



**Govern de les Illes Balears**  
Conselleria d'Educació, Cultura i Universitats  
Direcció General d'Universitats,  
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## SCIENTIFIC PROGRAMME OF THE COASTAL AND MARINE RESEARCH STATION *JAUME FERRER* (LA MOLA, MENORCA)





## BACKGROUND

The Menorca Island, comprising approximately 700 km<sup>2</sup> of surface area and 200 km of coastline, is characterized by an excellent environmental quality of its territory even its marine environment. Such a good environmental quality has resulted in an improved quality of life of its inhabitants and the environmental characteristics are also one of the fundamental attractions for visitors. The tourism industry has direct and/or indirect impact on the gross domestic income of the island, and in recent decades it has become the main economic resource. This economic activity presents a strong seasonality in human pressure, peaking during summer months, which occasionally rise from 85,000 to 160,000 people. This uncommon balance between environmental quality and development has led to the recognition of Menorca as a [Biosphere Reserve by UNESCO](#), declared on 8<sup>th</sup> October 1993.

The [Ministry of Research and Innovation of the Government of the Balearic Islands](#) and the [Spanish Institute of Oceanography](#) have signed a collaboration agreement for the implementation and development of the scientific coastal and marine research station *Jaume Ferrer*. The objective of this agreement is to promote permanent scientific research programs, technological development and innovation related with the sea and the problems derived from their exploitation and pollution in Menorca, thus contributing to the decentralization of research in a fragmented territory such as the Balearic Islands.

The purpose of the research station in Menorca is to obtain an excellence of research status, and provide scientific knowledge needed to carry out a management policy that ensures the maintenance of exceptional environmental quality of the island. Accordingly, the following requirements are needed: i) host interdisciplinary research, ii) a sustained research task on a long-term, iii) establishment of an attractive and comfortable environment for the implementation of research projects and attract the participation of highly reputed researchers, and iv) provision of space for the training of post-graduates and pre-doctoral studies.

During the days 24<sup>th</sup>, 25<sup>th</sup> and 26<sup>th</sup> of May, a group of 17 experts in various fields of marine research (physics, ecologist, fishery biologist and modellers) (see annex I) met at the Coastal and Marine Research Station *Jaume Ferrer* (La Mola, Menorca) to discuss and develop the scientific programme. The multidisciplinary group was requested to: i) to provide expert knowledge and guidance to the main objectives to be developed in the work programme; ii) to identify gaps of knowledge in the Mediterranean related to the participants own field of expertise; iii) to identify scientific and methodological tools to monitor and respond appropriately to risks posed by the global change to the ecosystem function, biodiversity and sustainable exploitation of resources; iv) to identify the main facilities needed to develop research of excellence in Menorca; and v) to develop the mainlines of the strategy plan for the coastal and marine research station *Jaume Ferrer*.

The meeting was founded by the Ministry of Research and Innovation of the Government of the Balearic Islands throughout the “Special Action to hold an international meeting developing the scientific program of the research station *Jaume Ferrer* (La Mola, Maó, Menorca)” and the Spanish Institute of Oceanography.’

## **OBJECTIVES AND MAINSTREAM RESEARCH OF THE COASTAL AND MARINE STATION *JAUME FERRER***

The research programme to be developed at the coastal and marine station is based on experimental work and the establishment of monitoring and systematic collection of biogeochemical data, in order to identify indicators to assess the evolution of ecological processes related to the loss of marine biodiversity, climate change, exploitation of living resources, and evaluation of different ecosystem-based management strategies. The Station is open to researchers interested in the following topics:

### **1. Conservation of marine biodiversity. For example:**

- Establish linkages between biodiversity and key ecosystem processes (e.g. productivity, trophic webs and nutrient cycling)
- Determine priority aspects for monitoring and assessing temporal and spatial changes in the biological diversity
- Identify keystone species and important groups for priority conservation

### **2. Modelling of marine ecosystems. For example:**

- Support operational biophysical oceanography and develop predictive capabilities
- Apply individual based models (IBMs) to describe recruitment of local spawning populations
- Implement the ecosystem-based approach to identify key processes driving the functioning of ecosystems.

### **3. Sustainable exploitation of living resources. For example:**

- Investigate life history parameters of commercially important species (experimental and monitoring studies)
- Determine the practical implications of involving local communities in the management and conservation of marine living resources.
- Assessment of commercial and recreational fisheries

### **4. Monitoring and assessment of the impact of global change at sea. For example:**

- Monitoring to inform the implementation of the [Marine Strategy Framework Directive](#).
- Assess temporal and spatial trends in the distribution, productivity, diversity and structure of natural resources.
- Establish routine long-term sampling of physical and biological variables around the Island of Menorca.

