small and mid-sized fish are the link between the climatic conditions of the ocean and tuna fisheries, an important resource in the economy of the Canary Islands. The great variability in the stock of the small and mid-sized pelagic fish is one of the most common features of these resources. It is known that there is a close relationship between recruitment, stock size, climatic conditions, water mass dynamics and plankton productivity and there is an exhaustive knowledge of the hydrology around Gran Canaria Island. The flow of the Canary Current induces the formation of a wake of cyclonic and anticyclonic eddies and the phyto-, zoo- and ichthyoplankton distribution have been shown to be related to these structures. However, the small and mid-sized fish distribution and its relationship with the dynamics of the water masses around this oceanic island is, at present, poorly known. Water mass dynamics as well as plankton distribution must be of importance in the presence and distribution of those fishes around oceanic islands. This is the primary hypothesis of this proposal. In this sense, it seems clear that the knowledge of fish biomass as well as the factors governing its variation and distribution is crucial for the fisheries management of the Canary Islands. Therefore, this proposal is based on the objectives: (1) Historical data review, (2) Knowledge of fish biomass and distribution using acoustic methods and experimental trawls, (3) The relationship of phyto-, zoo- (including the deep scattering layer), and ichthyoplankton with the hydrology around the island, and (4) To assess the fish biomass and distribution during the three characteristic periods of the annual cycle in this archipelago: the late winter bloom, the Trade Wind and non-Trade Wind seasons.

**Website:**

<http://www.ulpgc.es/webs/cbm>

**System Types Studied:**

Island shelf, Oceanic

**Target Organisms:**

larval fish  
zooplankton  
diel vertical migrants

**Physical Processes Examined:**

Filaments of upwelling

**Key Questions, Hypotheses and Issues:**

The effect of filaments of upwelling on the transport of fish larvae from Northwest Africa to the Canary Islands.

**Number of scientists and fte: 15**

**Participating Institutions:**

Facultad de Ciencias del Mar de la Universidad de Las Palmas de Gran Canaria  
Instituto Canario de Ciencias Marinas  
Facultad de Ciencias Biológicas de la Universidad de La Laguna  
Museo de Ciencias Naturales de Tenerife  
Instituto Español de Oceanografía

**Duration: 1998-2001**

**Budget: EUR 173,016**

**Funding Agency:**

European Union (Feder)  
Comisión Interministerial de Ciencia y Tecnología, Spain

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**4. Mesoscale vortices/meanders in the central portion of the Bransfield Strait: identification and physical–biological coupling. (BREDDIES)****Source of Information:**

Universidad de Las Palmas de Gran Canaria

**National Representative/Contact:**

Pablo Sangrà psangra@dfis.ulpgc.es  
Universidad de Las Palmas de Gran Canaria  
Edificio de Ciencias Básicas  
Campus de Tafira  
35017 Las Palmas de Gran Canaria  
Spain

**Project Description:**

Historical observations suggest the presence of mesoscale vortices/meanders in the central portion of the Bransfield Strait. The general objective of this project is their identification and the study of the coupling between the underlying physical processes and the plankton community. With this aim an interdisciplinary sampling was conducted in the region, with a greater spatial resolution and a degree of interdisciplinary interaction than previously seen. Through these observations we aim at gaining a better physical and biological characterization of these structures as well as understanding the adjustment mechanisms between the physical processes (water column stability, diapycnal mixing, advection) and the planktonic community (abundance and structure). Additionally we will develop a physical-biological model that allows us to understand and diagnose the nature of such coupling. In this way the results of this project could contribute to the identification of mesoscale structures not previously described and to a better understanding of the adjustment between the planktonic community and the physical environment in the marine antarctic system at the mesoscale range.

**System Types Studied:**

Central part of the Bransfield Strait

**Target Organisms:**

Bacteria, phytoplankton and zooplankton

**Physical Processes Examined:**

Fronts, eddies, vertical stability, diapycnal mixing

**Key Questions, Hypotheses and Issues:**

Mesoscale activity influence planktonic community distribution/structure through water column stability, diapycnal mixing and advective processes

**Participating Institutions:**

Universidad de Las Palmas de Gran Canaria  
Instituto de Ciencias Marinas de Andalucía (CSIC)  
Universidad de Vigo

**Duration: 3 years**

**Budget: EUR 145,144**

**Funding Agency:**

Ministerio de Ciencia y Tecnología (Spain)  
FEDER (UE)

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**5. Estudio de series temporales de datos oceanográficos (RADIALES). Oceanographic time-series studies**

**Source of Information:**

Instituto Español de Oceanografía  
Universidad de Oviedo

**National Representative/ Contact:**

J. Luis Valdés Santurio (luis.valdes@gi.ieo.es)

**Project Description:**

The objective of the project is to "Understand and parameterise the response of the ecosystem to the different sources of temporal variability, both regarding the oceanographic processes and the planktonic populations, and with particular focus on the factors and processes that affect biological production and can have an impact on the ecosystems". The project is based on a systematic and prolonged sampling making interdisciplinary (physical, chemical, biological) observations in the ocean. The frequency of sampling is set to depict the oceanographic events occurring at different seasonal and interannual scales in order to distinguish between the different sources of temporal variability and to characterize the main patterns.

As part of the *in situ* sampling programme, regular observations are performed on a monthly basis along transects located offshore Santander (sampled since 1991), and on a seasonal basis along transects located off Málaga (since 1992) and Murcia (1996). In the La Coruña ria, the benthic community has also been sampled on a seasonal basis since 1982. At each location sampling is carried out following similar methodologies and the results are stored in the data base of the IEO (SIRENO) from where data is available to all the researchers in the programme.

**Website:**

<http://www.seriestemporales.net>

**System Types Studied:**

Shelf seas

**Target Organisms:**

Plankton

**Physical Processes Examined:**

Mesoscale processes (i.e. upwelling events, fronts, etc)

**Number of scientists and fte: 15 scientists**

**Participating Institutions:**

Instituto Español de Oceanografía  
Universidad de Oviedo.

