

# IRTA

RESEARCH & TECHNOLOGY  
FOOD & AGRICULTURE

**“RESEARCHING  
TODAY TO BRING  
TOMORROW  
CLOSER”** [WWW.IRTA.ES](http://WWW.IRTA.ES)



**Generalitat de Catalunya**  
Government of Catalonia

**Sponsor Day**  
**Mas de Bover**  
**December, 3<sup>rd</sup>. 2009**

## IRTA Sant Carles de la Ràpita

A multi functional platform in **aquaculture**  
and aquatic ecosystem

## Aquaculture program



### General Objective:

Carrying out strategic research in the field of the aquaculture, facilitating the effective transfer to the sector and the Administration.

### Specific Objectives:

Development of research, with new aquatic species and/or processes to improve the productivity, value and safety of the existing ones.

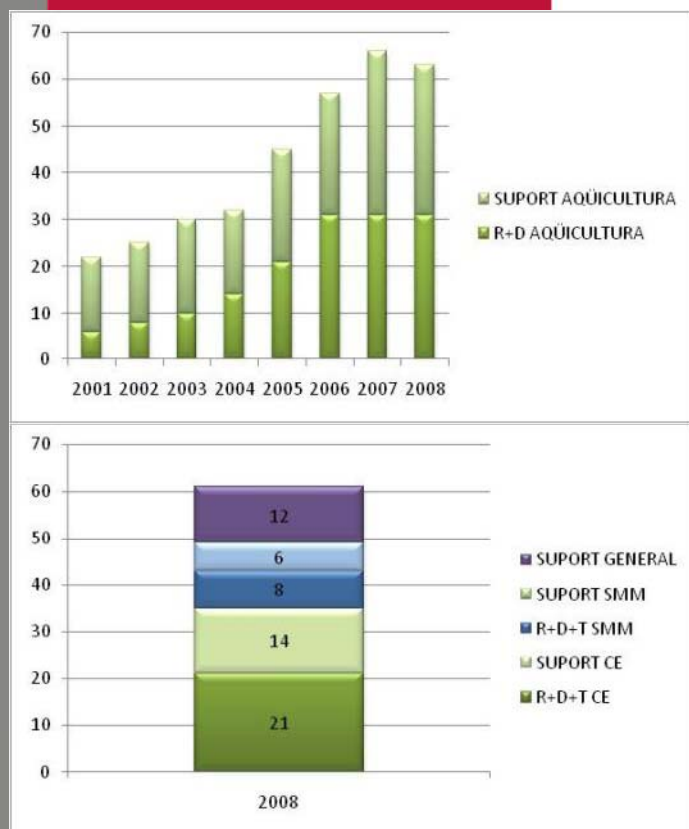
Systems and aquatic species, both from the productive point of view and conservationist.

Interdisciplinary: searching synergies and avoiding duplicities.

## Aquaculture program

### Organization of Research

- **Subprogram of Experimental Cultures (CE)**, reproductive and larval development processes and of larval development of species of interest for aquaculture or conservation. Biotechnological as well as zoo-techniques approaches.
- **Subprogram of Environmental Survey (SM)**, toxic microalgae, marine toxins, microbiological indicators and chemical pollutants, mainly linked to the aquaculture of shellfish. Marine environment and development of laboratory methods. Toxicology and natural substances.



## RESEARCH ACTIVITIES

### Environmental Survey

- Shellfish growing area monitoring
- Toxic Microalgae and Marine Toxins
- Microbiology in relation to public health
- Pollutants

### Experimental Culture

- Genetics and Reproduction
- Larval culture and Nutrition
- Aquatic Health and welfare

## END USERS

- Shellfish producers
  - Consumers and retailers
  - Human health agencies
  - Environmental agencies
- 
- Consumers and retailers
  - Feed and additive producers
  - Fish farmers
  - Aquatic animal health agencies
  - Conservationists bodies

## Facilities

General view

Greenhouses

Reservoir tanks

Wetlands and lagoons

### General sights





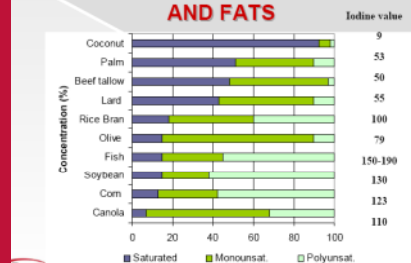
## Aquatic cultures

Phytoplankton

Rotifer

Artemia

**FATTY ACID COMPOSITION OF OILS AND FATS**



## Auxiliary cultures



### Phytoplankton culture

- Toxic microalgae
- Microalgae for food
- Bio-energetics

### Rotifers and artemia

- Fatty acid composition
- Specific vitamins profiles
- Enrichment emulsions
- Therapeutics emulsions

