

## COUNTRY: FRANCE

### Source of Information:

François Carlotti and Claude Roy, June 2004

### National Representative / Contact:

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### Organisation and funding agencies

There is not one French- GLOBEC program, but several GLOBEC- projects are funded through national, institutional and regional programs

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### National programs:

- National Program of Coastal Environment (PNEC) Phase II 2004-2008. This program covers site-specific projects and thematic projects.
- National Program of Oceanic Processes and Fluxes (PROOF). (<http://www.obs-vlfr.fr/proof>)
- National Program on Impact of Climate Change. (<http://medias.obs-mip.fr/gicc>)

### Funding

Funded by different ministries and agencies Ministry of Research, Ministry of Environment and Durable Development, Ministry of Cooperation, Foreign Office through National institutes.

ADEME: Agence de l'Environnement et de la Maîtrise de l'Énergie (<http://www.ademe.fr>)

DRAST: Direction de la Recherche et des Affaires Scientifiques et Techniques (<http://www.equipement.gouv.fr/recherche/drast/>)

DRIRE: Direction Régionale de l'Industrie, de la Recherche et de l'Environnement (<http://www.drire.gouv.fr>)

Ministère de l'Agriculture & de la Pêche (<http://www.agriculture.gouv.fr>)

Ministère de la Recherche (<http://www.recherche.gouv.fr>)

Ministère de l'Ecologie et du Développement Durable (<http://www.environnement.gouv.fr>)

Mission Interministérielle de l'Effet de Serre (<http://www.effet-de-serre.gouv.fr>)

### Participating Scientific Institutions to these national programs are:

CEMAGREF: Institut de recherche pour l'ingénierie de l'agriculture et de l'environnement (<http://www.cemagref.fr>)

CIREN: Centre International de Recherche sur l'Environnement et le Développement. (<http://www.centre-cired.fr>)

CNRS (<http://www.insu.cnrs-dir.fr>)

IFREMER: Institut français de recherche pour l'exploitation de la mer (<http://www.ifremer.fr>)

INSU: Institut National des Sciences de l'Univers (<http://www.insu.cnrs-dir.fr>)

IRD: Institut de Recherche pour le Développement (<http://www.ird.fr>)

Météo-France (<http://www.meteo.fr>)

### Institutional program (funded by each Institute for its research laboratories)

- IFREMER: Integrated project on the Bay of Biscay. (<http://www.ifremer.fr/anglais/program>)

- IRD: Research Unit R097 on upwelling ecosystems (<http://sea.uct.ac.za/marine/idyle/>)
  - Research unit R109 on tropical tuna (<http://www.brest.ird.fr/ur109/index.htm>)
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## Regional programs

There are several regional programmes funded by each of the regions which usually complement the national programmes. Regional programmes include:

- Bay of Biscay
- North Western Mediterranean ecosystem
- English Channel ecosystems
- Upwelling systems
- Tropical areas

Further details for each regional programme are given below.

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## Bay of Biscay Ecosystem

### System Types Studied:

Bay of Biscay  
Gironde River

### Target Organisms:

European anchovy (*Engraulis encrasicolus*)  
Common sole (*Solea solea*)  
European Seabass (*Dicentrarchus labrax*)

### Physical Processes Examined:

Eddies  
Fresh water flux  
Fronts  
Gyres  
Ocean circulation  
Upwelling

### Key Questions, Hypotheses and Issues:

- Spatial structure of the population: identification of habitats and spatial units relevant to each life stage; identification of hydrological and hydrodynamical structures connected with these habitats.
- Identification of the linkages between meso-scale physical structures, trophic structure and fish response (i.e. larval survival, growth, condition, fecundity). Reconstruction of the links between population and environment at the scale of the population by aggregation of meso-scale relationships.
- Characterisation of the relationship between large scale climatic situations and the activation of meso-scale physical structures. Hindcasting of specific environmental features in the Bay of Biscay from available historical climate records, identification of climatic trends and changes in biological reference points.
- Development of short-term recruitment forecast indices based on observed environmental conditions.
- Analysis of combined environmental and fishing effects, using a meso-scale model of the population dynamics.