**Duration:** 1991- present (IEO Core Strategic Project)

**Budget:** EUR 100000 / year

**Funding Agency:**

Instituto Español de Oceanografía

Various funds from CICYT, Fundación Marcelino Botín y Fundación Pro-Vigo proposals.

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**6. Variabilidad temporal de las comunidades planctónicas en el Cantábrico central (VARIPLACA) / Temporal variability of the planktonic community in the central Cantabrian Sea.**

**Source of Information:**

Instituto Español de Oceanografía.

**National Representative/ Contact:**

J. Luis Valdés Santurio (luis.valdes@gi.ieo.es)

**Project Description:**

The objective of VARIPLACA is to study the trophic structure of the planktonic community in the central Cantabrian Sea and how the temporal variability is related to the different oceanographic processes occurring in a temperate sea such as the Cantabrian Sea. This study of the trophic structure is based on the hypothesis that physical forcing determines the size structure of planktonic producers and the circulation of organic matter through the classical (herbivorous) and microbial food webs. In order to achieve this objective the distribution of different size classes of primary producers (picoplankton, nanoplankton and microplankton) will be analysed and their physiological state will be estimated (through flow cytometry and cell sorting). The size structure of the zooplankton community will also be studied as well as the trophic preferences of the main zooplankton constituents through the analysis of the stable nitrogen isotope ratios ( $^{14}\text{N}/^{15}\text{N}$ ) in order to determine the adaptive strategies to the oceanographic conditions characteristic of temperate seas (stratification periods, fronts, upwelling events, oligotrophic phases, etc.). The project also involves sardine larvae growth studies and the relationship of growth to food availability (sardine was selected as the target species due to the existing knowledge on the otolith methodology and on the fact that there is sufficient amount of information in other regions to use for comparative purposes). The project takes advantage of the logistical resources available through the RADIALES project; it's based on monthly sampling in a transect off Gijón and intensive sampling periods during the spawning period of the sardine. Data will be included in the oceanographic database of the IEO.

**Website:**

<http://www.seriestemporales.net>

**System Types Studied:**

Shelf Seas

**Target Organisms:**

Plankton

**Physical Processes Examined:**

Mesoscale processes (i.e. upwelling events, fronts, etc)

**Number of scientists and fte: 5 scientists**

**Participating Institutions:**

Instituto Español de Oceanografía.

**Duration: 2002 – 2004**

**Budget: EUR 100000 / 3 years**

**Funding Agency:**

Instituto Español de Oceanografía, Plan Nacional 2000-2003

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## **7. Análisis de series temporales, biología y ecología del zooplankton / Time-series analysis, zooplankton biology and ecology.**

### **Source of Information:**

Instituto Español de Oceanografía.

### **National Representative/ Contact:**

J. Luis Valdés Santurio (luis.valdes@gi.ieo.es)

### **Project Description:**

The main objective of the project is to study the seasonal and interannual variability of zooplankton abundance in the Cantabrian Sea and Bay of Biscay. The changes in abundance, diversity and size structure observed by long term monitoring studies will be analysed at different spatial and temporal scales to develop models that describe and predict the main patterns in the seasonal succession of the planktonic community. The specific objectives of the project are:

- Parameterise the ecological realized niche of several target zooplankton species using empirical statistical models and combine them with geographical information systems to predict the habitat distribution of each species.
- Validate and improve current theoretical models which attempt to explain the effect of temperature and body size on the development time and metabolism of different groups of zooplankton. Make use of the models developed to predict the succession and the changes in community size structure observed by the RADIALES project and use them as a baseline to detect anomalous conditions.
- Analyze the seasonal and long-term trends of zooplankton abundance using a comparative approach where the data collected by the RADIALES programme will be analysed in combination with data from monitoring programs maintained by other European and US institutions in the North Atlantic.

### **Website:**

<http://www.seriestemporales.net>

### **System Types Studied:**

Shelf seas

### **Target Organisms:**

Plankton

### **Physical Processes Examined:**

Mesoscale processes (i.e. upwelling events, fronts, etc)

**Number of scientists and fte: 4 scientists**

### **Participating Institutions:**

Instituto Español de Oceanografía.

**Duration: 3 years**

**Budget: EUR 27100/ year**

### **Funding Agency:**

Plan de Investigación

Desarrollo Tecnológico e Innovación de Asturias 2001-2004

Instituto Español de Oceanografía

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## **8. Role of Microphagous Zooplankton in Marine Microbial Communities: Trophic Impact and Carbon Transfer (ZOOTRANSFER) REN 2001-1693**

### **Source of Information:**

Institut de Ciències del Mar (CSIC)

### **National Representative/ Contact:**

Dr. Enric Saiz (enric@icm.csic.es)

### **Project Description:**

Marine stratified waters are often characterized by high abundance of two groups of mesozooplankton, cladocerans and small copepods. Little is known, however, on the functional roles of these groups and their importance in biogeochemical fluxes. Here, by combining field studies and laboratory work, we will attempt to determine the trophic impact of these groups of zooplankton on the different components of microbial food webs, and quantify the carbon fluxes mediated by them. Furthermore, other aspects of the ecology and ecophysiology of these organisms, like trophic niche overlapping, threshold and critical food concentrations for growth, and the effects of small-scale turbulence in their ingestion rates, will be studied.

### **Website:**

<http://www.icm.csic.es/bio/projects/zootransfer>

### **System Types Studied:**

Mediterranean coastal waters

### **Target Organisms:**

*Oithona* spp., *Evadne* spp., *Podon* spp., *Penilia* spp.