## Aquatic cultures

Photo period control

Temperature control

Salinity control

Recirculation systems



## Reproduction

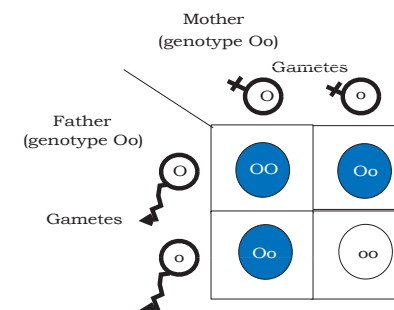


### Broodstock management

- Nutritional factors affecting reproduction and egg quality
- Design specific broodstock diets
- Environmental factors manipulation to obtain good quality eggs

### Genetics improvement

- Populations profile
- Analysis of relatives





## Aquatic cultures

Fish

Molluscs

Crustaceans



### Larval culture

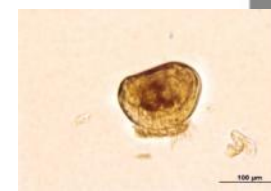


#### Larval zootechniques

- Main adequate culture parameters, i.e.: density, photo and thermo period, salinity,...

#### Larval nutrition

- Study of initial live and pellet diets (weaning diets) → Design doses-response
- Nutritional requirement analysis
- Digestibility
- Starvation effect

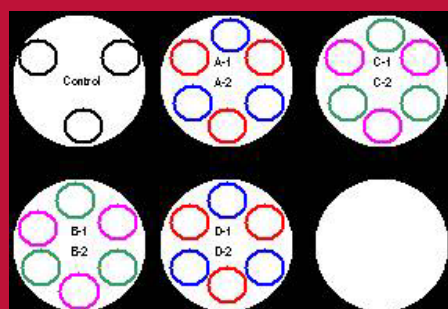


# Aquatic cultures

Fish

Molluscs

Crustacean



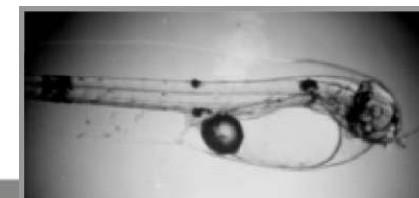
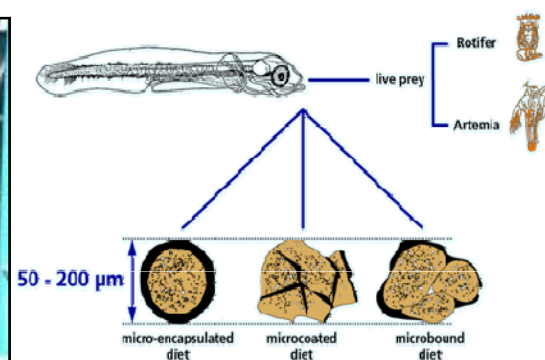
## Larval culture

### Larval physiology

- Respirometry
- Energetic metabolism
- Larval growth behavior

### Egg quality

- Spawning quality
- Studies of egg incubation and larval survival



## Aquatic cultures

Fish

Molluscs

Crustacean

### Juvenile culture and growth

#### Growth physiology

- Specific growth trials
- Effect of feed additives in growth
- New raw ingredients
- Fish protein substitutes

#### Sanitary management

- Vaccines efficacy





## Aquatic cultures



### Challenge room

#### Applications of the challenge

- Test feeds with immunoadditives
- Test feeds with probiotics
- Test oral vaccines (or any other type of vaccine)
- Test medicines

#### Diagnostic capacity in pathology

- Several labs which can be used for:
  - Test probiotics in the lab (especially the ones directly applied in the water)
  - Test antibiotics in the lab
  - Recover and confirm pathogens identity from challenge tests
  - Diagnose public health related pathogens

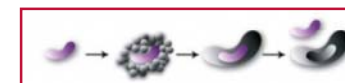
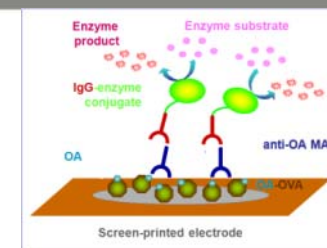
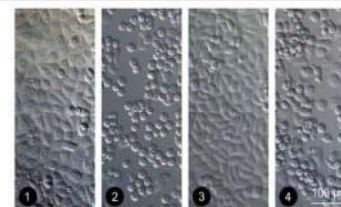
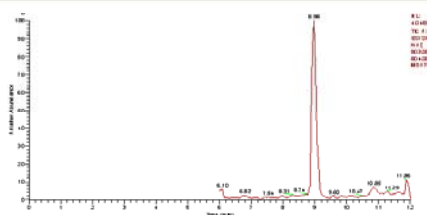
Up to 64 experimental units  
Biosecure (Ozonator)  
Controlled conditions  
(temperature, oxygen and salinity)

# Analytical potential and bio/technological tools

## 1) Methods & approaches



## 2) Examples of application



**A plural-disciplinary team experienced in the purification, identification and characterization of toxins and bioactive compounds**

- Solid phase extraction / Liquid Chromatography / Mass spectrometry
- Colorimetric assays (enzymes, antibodies, aptamers) and electrochemical biosensors
- Cell-based assays for toxicity evaluations
- Laboratory working under ISO 17025 requirements for chromatography, microbiology and phytoplankton counts.