### Participating Institutions:

IFREMER, CNRS, IRD, Universities

### Duration

1999 – on-going

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## **Bay of Biscay Ecosystem Projects:**

### **1. Integrated project in the Bay of Biscay**

**Source of Information:**

Benjamin Planque ([benjamin.planque@ifremer.fr](mailto:benjamin.planque@ifremer.fr))

**Website:**

<http://www.ifremer.fr/gascogne>

**Contact:**

Jean Boucher ([jean.boucher@ifremer.fr](mailto:jean.boucher@ifremer.fr))

**Project Description:**

The "integrated Bay of Biscay project" is an institutional trans-disciplinary project based in IFREMER. The main objectives are 1) to understand interactions between fisheries resources, the environment and anthropogenic activities (including fisheries) at the regional scale of the Bay of Biscay, 2) to determine how social and economical factors control the behaviour of human factors, and 3) to understand and predict the behavior of the Bay of Biscay anthroposystem under different climatic and economical scenarios.

The project is organized along 5 major themes: a) climate and hydroclimate, b) physical-biological interactions, c) impact of anthropogenic activities on resources, d) interaction between human activities and the environment and e) medium term social and economical scenario building. In addition, a major effort is devoted to technological development in support to all themes of the project.

Key action relevant to GLOBEC include:

- Coupled biological-hydrodynamical modeling
- Dynamics of sea bass populations and their exploitation
- Dynamics of Sole populations
- Dynamics of small pelagic populations (Action Forever)
- Dynamics of fish assemblages
- Spatial-seasonal fisheries modeling
- Phytoplankton dynamics

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### **2. Action Forever on small pelagics**

**Contact:**

Pierre Petitgas ([pierre.petitgas@ifremer.fr](mailto:pierre.petitgas@ifremer.fr))

**Project Description:**

This project focuses on the correspondence between the hydrodynamical concept of mesoscale structures and the biological concept of habitat. The project concentrates on the investigation of the relationships between mesoscale hydrodynamical structures and a populations' life cycle. A particular population is described as an ensemble of mesoscale spatial units and the global response of the population to environmental forcing is then analysed as the result of the multiple mesoscale responses. The project particularly concentrates on two types of population response: recruitment and spatial organization.

The target population is the anchovy in the Bay of Biscay. The spatial distribution of this population is relatively limited (in comparison with highly migratory species in the same area), its life duration is short, it is highly dependent on hydroclimatic variations and it is an economically important stock. The Bay of Biscay is constituted by a collection of mesoscale features which can be activated or not, depending on meteorological conditions. 3D hydrodynamical models, such as the one developed at IFREMER allow for realistic reconstruction of the key mesoscale structures so that it is possible to study the details of the bio-hydrodynamical coupling between anchovy habitats during successive life stages (eg. spawning, larval stages) and the activation/de-activation of physical structures).

The current results from the programme include the determination of:

- Spatial distribution of spawning areas
- The influence of wind regimes on transport and retention of eggs and larvae
- Regional variations in larval growth and food web structures
- Spatial structures of fish schools
- A recruitment forecast index

Evaluation of the anchovy stock and cartography of adult distribution and spawning areas are currently produced annually and used for management advice.

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### **3. PNEC Project: Site study Bay of Biscay**

**Contact:**

Alain Herbland (aherblan@ifremer.fr) and Christine Dupuy (Christine.Dupuy@univ-lr.fr)

**Project Description:**

The objective is to evaluate the impact on marine ecosystems of climatic phenomena and various anthropic effects on various scales of space and time. The activities include regular surveys.

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### **4. PNEC Thematic project: Modelling physical-biological processes**

**Contact:**

Benjamin Planque (benjamin.planque@ifremer.fr) and Pascal Lazure (pascal.lazure@ifremer.fr)

**Project Description:**

The aim of this thematic project is to build a forum of exchange and interaction between ecologists and hydrodynamical modellers. The project specifically works towards:

- developing biogeochemical (e.g. NPZD) and biological (e.g. IBM) modules coupled with hydrodynamical models,
- developing methods and tools for the interpretation and validation of model simulations,
- developing new approaches towards a better description, understanding and forecasting of the influence of hydroclimatic and anthropogenic changes on marine ecosystems.

The thematic project is built on 11 research actions which are devoted to (1) the construction of indices derived from hydrodynamical simulations (habitats, key processes such as enrichment, retention or concentration, ecosystem indicators), (2) the development and validation of NPZ models, biogeochemical and IBM modules, and (3) the development of novel approaches for the calibration and validation of hydrodynamical models applied to ecology. Five of these actions are located in the Bay of Biscay region. Others take place in the English Channel, Mediterranean Lagoon, and open Pacific and Atlantic oceans.