### **Physical Processes Examined:**

Small-scale turbulence

### **Number of scientists and fte: 5**

### **Participating Institutions:**

Institut de Ciències del Mar (CSIC)

### **Duration: 28/12/2001 to 27/12/2004**

### **Funding Agency:**

Spanish Ministerio de Ciencia y Tecnología

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## **9. Effects of polluting hydrocarbons on marine zooplanktonic communities (PETROZOO) VEM2003-20037**

### **Source of Information:**

Institut de Ciències del Mar (CSIC)

### **National Representative/ Contact:**

Dr. Albert Calbet (acalbet@icm.csic.es)

### **Project Description:**

The catastrophe of the *Prestige* has revealed our lack of knowledge concerning the consequences of crude oil spills on the dynamics and functioning of marine planktonic food webs, and specifically on zooplankton, which constitutes the most important food source for fish. The goal of the present project is to study the ecological consequences associated to fuel discharges on the zooplanktonic community, and to identify related responses the energy transfer through the marine planktonic food web. This will be done by using cost effective and ecologically relevant functional toxicity bioassays and experimental mesocosms developed in the laboratory with autochthonous organisms. More specifically it is intended to identify ecological risks of polycyclic aromatic hydrocarbons (PAH) associated with fuel-oil spills since those compounds are considered of special concern to biota.

**System Types Studied:**

Mediterranean coastal waters

**Target Organisms:**

*Oithona* spp., *Acartia* spp.

**Key Questions, Hypotheses and Issues:**

- To determine the effects of polycyclic aromatic hydrocarbons (PAH), present in oil slicks, on the local species of marine planktonic copepods.
- To study the transfer of contaminants (PAH) through the marine planktonic food web.
- To evaluate the changes in structure and function in the natural planktonic communities produced by hydrocarbon contaminants.

**Number of scientists and fte: 3**

**Participating Institutions:**

Institut de Ciències del Mar (CSIC),  
Universitat Politècnica de Catalunya

**Duration: November 2003 to November 2006**

**Budget: 88000 Euro**

**Funding Agency:**

Spanish Ministerio de Ciencia y Tecnología

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**10. Estuarine and coastal quality network of the Basque Country****Source of Information:**

AZTI

**National Representative/Contact:**

Angel Borja (aborja@pas.azti.es)

**Project Description:**

The study and surveillance of the different biological elements contained in the Water Framework Directive, relating its evolution with the physico-chemical and pollution elements of the system, including water, sediment and biota analysis.

**System Types Studied:**

Estuaries and coastal waters (up to 40m water depth)

**Target Organisms:**

phytoplankton, macroalgae, soft-bottom benthos and fishes

**Key Questions, Hypotheses and Issues:**

Development of methodologies in establishing the ecological status.

**Number of scientists and fte: 12**

**Participating Institutions:**

AZTI

Insub

University of the Basque Country

Labein

**Duration: 1994 to date**

**Budget: EUR 412000 /year**

**Funding Agency:**

Departamento de Ordenación del Territorio y Medio Ambiente, Gobierno Vasco.

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**11. Efecto de los procesos hidrográficos sobre la distribución y la alimentación de las larvas de *Sardina pilchardus* y sus consecuencias sobre el crecimiento, en la costa asturiana (SARDINA)****Source of Information:**

Universidad de Oviedo

**National Representative/ Contact:**

Ricardo Anadón (ranadon@correo.uniovi.es)

**Project Description:**

The stock of Iberian sardine has suffered a significant decrease in the last years. The coast of Asturias (Bay of Biscay) is an important spawning area where the fleets from Asturias and Cantabria develop an important fishing activity on this resource. Recruitment, that is closely related to population size, is determined by the dynamics during the early life history of fish. The general objective of this project has been to determine the influence that mesoscale hydrographic processes have on the dynamics of the early life history of the Iberian sardine. Both, the direct effect of these processes on the distribution of eggs and larvae, and through the effect that these processes have on the dynamics of the ecosystem and therefore the availability of food for larval fish. The effect that feeding has on growth will be analysed because of the role that growth has on recruitment variability. A retrospective analysis on abundance of sardine eggs and larvae of the Cantabrian Sea, combined with satellite imagery data, would allow to link the role of mesoscale processes with larger spatial and temporal hydrographical and climatic processes.

**System Types Studied:**

Coastal pelagic ecosystem in relation to sardine larvae.

**Target Organisms:**

*Sardina pilchardus*

**Physical Processes Examined:**

Portuguese Coastal Counter Current  
Interannual variability

**Key Questions, Hypotheses and Issues:**

- Spawning areas in relation with hydrographic structure.
- Retrospective analysis on abundance of sardine eggs combined with satellite imaginary data.
- Effects of coastal mesoscale processes on egg and larvae distribution.
- Growth and survival related with ecosystem food web structure.
- Feeding of sardine larvae.

**Number of scientists and fte: 8 and 4 doctoral students**

**Participating Institutions:**

Universidad de Oviedo  
Instituto Español de Oceanografía

**Duration: 30 months**

**Budget: EUR 220000**

**Funding Agency: CICYT – FEDER**

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**12. TEMPANO. Temperature effect on structure and metabolism of planktonic communities of Antarctic waters (REN-2001-0588ANT)****Source of Information:**

Institut de Ciències del Mar

**National Representative/ Contact:**

Dr. Dolors Vaqué (dolors@icm.csic.es)

**Project Description:**

Temperature is considered to be one of the main environmental factors responsible for the control of plankton metabolism. In general, in mid-latitude areas, the metabolic changes on poikilotherms in relation to temperature can be adequately described by means of well known equations (i.e. Arrhenius). However, when temperature conditions are extreme, the effects can be quite different. In Antarctica, for instance, with extreme temperatures and yearly water temperature ranges restricted to less than 5°C, thermal laws can be different. If the different metabolic processes (i.e. respiration, excretion, feeding, production, etc.) follow different patterns and non-linear functional responses for a similar temperature rise, the consequences in terms of the fate of biogenic carbon can be extremely important. Carbon flow between the different trophic compartments of the system can be altered, as well as the equilibrium between the proportion of sequestered, particulate C, and CO<sub>2</sub> returned to the atmosphere by respiration. This possible change in the role of the Southern Ocean as a source or sink of CO<sub>2</sub> is of paramount importance (greenhouse gas effects), and its consequences for the parameterisation of integrated climatic models is out of question. This project focuses in these problems, and will try to quantify the effects of slight temperature rises in the Antarctic Ocean, similar to the climatic tendencies observed the last decade, for the ocean-atmosphere CO<sub>2</sub> exchange. The objective of the project is experimentally determine how temperature changes, in a short variability range, can affect the regulation of the different metabolic processes of auto- and heterotrophic communities (phytoplankton, bacteria, protozoa and zooplankton).