### **5. Evaluation of different ecosystem-based management strategies. For example:**

- Use the Island of Menorca as a model system to integrate ecological, economic and social objectives for ecosystem-based management

## STRATEGY PLAN

The means of achieving the main objectives of the research station are through three approaches, monitoring, experimental research and networking. The monitoring programme will be established utilising the facilities and permanent staff of the station and aims to establish long term sampling of physical and biological variables of Menorcan coastal seas. Experimental research is required to understand causal processes of natural change and anthropogenic impacts on the natural Menorcan coastal ecosystem. Experimental research will predominantly be undertaken by visiting researchers utilising the unique access to the marine environment, high water quality and facilities of the research station. To facilitate this, a programme of networking will be applied to promote the visibility of the research station, to allow visits by scientists, postgraduate and undergraduate students.

### ➤ Basic monitoring programmes

Objective: to obtain continuous baseline data in an area of very good environmental status.

1. Physical and biochemical data: To collect salinity, temperature, turbidity, oxygen, fluorimetry, current velocity and nutrients
  - a. to carry out 5 nm CTD transects following altimeter track ([Envisat](#)) to validate coastal sea level from satellite altimetry
  - b. to establish a nearshore real time monitoring coastal ocean system as part of the mooring facilities from [SOCIB](#) in the vicinity of the Maó Marine Research Station<sup>1</sup>.
  - c. to recover time series of satellite data (SST, ocean colour, sea level)
2. Fisheries: to collect landing data (mainly catch and if possible size) for selected representative boats of different fisheries
  - a. to estimate the total landings and the fishing effort for the different fisheries
  - b. to estimate the size structure of the exploited communities from surveys
  - c. to obtain size frequency composition of some important species of the catches and to construct historical data series
3. Key habitats and species:
  - a. to quantify, describe and monitor habitats and species of interest for the conservation (included in the Habitats Directive 1992/43/EC and/or IUCN, Barcelona Convention and Regional lists of endangered species; e.g. *Cystoseira* spp., *Posidonia oceanica* barrier-reefs)
  - b. to collect density values of recruitment/settlement for target commercial (e.g. spiny lobster, groupers, sparidae), recreational species (*Diplodus annularis*, *Coris julis*, e.g. *Serranus scriba*, *S. cabrilla*) and indicator species (e.g. *Pinna* spp.)
4. Invasive species: to collect density data of *Caulerpa racemosa* and *Lophocladia lallemandii*

<sup>1</sup> A nearshore real time monitoring coastal ocean system will be established as part of the moorings facility from SOCIB in the vicinity of the Maó Marine Research Station. The main objective is to obtain continuous baseline data in an area of very good environmental status. The system will allow continuous monitoring of oceanographic variables (temperature, salinity and currents at different depths) that will be transmitted through a cable of length approximately 400 m to the station. In a second phase, bio-geochemical data will be also considered. Automatic quality control procedures will be established and the data will be available in quasi real time through the SOCIB web to end users (researchers, policy makers, environmental agencies, society, etc) for visualization, download, etc. Maintenance procedures (sensors manual cleaning by diver) will be established and will be carried out by technicians from the Maó Station. Purchase is expected during 7/2010, installation during 10/2010, initial operations 12/2010, operations and maintenance until 4/2011 and final operational capabilities by 6/2011.

5. Secondary production
  - a. Short term: To collect zooplankton samples along the CTD stations.
6. Data base: Create a data base for biochemical data collected in the programmes develop at the station and in collaboration with other research teams

➤ **Experimental ecology for understanding processes**

Objectives: Experimental ecological research at the Coastal marine research station is, at least in the first years, expected to be conducted wholly by visiting researchers. Given this, and given the aim to encourage as wide a participation at the research station as possible by local, national and international researchers it is felt unnecessary to prescribe or limit the focus of research in the general area of marine biodiversity.

Requisites: To promote experimental ecological research at the station, both field and laboratory based, consideration needs to be given to development of facilities and permanent staff to facilitate visiting research:

1. Within a short time frame:
  - a. Small water pumps (2) ca 2000 €
  - b. Wooden platform ca 20-30 square metres with tent like cover. ca 5000 €
  - c. Small tanks (100-1000litres): ca 1000 €
  - d. Set of sieves: ca 500 €
  - e. 2-3 stereo microscopes
  - f. Sets of diving equipment: the station should have at least one
  - g. Sampling gear to collect experimental plants and animals (i.e. small grab and epibenthic sledge)
2. Within a medium time frame:
  - a. More elaborated water system with header tanks and filtering system (sand filters)
  - b. Building for a variety of mesocosm types experiments
  - c. Rooms with the possibility to regulate temperature and light conditions
    - i. For carrying out experiments on organisms from deeper waters or other type of environment that cannot be simulated in the mesocosm building
    - ii. For keeping experimental animals before the start of experiments in relatively low temperature environment (i.e. higher oxygen tension and metabolic rate slower)
    - iii. Cultivation of phytoplankton and zooplankton (rotifers, Artemia) (feeding experiments/food for experimental animals)
  - d. Compressor
  - e. Possibly more stereo microscopes
3. Within a long time frame:
  - a. Wet laboratory
  - b. Laboratories for sorting and preparing animals for experiments or other treatments with access to seawater through taps.
  - c. Water treatment equipment with multiple filter cartridges (and capsules) and ultraviolet disinfection unit (several lamps) to obtain high quality water for maintenance of eggs and larvae