- Food safety and marine toxins
- Bioactive compounds, phosphatase inhibiting compounds
- Development of biosensors
- Molecularly Imprinted Polymers



# Marine platforms and environmental monitoring

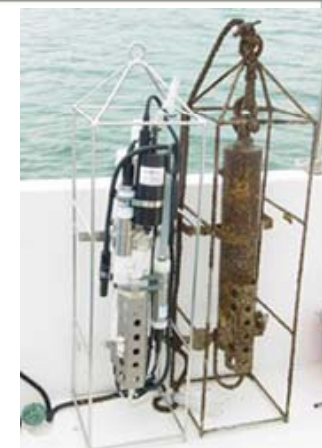
## 1) Methods/approaches



## 2) Examples of application



An **experienced team** in near-shore **monitoring** of  
physic-chemical parameters and  
marine **samples**  
water,  
marine organisms  
sediments  
in close communication with **research**  
advances and needs



- Historical data of environmental parameters such as temperature, dissolved oxygen, etc. useful for
  - Environmental impact studies
  - Characterization of bivalve and finfish production zone
  - Establishment of preventing actions that affect production and/or harvesting routines
- Complementary data for evaluation of new production facilities and ecological studies (microalgae communities, etc.)

## Microalgae biomass production

### 1) Methods/approaches

Strain characterization  
(taxonomy, toxicity)

Volume scaling under determined  
culturing conditions

Experimental end-use  
(harvesting, exposition, ...)

### 2) Examples of application

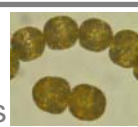


#### USEFUL FOR

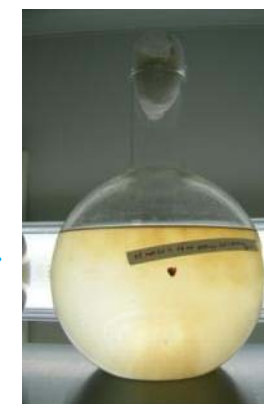
obtaining **bioactive substances** in larger amounts  
experimental designs for **ecological studies** (microalgae physiology, toxicology, etc.)  
evaluating **new sampling tools**



Isolation of single cells  
or  
already established strains



**Strain collection** maintained under  
laboratory conditions



Single strain scaling to increasing volumes

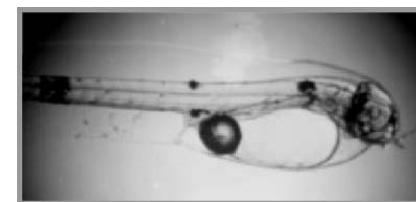
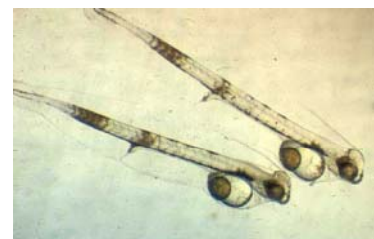
- Obtaining of **bioactive** substances produced by *Prorocentrum rhathymum*
- Obtaining of **Shellfish Reference Material** for analytical methods by intoxicating marine organisms with PSP-producing microalgae
- **Toxic effects** of *Karlodinium* sp. on marine organisms such as fish
- Domoic acid **production** by *Pseudo-nitzschia* spp. at different culturing temperatures
- Evaluation of Molecularly Imprinted Polymers (MIPs) as passive **sampling** devices for dissolved toxins

## Some collaborative research examples



### CENIT ACUISOST “Towards a sustainable aquaculture”

- *Evaluación nutricional, de seguridad alimentaria y medioambiental de las nuevas dietas diseñadas*
- Doses-response assay with larval and pre-fattening diets in sea bass and sea bream juveniles
- Essay with probiotics during marine fish larvae rearing
- *Diseño, desarrollo e integración de programas de bioseguridad basados en sistemas y técnicas que deriven hacia una acuicultura sostenible*
- *Efecto de la incorporación de dos agentes aditivos a dietas secas para alevines de trucha*



## Some agreements research examples



Monzón Biotech, S.L.

### SKRETTING ARC “Dietary trials with sea bass and sea bream”

- Study of the effect of including different raw materials on the zootechnical parameters in marine fish species
- Study of the effect of different diets on the performance of sea bass and sea bream

### EVIALIS “Dietary trials with sea bass and sea bream”

- Effects of different dietary type caviar for european sea bass/gilthead sea bream larvae

### MONZON BIOTECH, S.L: “Microalgae as food in marine fish”

- El uso de microalgas como alimento en acuicultura marina



# Integration of research potentialities at IRTA