**System Types Studied:**

Antarctic waters (Bransfield strait, Gerlache Strait and Bellingshausen Sea)

**Target Organisms:**

Prokaryotes, protists, phytoplankton and zooplankton

**Physical Processes Examined:**

Temperature, irradiance

**Key Questions, Hypotheses and Issues:**

We hypothesize that an increase of temperature will i) increase bacterial production because, on one hand DOC would be more available for bacteria, on the other hand bacteria would increase the release of ectoenzymes that participate in the organic compounds break-down; ii) will favour changes of bacterial diversity. Thus in areas where the temperature would be the coldest (~2°C), the prokaryotic activity should be dominated by communities of strict psychrophilic microorganisms. Once temperature increases we should observe changes to tolerant psychrophilic communities; iii) the fate that Archaea communities were abundant during the winter season, will suggest that an increase of temperature would provoke a decrease of abundance and activity iv) It will increase bacterivory ingestion rates by protists and their growth; v) It will modify the daily pattern of optic characteristics related with the increase of cell activity, as well as with changes of autotrophic pico-nanoplankton community structure; vi) It will increase the ingestion rate and respiration of copepods. All of that would be converted in an increase of excretion of CO<sub>2</sub>, which part of it would be used again by phytoplankton, and in the worse of cases the left CO<sub>2</sub> would go to the atmosphere and it would contribute to the global warming.

**Number of scientists and fte: 21**

**Participating Institutions:**

Institut de Ciències del Mar-CMIMA (CSIC)  
Spanish Institut of Oceanography of Xixon and Malaga (IEO)  
University of Barcelona (UB)  
University of Jaen (UJ)  
University of Málaga (UMA)

**Duration: 2 years**

**Budget: EUR 168000**

**Funding Agency: MCyT**

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**13 Bay of Biscay microzooplankton**

**Source of Information:**

Xabier Irigoien (xirigoien@pas.azti.es)

**National Representative/ Contact:**

Xabier Irigoien (xirigoien@pas.azti.es)

**Project Description:**

The objective of the project is to investigate the microzooplankton distribution in the Bay of Biscay during the spring period and to model the distribution through ecological niche factor analysis.

**System Types Studied:**

Bay of Biscay

**Target Organisms:**

Microzooplankton

**Physical Processes Examined:**

River plume and shelf break front.

**Key Questions, Hypotheses and Issues:**

Bottom up vs top down control of the microzooplankton distribution.

**Number of scientists and fte: 2**

**Participating Institutions: AZTI**

**Duration: 4 Years**

**Budget: EUR 36 000 €**

**Funding Agency: Basque Government.**

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## **14 Effects of the Prestige Oil spill on the zooplankton and ichthyoplankton**

**Source of Information:**

Xabier Irigoien (xirigoien@pas.azti.es)

**National Representative/ Contact:**

Xabier Irigoien (xirigoien@pas.azti.es)

**Project Description:**

The objective of the project is to develop a GAM model of the zooplankton and ichthyoplankton distribution in the Cantabrian Sea to evaluate the impact of the Prestige Oil spill.

**System Types Studied:**

Cantabrian Sea, Bay of Biscay

**Target Organisms:**

Mesozooplankton and ichthyoplankton.

**Physical Processes Examined:**

River plumes, eddies and shelf break front.

**Key Questions, Hypotheses and Issues:**

Impact of oil spill vs natural variability

**Number of scientists and fte: 4**

**Participating Institutions: AZTI, IEO**

**Duration: 3 Years**

**Budget: EUR 80 000 €**

**Funding Agency: MCYT**

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## **15. Biological effects of mixing processes in the Strait of Gibraltar (REN2001-2733-C02-02)**

### **Source of Information:**

Universidad de Cádiz (carlos.garcia@uca.es)

### **National Representative/ Contact:**

Carlos M García (carlos.garcia@uca.es)

### **Project Description:**

The project will try to characterize the mixing processes in the Strait of Gibraltar and its effects on biological productivity in both, the channel area and the adjacent areas within Alborán Sea. The project will focus on the variability of internal waves generation processes occurring in Camarinal Sill at a fortnightly scale, as a key mechanism for mixing, either as internal bore release during higher amplitude tides or due to the existence of arrested waves in neap tides or during the transition from neap to spring phases. These mixing episodes represent a rich deep water intrusion on the eastward flowing surface layers. This fact, together with the shallower position of the Atlantic-Mediterranean Interface (AMI) toward east, enhances the magnitude of phytoplankton blooms in the eastern sector. The study of mixing processes will allow us to detail better the magnitude of the water masses, gases and nutrient exchanges through the AMI. Another aspect to study will be the propagation to the Mediterranean of internal waves and the transport of surface water so enriched and, finally, the resulting biological and chemical patterns in the eastern sector, hypothetically derived from diverse mixing processes produced in the different tidal cycles. As objectives, we will try to understand the mechanism producing the internal undulatory processes and the associated mixing phenomena on the sill, aiming to develop future suitable predictive models. Furthermore, we will try to describe the effects of these mixing processes on nutrients and seston patterns in both the Gibraltar and Western Alboran Sea, identifying sources for space and time variability. The synthesis will include mixing intensity estimations as well as its consequences on production and the typical response patterns that could be related to tidal cycles or to weather or climatic variability in the area.