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### **5. GICC Project: Fishing and Climatic warming impacts on spatial fish distributions in the Bay of Biscay**

**Contact:**

Fabian Blanchard (Fabian.Blanchard@ifremer.fr)

**Project Description:**

This project includes and expands beyond the Bay of Biscay area. The main objective is to assess the effects of climatic forcing on exploited fisheries resources. The first part of the project is based on retrospective studies and the use and development of original time-series analyses techniques. The second part focuses on predictive aspects, using ecosystem and bio-economical models.

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## North Western Mediterranean ecosystem (2004-2007)

### Source of Information:

François Carlotti (carlotti@com.univ-mrs.fr)

### System Types Studied:

North western Mediterranean gyre

Ligurian jet

Gulf of Lion

Rhône river

### Target Organisms:

Key Mediterranean zooplankton species (copepods, salps, jellyfish, fish eggs)

### Physical Processes Examined:

Ocean circulation

Eddies

Fresh water flux

Fronts

Gyres

### Key Questions, Hypotheses and Issues:

- To review the available time-series and predictive models
- To suggest improvements in terms of sampling and modeling strategy, and the addition of new time-series observations that are not yet part of the monitoring system
- To determine physical influences and biophysical interactions in planktonic communities
- To understand the dynamics of zooplankton (i.e. holoplankton, meroplankton and ichthyoplankton) and their interactions with both lower and higher trophic levels
- To identify probable changes in living marine resources resulting from climate change

### Participating Institutions:

IFREMER, CNRS, IRD, Universities

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## North Western Mediterranean ecosystem Projects:

### 1. PNEC project: ZOOPNEC

#### Contact:

Gabriel Gorsky (gorsky@obs-vlfr.fr)

#### Duration:

2004-2007

#### Project Description:

Nationally funded projects with cooperation from Italy and Spain

The objective is to provide:

- Optimised approaches for the acquisition and treatment of data related to the zooplankton population dynamics and their environment
- Proxies for the definition of structures, diversity and function of these populations related to other ecosystem components

In order to estimate zooplankton distribution and abundance as close as possible to the reality we propose to proceed as follows

- To apply these methods to past zooplankton sample series from seven NW Mediterranean sites
- To group French field and laboratory instrumentation to define the best links between existing and new methods in order to optimize procedures for data acquisition and treatments allowing the estimation of the temporal and spatial properties of zooplankton communities

- To apply these methods on new data sets collected in the NW Mediterranean during the ZOOPNEC project

An international working group MEZOTIS (Mediterranean Mesozooplankton Time Series) of ICESM sub-committee "Living resources and marine ecosystem", will meet first in Barcelona in June 2004.

There are ZOOPNEC Bilateral Co-operation Projects (PAI) that are funded by the Foreign Office with Belgium, Spain and Italy and a ZOOPNEC Regional Programme in the PACA region.

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## **2. PNEC : Thematic project: Modelling physical-biological processes"**

### **Contact:**

Benjamin Planque (Benjamin.planque@ifremer.fr), Pascal Lazure and J.C. Poggiale

### **Project Description:**

The objective is to evaluate the impact on marine ecosystems of climatic phenomena and various anthropogenic effects on various scales of space and time. The activities include regular surveys and methodology (modeling, statistics) processing.

Biophysical coupling and coupling between lower and higher trophic levels will be targeted actions to model plankton succession in the northern Western Mediterranean sea.

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## **3. PROOF project PECHE (Production and Exportation of Carbon: control by Heterotrophic organisms at small time scales )**

### **Contact:**

V. Andersen (andersen@obs-vlfr.fr) and M. Goutx (goutx@com.univ-mrs.fr).

### **Website:**

<http://www.obs-vlfr.fr/proof/vt/op/ec/peche>

### **Project Description:**

The objective to examine the natural variability of the structure and the dynamics of the pelagic ecosystems at small time scales and in response to transient events. The project addresses a major question concerning the functioning of biological systems in the open ocean and the biogeochemical responses to global change.

## **English Channel ecosystem**

### **Source of Information:**

François Carlotti (carlotti@com.univ-mrs.fr)

### **System Types Studied**

English Channel, Seine river, Bay of Mont St Michel

### **Target Organisms**

Meroplanktonic larvae

### **Physical Processes Examined:**

Jet

Eddies

Tides

Estuarian hydrodynamics

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

- Analyse how hydrodynamics controls dispersion or retention of meroplankton larvae, and the consequences for benthic population dynamics.
- Quantify the gene exchanges between local populations over English Channel system.