- d. Small motor boats to access experimental sites.
4. Permanent staff. It is anticipated that the technicians of the station would play a vital role in research support to include (but not limited to):
    - a. Set up, fine tuning, maintenance and running of sea water supply system
    - b. Boat and diving support for visiting researchers
    - c. Collection and maintenance of organisms required for research
    - d. Development of local knowledge to assist visitors (site selection, etc.)

#### ➤ Networking activities

Objective: To enhance visibility and usage of *Jaume Ferrer* research station to local communities and wider research arena.

Prerequisites: Provide local infrastructure information, through web site (short term)

- General information about station (booklet)
- Information about travel
- Accommodation and board
- Contacts
- Activity months

Examples of activities:

1. Summer courses.
  - a. Max 15-20 attendants, 1 week.
  - b. Example of topics include:
    - i. larval transport and connectivity,
    - ii. experimental design in benthic ecology,
    - iii. fisheries population dynamics,
    - iv. statistical analysis in fisheries science,
    - v. modeling bio-physical interactions during fish early life stages
2. Small workshops.
  - a. Max 15 attendants.
  - b. Example:
    - i. EU work packages,
    - ii. proposal writing groups,
    - iii. synthesis and writing
3. Local outreach.
  - a. Provide information to local community
    - i. Quarterly encounter with fishermen,
    - ii. Public talks (schools, university,...)
    - iii. data access through website
4. Fellowship program for short-term research stay.
  - a. Mostly directed to MS and PhD student.
  - b. Covers travel, accommodation and technical assistance
5. Platform for regional projects.

- a. Advertise local physical and biological features that can make local research relevant to regional and global projects
- b. Examples of local features relevant for regional projects:
  - i. Pristine (more or less) condition of local benthic and demersal habitats and communities allow to conduct sampling along a gradients of anthropogenic impact
  - ii. Convergence of different water masses (Atlantic and Mediterranean waters) allow examination of small scale physical features and relative effects on biota
  - iii. Spawning aggregation of several big pelagic (bluefin tuna, albacore, etc) allow evaluation of spawning phenology, abundance and association with bio-physical variables
  - iv. Line of congregation between sea turtles from Mediterranean and Atlantic origins allow examination of population structure, etc.

6. Education field courses for 5 to 10 people

➤ **Specific needs**

1. Short term:
  - a. Infrastructures for experimental work (tanks, pumps, etc): the platform
  - b. Improvement of Internet connexion to send real time data form moorings to the SOCIB data centre.
  - c. Website with the database capabilities.
  - d. Refurbish the Slipway
2. Medium term:
  - a. Refurbish the second military battery building
3. Long term:
  - a. Rebuild the building close to the sea



## ANNEX I

### LIST OF PARTICIPANTS TO THE AD HOC WORKING GROUP FOR DEVELOPING THE SCIENTIFIC PROGRAMME OF THE COSTAL AND MARINE RESEARCH STATION JAUME FERRER (MAÓ, MENORCA, 24 - 26 MAY 2010)

1. Ken Haste Andersen, Associate professor in fisheries science, Technical University of Denmark (Charlottenlund, Denmark)
2. Enric Ballesteros, Senior Researcher, Marine Ecology Department, Centre for Advanced Studies of Blanes (Girona, Spain)
3. Lluís Cardona, Associate Lecturer, Department of Animal Biology, University of Barcelona (Barcelona, Spain)
4. David Carreras, Senior Researcher, Director of the Socio-Environmental Observatory of Menorca (Maó, Spain)
5. Lorenzo Ciannelli, Assistant Professor, College of Oceanic and Atmospheric Sciences, Oregon State University (Oregon, US)
6. Damià Gomis, Professor, Department of Ecology and Marine Resources, Mediterranean Institute for Advanced Studies (Esporles, Spain)
7. Stuart Jenkins, Reader in Marine Ecology, School of Ocean Sciences, Bangor University (Menai Bridge, UK)
8. Enric Massutí, Senior Researcher, Director of the Oceanographic Centre of the Balearic Islands, Spanish Institute of Oceanography (Palma, Spain)
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11. Pere Oliver, Directorate-general of Research, Technological Development and Innovation of the Government of the Balearic Islands (Palma, Spain)
12. Daniel Oro, Research Professor, Head of the Population Ecology Group, Biodiversity and Conservation Department, Mediterranean Institute for Advanced Studies (Esporles, Spain).
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