### **Website:**

[http://www2.uca.es/grup-invest/ecosist-acuaticos/Oceanogr/Estrecho/Gibraltar\\_Pr.htm](http://www2.uca.es/grup-invest/ecosist-acuaticos/Oceanogr/Estrecho/Gibraltar_Pr.htm)

### **System Types Studied:**

Pelagic, coastal, strait

### **Target Organisms:**

Plankton (wide sense)

### **Physical Processes Examined:**

Mixing induced by tides

### **Key Questions, Hypotheses and Issues:**

Tides in the Strait of Gibraltar induce mixing processes and transport of enriched surface waters to the NW Alboran Sea, the project will study variability of mixing events, particularly on a fortnightly scale. The basic hypothesis is that enrichment so generated exists and is higher in spring tides than neap tides.

### **Number of scientists and fte:**

2 senior scientists (fulltime), 2 senior scientists (part-time), 1 fellowship researcher

### **Participating Institutions:**

University of Cadiz

### **Duration: 3 yr**

### **Budget: EUR 94418**

### **Funding Agency:**

Comision Interministerial de Ciencia y Tecnología (Ministry of Sciences and Technology, Spain)

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## **16. Study of the effects of global change on marine communities in the western Mediterranean. REN 2002-01339**

### **Source of Information:**

Institut de Ciències del Mar (CSIC)

### **National Representative/ Contact:**

Ana Sabatés (anas@icm.csic.es)

### **Project Description:**

The overall objective of the project is to relate the likely climate changes in the western Mediterranean to relevant changes in the composition, distribution and abundance of plankton communities (fish larvae and gelatinous zooplankton), and fish communities. To this end, time series of data (physical and biological) collected by systematic samplings performed in the last 20-25 years will be analysed.

### **System Types Studied:**

NW Mediterranean continental shelf

### **Target Organisms:**

Fishes, gelatinous zooplankton

### **Physical Processes Examined:**

Study of the interannual variability in climatic conditions and physical characteristics of sea water in the Catalan Sea (NW Mediterranean), to determine the magnitude of environmental changes during the last decades.

### **Key Questions, Hypotheses and Issues:**

The study aims to ascertain whether the eventually observed changes in the species distribution and biology are indicators of a trend in the long term, consequence of the global change or, on the contrary, they are a response to the interannual variability in the physical characteristics.

### **Number of scientists and fte: 8**

### **Participating Institutions:**

Institut de Ciències del Mar (CSIC)

**Duration: November 2002- October 2005**

**Budget: EUR 81,380**

### **Funding Agency:**

MCYT (Spanish Ministry of Science and Technology)

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## **17. Nutrient dynamics mediated through Turbulence And Plankton interactions (NTAP)**

### **Source of Information:**

Institut de Ciències del Mar (CSIC)

### **National Representative/ Contact:**

Cèlia Marrasé (celia@icm.csic.es)

### **Project Description:**

Turbulence effects on plankton can strongly modulate nutrient and organic matter dynamics in coastal areas. However, data at present show that effects may be non-linear, depend on initial environmental conditions, and/or may be specific to certain sizes of organisms or specific taxa. In models of marine systems, turbulence is accounted for as affecting the transport of chemicals and organisms, but rarely

as affecting biological processes, since biological effects appear complex and little is known about their dynamics. The overall objective of the project is to provide a unified conceptual framework for nutrient dynamics as modulated by the interaction of turbulence and plankton and to use this information to aid in implementing and modifying legislation on coastal water quality and management. The specific objectives are a) to build a database on turbulence effects by gathering existing scattered data, b) to produce experimental data on key organisms, interactions and mass transfer rates, c) to develop a sensor for laboratory measurement of small-scale turbulence, and d) to produce a dynamical model at community level with exploratory and predictive capabilities. The research strategy for fulfilling the specific objectives as well as building the overall framework consists of using multi-level approaches and levels of observation. Existing data from both experiments and field observations is analysed to guide the design of new experiments and preliminary modelling efforts. New experimental data on the effects of turbulence on plankton, ranging from organism to net community responses, is produced. A microsensor to measure flow in small containers is developed to overcome current size constraints. Modelling efforts are conducted to incorporate small-scale turbulence effects into a microbial food web model.

**Website:**

<http://www.icm.csic.es/bio/projects/ntap/>

**System Types Studied:**

Coastal communities enclosed in micro and mesocosms

**Target Organisms:**

pico-, nano-, microplankton and meso-zooplankton

**Physical Processes Examined:**

Small scale turbulence

**Key Questions, Hypotheses and Issues:**

Turbulence influence trophic interactions and nutrient fluxes in marine ecosystems

**Number of scientists and fte: 20**

**Participating Institutions:**

Institut de Ciències del Mar (CSIC), Spain  
University of Bergen, Norway  
Laboratoire d'Océanographie de Villefranche, France  
University of Cambridge, United Kingdom  
Marine Biological Laboratory, Denmark  
Nortek AS, Norway

**Duration: 1/04/2001- 31/03/2004**

**Budget: EUR 1,494,000**

**Funding Agency:**

European Commission

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**16. DINAPROFIT- DINÁmica de PROliferaciones de FIToplancton de Primavera en el Cantábrico Central (Dynamics of Spring Phytoplankton Blooms in the Central Cantabrian Sea). Project ID#: REN2003-09549-CO3-01**

**Source of Information:**

Spanish Ministry of Science and Technology

**National Representative/ Contact:**

José Luis Acuña  
Associate Professor of Ecology  
Area de Ecología  
Departamento de Biología de Organismos y Sistemas

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Universidad de Oviedo  
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Spain

**Project Description:**

Bursts of microphytoplankton (or net phytoplankton), of which the Spring Phytoplankton Bloom (SPB) in mid and high latitudes is the most conspicuous and best known example, represent the main contribution to atmospheric CO<sub>2</sub> sequestration in ocean sediments and to fish production, because large particles sink fast and are readily consumed by large predators. The SPB does not proceed as an isolated, sudden event, but as trains of small blooms, or microsuccessional (MS) events which are consequence of successive "windows of opportunity". DINAPROFIT aims at identifying the conditions that determine the initiation, dynamics and fate of MS events during the SPB in the Cantabrian Sea, and to develop tools for their prediction from meteorological and hydrographic data. To this end, DINAPROFIT will follow 3 complementary approaches: 1) Retrospective analysis of satellite imagery, time-series data and stored samples, that will allow the statistical characterisation (initiation, frequency, intensity and species composition) of MS events, their empirical modelling using meteorological and hydrographic variables and the identification of optimal periods for the development of subsequent DINAPROFIT cruises; 2) A meso-scale cruise using automated probes calibrated against manual methods and repeated at very short (3 days) intervals during the month of maximal variability of chlorophyll distributions. The high temporal resolution of this cruise, in combination with the low average residual current velocity in this area should allow close control of horizontal advection and clear resolution of the relative role of different factors on the initiation of MS events and their propagation to upper trophic levels. A further cruise along time series transects at weekly intervals during the following year will give an indication of interannual variability of the observed patterns; 3) Microcosm experiments to determine the role of upper trophic levels in determining the dynamics and fate of the SPB.