### **Participating Institutions:**

CNRS, Universities, IFREMER

## English Channel ecosystem projects

### 1. PNEC project: Hydrodynamics, genetics and biology controlling the distribution patterns of benthic populations

**Contact:**

Eric Thiébaud (eric.thiebaut@snv.jussieu.fr)

**Duration:**

1999 - on-going

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## Upwelling systems

**Source of Information:**

Claude Roy (claudio.roy@ird.fr)

**System Types Studied**

Upwelling ecosystems

**Target Organisms**

Small pelagic fish

Zooplankton

**Physical Processes Examined**

Upwelling process

Meso-scale circulation dynamics

Cross-shore exchanges

Climate and open ocean forcing on coastal systems

**Key Questions, Hypotheses and Issues**

The aim of the project is to provide an adapted methodology to analyse the structure and functioning of upwelling ecosystems in order to implement an ecosystem approach to fisheries. By using an integrative and comparative approach, the project studies the dynamic of pelagic fish and their ecosystem, in relation to global and regional changes in their exploitation and the environment.

The project focuses on the following questions:

- global change and its impact on upwelling regions;
- exploitation and its effects on the structure and functioning of the upwelling ecosystems: spatial interactions between marines resources and the physical environment, adaptive strategies of the populations and communities;
- regime shifts in upwelling ecosystems;
- socio-economical aspects of the pelagic fisheries in the world.

The project is implemented in three upwelling regions: the Benguela current, the Humboldt current and the Canary current.

The methods that are developed, used and integrated include:

- analysis and modelling of the physical (hydrodynamic) processes which are essential to the dynamics of biological processes such as primary and secondary production, recruitment and distribution of resources;
- Lagrangian approaches to analyse the links between the physical environment and the various upper trophic levels;
- tropho-dynamic models to analyse the spatio-temporal dynamics of species interactions in the ecosystem;

- geographical information systems (GIS) and ecosystem indicators to incorporate all the available knowledge within one or two ecosystems;
- *in situ* experiments to study how space is utilised by pelagic species as a function of their biology and the environment *sensu lato*.

**Participating Institutions:**

IRD groups at CRHMT, Sète, France

Centre IRD de Bretagne, Brest, France

Université de Bretagne Occidentale, Brest, France

Laboratoire de Physique des Océans, Brest, France - CEEED (Saint Quentin en Yvelines)

Marine and Coastal Management, University of Cape Town, South Africa

NFMR, Namibia

BCLME, Namibia

BENEFIT, Namibia

IMARPE, University of San Marcos, Peru

University of Concepcion, Chile

IFOP, Chile

INPESCA, Chile

PUCV, Chile

INRH, Morocco

LPA, Senegal

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**Upwelling Systems Projects**

**1. IRD Project: Upwelling Ecosystems**

**Contact:**

Pierre Fréon IRD, CRHMT, Sète ( pierre.freon@ird.fr)

**Project Description:**

A study of the structure and functioning of exploited upwelling ecosystems: comparative analyses within the framework of an ecosystem approach to fisheries

**Duration:**

2005-2008 (a follow up to the IDYLE project)

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**Tropical areas**

**Source of Information:**

Olivier MAURY (maury@ird.fr)

**System Types Studied**

Tropical regions Indian Ocean, Atlantic Ocean, Pacific Ocean

**Target Organisms:**

Tuna

**Physical Processes Examined**

Frontal systems

Tropical instability waves

**Key Questions, Hypotheses and Issues**

Coupling between the environmental variability and spatial stock dynamics

Fish trophodynamics

Exploitation strategies

**Participating Institutions:**



IRD  
IFREMER  
Universities  
CNRS

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### **Tropical Areas Projects**

**1. IRD THETIS: Tropical ecosystems; environment, exploitation, and interactions.**

Contact: Olivier MAURY (maury@ird.fr)

**2. IRD Ecosystem dynamics linked with tropical instability waves**

Contact: Menkes Christophe (menkes@lodyc.jussieu.fr)

**3. PNEC: Modelling habitat and spatial dynamics of bluefin tuna population**

Contact: Jean-Marc Fromentin (Jean.Marc.Fromentin@ifremer.fr)