**Website:**

<http://www.uniovi.es/dinaprofit>

**System Types Studied:**

Winter, temperate shelf system with circulation patterns dominated by the Portuguese Coastal Counter Current.

**Target Organisms:**

phytoplankton, microzooplankton, copepods, appendicularians, fish larvae

**Physical Processes Examined:**

Portuguese Coastal Counter Current, changes in vertical structure (mixing depth, turbulence), coastal haline stratification

**Key Questions, Hypotheses and Issues:**

*Hypothesis 1:* Generation: the Sverdrup mechanism suffices to explain the generation of production pulses (vs. other mechanisms have to be invoked).

*Hypothesis 2:* Propagation: production pulses can be immediately detected in upper trophic levels (vs. there is a delay).

*Hypothesis 3:* Control: the species composition of the community of consumers affects the fate and dynamics of production pulses (vs. control of fate and dynamics is bottom-up).

**Number of scientists and fte:**

14 scientists, 9 EDP (work power units meaning one person, full-time job per EDP)

**Participating Institutions:**

Universidad de Oviedo  
Instituto Español de Oceanografía

**Duration: 3 years 2004-2007**

**Budget: EUR 110000 (ship costs not included)**

**Funding Agency:**

Spanish Ministry of Science and Technology

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**18. Seasonal and interannual zooplankton variability in relation to environmental physico-chemical variables in the Balearic Sea (HERCULE and ECOBALEARES).****Source of Information:**

Spanish Oceanographic Institute

**National Representative/ Contact:**

M<sup>a</sup>Luz Fernández de Puelles Martínez (mluz.fernandez@ba.ieo.es)

**Project Description:**

The main goal of both projects is to know the pattern and variability of zooplankton in relation to environmental and oceanographic variables to better understanding the pelagic system of the Balearic Sea.

**Website:**

<http://www.seriestemporales.net>

**System Types Studied:**

Pelagic and neritic waters (0-200m)

**Target Organisms:**

Cladocera (*Evadne spinifera*, *E. Tergestina* and *Penilia avirostris*)

Copepods (*Calanus helgolandicus*, *Centropages typicus*, *Acartia clausi*, *Temora stylifera*, *Diaixis hibernica*, *Ctenocalanus vanus*, etc.)

**Physical Processes Examined:**

Interannual variability in relation to climatic change and some mesoscale processes (fronts and eddies in the area).

**Key Questions, Hypotheses and Issues:**

- To describe the seasonal and interannual dynamic of the main species of zooplankton in the Balearic Sea waters. In relation to that to know the main environmental factors involved in the zooplankton variability.
- How are the main species changing in relation to "warming" or cooling years?
- Are the zooplankton changes in the area in relation to local and/or global climate changes?

**Number of scientists and fte: 2 scientists and 4 technicians**

**Participating Institutions:**

Spanish Oceanographic Institute (Balears Center)

**Duration: From 1994 to 2004**

**Budget: Yearly: EUR 25000 (Hercule) and EUR 50000 (Radial Balear)**

**Funding Agency:**

Spanish Oceanographic Institute

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**19. Estudio de los recursos pesqueros del Golfo de Cádiz / Study of the Fishery Resources from the Gulf of Cádiz****National Representative/Contact:**

José María Naranjo

C.I.C.E.M. "El Toruño"

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11500 El Puerto de Santa María  
Cádiz  
Spain

### **Project Description:**

The project aims at describing time and spatial changes in environmental parameters including currents, water quality, pelagic productivity and zooplankton, and their relationship with early life stages, recruitment and fishery dynamics of six species of economic interest in the southern Iberian Peninsula (see below). Physical and biological data are collected from surveys during 26 months (2002-2004) on board Regina-Maris managed by Junta de Andalucía.

*Physical data:* Monthly survey of hydrology in discrete stations (vertical profiles) and in continuum along the Gulf of Cádiz complemented with data from moorings, meteorological and riverine-discharge data. Study of fluorescence and main nutrient concentrations is also addressed.

*Biological data:* Monthly surveys of ichthyoplankton are conducted in ca 30 stations and trawling data is collected from 7 strategic areas. Main biological variables are monthly abundance and distribution of planktonic phases for the target species, total zooplankton abundance, as well as biometry, reproductive status and population dynamics of the six species under study. Community structure is also studied. Current fishery data is complemented with previous monthly (1997-2004) and annual (from the 70's or 80's, depending on the species, to present) data from the main ports of the Gulf of Cádiz.

*Anthropogenic factors:* are also considered, including fishery dynamics (landings, dredging, etc.). The study has an integrative nature that may enable the establishment of ecosystem-based indicators to predict fishery variability of certain species.

### **System Types Studied:**

Shelf waters (over the continental shelf, from 10m down to 90m depth) with highly riverine-influenced areas. Particular attention is placed onto the planktonic community (fish and crustaceans) and demersal communities of fish and crustaceans.

### **Target Organisms:**

The species under study are four fish and two crustaceans of commercial interest in the Gulf of Cádiz. Fish species studied are anchovy *Engraulis encrasicolus*, pilchard *Sardina pilchardus*, meagre *Argyrosomus regius* and wedge sole *Dicologlossa cuneata*. Crustaceans are mantis shrimp *Squilla mantis* and the penaeid shrimp *Melicerus Kerathurus*.

### **Physical Processes Examined:**

Hydrology and hydrodynamics is explored on a monthly basis, as well as its relationship with meteorological forcing or annual variations in environmental indices like the North Atlantic Oscillation.

### **Key Questions Hypotheses and Issues:**

Ecosystem functioning and its variability in the Gulf of Cádiz. Special attention is given to the build-up of a model linking physical forcing, early life stages, recruitment and fisheries of the main species studied. The fishery of the Gulf of Cádiz is particularly important at national level with respect to anchovy. The fluctuations in landings are caused both by fishing pressure (with strong political forcing due to historical dependence of Moroccan fishery grounds) and by environmental fluctuations, which probably act synergistically to determine the final biomass. Therefore, it is a key issue to understand both the biology, population dynamics and its links with the environment in order to build future ecosystem-based indicators that help the modelling and prediction of the fishery.

**Number of scientists and fte: 11**

### **Participating Institutions:**

Consejería de Agricultura y Pesca (Junta de Andalucía)  
Instituto de Ciencias Marinas de Andalucía (ICMAN-CSIC)  
Instituto Español de Oceanografía (IEO)

**Duration: 2002-2005**

**Budget: EUR 848 042**

## 20. Plankton-mediated carbon fluxes in contrasting subtropical oligotrophic environments: a lagrangian approach (CARPOS). REN2003-09532-C03

### Source of Information:

Universidad de Vigo

### National Representative/ Contact:

Emilio Fernández Suárez  
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### Project Description:

An active scientific debate has been held on the metabolic balance of the oligotrophic ocean during the past years. Briefly, this debate arises from the discrepancy between two statements: respiration exceed production in the oligotrophic ocean *versus* the open ocean is in metabolic balance.

The principal objective of CARPOS is to quantify the net metabolic carbon balance of the planktonic communities in the central and marginal regions of the subtropical NE Atlantic by adopting a lagrangian approach. This main aim splits into 4 particular objectives: 1) To verify that the net metabolism of the planktonic communities in the central region of the North Atlantic subtropical gyre is balanced or autotrophic, 2) to build up and compare *in situ* versus *in vitro* net metabolic balances for two contrasting oligotrophic environments, 3) To quantify the effect of short-scale physical variability on primary production rates and to infer its potential effect upon the net metabolic balance of the region and 4) to evaluate the effect of methodological limitations associated to *in vitro* experiments on the metabolic balance of this oceanic region.

These objectives will be accomplished through the development of a working plan organised in 4 modules which includes the completion of two oceanographic cruises. The first of these cruises (CARPOS-I), consists of a lagrangian experiment in the central region of the North Atlantic Subtropical Gyre, where a balanced net metabolism is expected.

The second cruise, CARPOS-II, will be centered on the marginal NE area of the subtropical North Atlantic, where the metabolic balance is known to be net heterotrophic. In this region, a new lagrangian study lasting 20 days will be conducted.

### System Types Studied:

Subtropical NE Atlantic

### Target Organisms:

Phytoplankton, bacteria, microzooplankton, mesozooplankton

### Physical Processes Examined:

Short-scale vertical displacements of the seasonal thermocline

### Key Questions, Hypotheses and Issues:

*Hypothesis 1:* The central region of the subtropical Atlantic gyre is characterized by balanced net community production rates (i.e. primary production equals community respiration)

*Hypothesis 2:* The lack of consideration of short-scale physical variability associated to internal wave activity leads to significant biases in the estimates of organic matter production and consumption in the region.

*Hypothesis 3:* The heterotrophic net metabolic balance of the subtropical NE Atlantic is, at least partly, the result of methodological artefacts related to the confinement of microbial populations in experimental bottles

**Number of scientists and fte: 23 scientists**

**Participating Institutions:**

Universidad de Vigo  
Instituto Español de Oceanografía  
Universidad de Oviedo

**Duration:** 2004-2006.

**Budget:** EUR 330970 (ship costs not included)

**Funding Agency:** Spanish Ministry of Science and Technology

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**21. Estudio de las variaciones de parámetros oceanográficos y meteorológicos de interés para las pesquerías del Golfo de Vizcaya / Oceanographic and meteorological time-series studies in the SE Bay of Biscay****Source of Information:**

AZTI

**National Representative/ Contact:**

Victoriano Valencia (vvalencia@pas.azti.es)

**Project Description:**

The objective of the project is to study the oceanographic-meteorological coupling in the Southeastern Bay of Biscay and to relate events and anomalies with the oscillations in the abundance and recruitment of some exploited fishes (mainly anchovy and other small pelagic fishes).

The project is based on a systematic and prolonged sampling (from 1986) for basic oceanographic parameters (temperature, salinity, nutrients, chlorophyll etc.) in the shelf waters of the Basque Coast. In addition of the direct measurements and analysis, external series of meteorological and oceanographic parameters concerning the study area are recollected (SST, scalar and vectorial wind, precipitation, river discharges, NAO, etc.) from several sources.

**System Types Studied:**

Shelf seas in the SE Bay of Biscay

**Target Organisms:**

Small pelagic fishes (mainly anchovy)

**Physical Processes Examined:**

Mesoscale processes (upwelling/downwelling balance, turbulence, river plumes, fronts, etc),

**Key Questions, Hypotheses and Issues:**

Atmosphere-ocean interactions and biological responses (small pelagic recruitment)

**Number of scientists and fte:** 5 scientists

**Participating Institutions:**

AZTI

**Duration:** 1986- Present

**Budget:** variable (around EUR 30,000/ year)

**Funding Agency:**

Departamento de Agricultura y Pesca (Gobierno Vasco)

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**22. Spawning Stock Biomass Estimates of the Bay of Biscay anchovy (*Engraulis encrasicolus*, L.) in 2003**

**Source of Information:**

Fundación AZTI

**National Representative/ Contact:**

María Santos

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AZTI Foundation

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20110 Pasaia, Gipuzkoa

Spain

**Project Description:**

The objective of this project is to estimate the daily egg production, the spawning area and the adult parameters of the Bay of Biscay anchovy (*Engraulis encrasicolus*, L.) in 2003. The spawning stock biomass is calculated as the relation between the daily egg production and the daily fecundity of the adult population applying the daily egg production method (DEPM). This estimate is presented to the ICES working group on the assessment of this species.

These results were presented as well in the *ad hoc* working group on 'In season assessment of anchovy in the Bay of Biscay' to provide the Commission with scientific background for management

**Website:**

<http://www.azti.es>

**System Types Studied:**

Fishing resources

**Target Organisms:**

*Engraulis encrasicolus*

**Physical Processes Examined:**

Physical parameters acquired are temperature, salinity, chlorophyll in the water column, currents, wind in the study area to analyse the relationship between anchovy and the environment. Water column stratification.

**Number of scientists and fte: 5**

**Participating Institutions:**

AZTI Foundation

**Duration: From 01/01/03 until 31/12/03**

**Budget: EUR 275,448**

**Funding Agency:**

Partly funded by the Spanish National Programme for fishery monitoring and the Department of Agriculture and Fisheries of the Basque Government.

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**23. Physical and Biological Structures and Biogeochemical Fluxes in the Northwestern Mediterranean (EFLUBIO) (REN2002-04151-C02-01/ MAR)**

**Source of Information:**

Institut de Ciències del Mar

**National Representative/ Contact:**

Mikel Latasa (latasa@icm.csic.es)

**Project Description:**

Hydrographic and biological processes play a fundamental role in the distribution and fluxes of the biogeochemical elements in marine ecosystems, with a clear importance for the interests of our society (climate, fisheries, pollution, tourism, etc.). The northwestern Mediterranean is the most productive area of the whole Mediterranean Sea because the intensity and extension of its processes of fertilization. In spite of such an importance, most studies have been restricted to the coastal

margins, with a limited geographical extension. Meanwhile, the open sea comprising the area of influence of the Nor-Balearic Front and the two boundary water masses, is basically unknown, especially from a multidisciplinary point of view. Therefore, the goal of this project is to identify, quantify and establish relationships between the physical and chemical conditions, the structures of the planktonic communities and the biogeochemical fluxes in that area. An intensive study is proposed during the bloom period in April, when strong physical and biological contrasts exist north and south of the Nor-Balearic front. A reference study, reduced in time and effort, is proposed during the summer stratification, the most extended situation in time and the one with the strongest contrasts with the April situation.

**System Types Studied:**

Nor-Balearic Front: open ocean spring bloom

**Target Organisms:**

Bacteria, phyto and zooplankton

**Physical Processes Examined:**

Spring stratification, Nor-Balearic front, mesoscale instabilities.

**Key Questions, Hypotheses and Issues:**

- Which organisms are key players in the spring phytoplankton bloom of the NW Mediterranean?
- Which ones are responsible for the phytoplankton bloom?
- Which ones are associated to different water masses?
- Which ones are associated to the biogeochemical behaviour of the system?
- Which ones are associated to sedimentation of organic matter?

**Number of scientists and fte: 5**

**Participating Institutions:**

Institut de Ciències del Mar (CSIC)  
Instituto Oceanográfico de Palma de Mallorca

**Duration: 2003-2005**

**Budget: EUR 133000**

**Funding Agency:**

Comisión Interministerial de Ciencia y Tecnología, Spain

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**24. SARDine DYNAmics and stock structure in the North-east Atlantic (SARDYN).**

**Source of Information:**

Instituto Español de Oceanografía (IEO)

**National Representative/ Contact:**

Carmela Porteiro Centro Oceanográfico de Vigo Instituto Español de Oceanografía Apdo. 1552, 36280 Vigo Spain	E-mail: <a href="mailto:carmela.porteiro@vi.ieo.es">carmela.porteiro@vi.ieo.es</a> Tel: +34 986 492111 Fax: + 34 986 492351
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**Project Description:**

The principal objective of this project is a comprehensive study of the life history and structural dynamics of the sardine (*Sardina pilchardus*) in Atlantic European waters with an emphasis on the factors required for improvement of the assessment and management of this species. The study will lead to the modification/extension of existing assessment models or to the development of a new model based on biologically defensible definitions of the stock boundaries and an adequate description of the sardine dynamics within the stock area. The objective will be achieved by establishing a multi-

disciplinary team to study the stock structure of sardine in the North-East Atlantic, to describe the sardine dynamics in relation to the environment and finally to integrate the above results in appropriate analytical assessment methods.

**Website:**

<http://www.ieo.es>

**System Types Studied:**

Oceanography and fishing resources

**Target Organisms:**

North Eastern Atlantic sardine (*Sardina pilchardus*)

**Physical Processes Examined:**

Regional and mesoscale circulation features of surface waters to assist the identification of current spawning grounds and seasons of the sardine in the North East Atlantic and migratory movements of adults.

**Key Questions, Hypotheses and Issues:**

Definition of current stock structure of sardine population. Regional studies of productivity/food availability and physiological preferences and on local studies related to retention/upwelling using a hydrodynamical/individual-based coupling model approach, and to quantify, size-structure and quality of food available to sardine larvae.

**Number of scientists and fte:** 39

**Participating Institutions:**

Instituto de Investigaçao das Pescas (IPIMAR, Portugal, Coordinator)

Instituto Español de Oceanografía

Institute of Marine Biology of Crete (IMBC, Greece)

Marine Biological Association of the UK (MBA, UK)

Instituto of Marine Research of Bergen (IMR, Norway)

Université de Perpignan (France)

Fundación AZTI (Spain)

**Duration:** From 01/10/2002 until 31/09/2005

**Budget:** 748,762 Euros (IEO)

**Funding Agency:**

IEO and V Framework Programm of the EU (QLRT-2001-00818)