Annual report 2011

Ifremer

Foreword

Foreword

For Ifremer, the year 2011 was marked by the implementation of a new internal organisation aiming to create the conditions for better leadership within our institution. This was firstly scientific, through the creation of four large departments, each with their own well-identified core businesses and management and working alongside a new team of scientific managers. Secondly, there is now a managerial team specifically in charge of management accounting and control. The aim is also to boost our dynamic drive, with the creation of a business development and economic partnerships department.

Concurrently, the quality approach aiming to obtain ISO 9001 certification for the entire Institute in 2012 has advanced considerably.

New facilities have also been commissioned. They include the *Commandant Chauvin* building in Brest where research fleet missions are prepared; the renovated test tank in Lorient, particularly devoted to fisheries technology; the future building of the European underwater technologies centre in Toulon and the preparation of a regional innovation platform to serve the shellfish farming sector, in Bouin. For all these operations, Ifremer received support from the French State, as well as from the relevant regional and county councils. This funding can be seen as proof of confidence in our teams who work in a wide range of missions.

At the same time, our Institute showed a series of highly positive results in the Investments for the future framework, particularly for the Labex Mer laboratory of excellence and the *France Énergies Marines* institute of excellence for low carbon energies devoted to marine renewables and which will be a vector of the ecological transition engaged in France. The rise in the number of PhD theses supervised by scientists from Ifremer also illustrates the dynamics underway.

2011 was rich in original scientific output. Its milestones also included working with the Agency for marine protected areas to coordinate the drawing up of the initial assessment of marine waters status and environmental impact of human activities on the marine environment, thus achieving a key step in the implementation of the European Marine Strategy Framework Directive.

Setting up, with our partners from INSU, IRD and IPEV, the joint service unit which now coordinates the preparation of research cruises and defines the guidelines needed for the progressive renewal of vessels and vehicles was also a new phase in operating the major research infrastructure which the French oceanographic fleet has now become, being multifunctional and serving the entire scientific community in question.

Finally, the adoption of the Joint Programming Initiative for "Healthy and productive seas and oceans", along with the good results obtained by our Institute in European calls for tender, further asserts our will to ensure that Ifremer remains the reference institution for marine science in Europe.

In fact, this will be one of the major objects in our strategic approach in drawing up the future five-year plan with our supervisory ministries.

Jean-Yves Perrot
President-Managing Director of Ifremer

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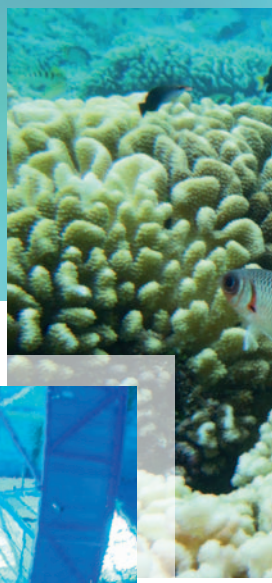
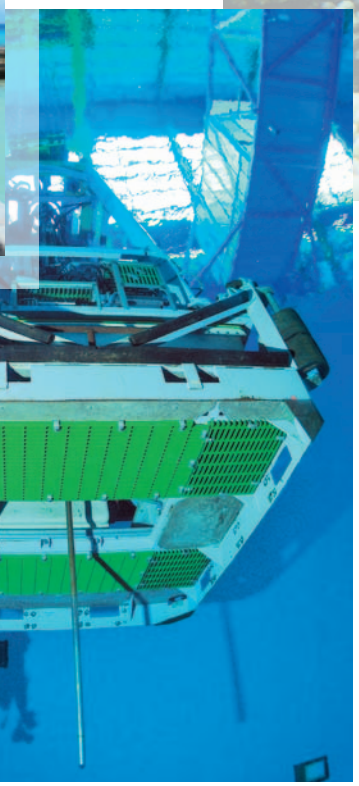




Photos showing general atmosphere: © Ifremer/Michel Gouillou, Olivier Dugornay, Stéphane Lesbats, Jérémie Drelon, Jérôme Bourjea, Lionel Loubersac, Cédric Pau, Hugues Lemonnier, Xavier Caisey, Béatrice Chatain, Yannick Gueguen

BUSINESS DEVELOPMENTS FROM RESEARCH

SUPPORT AND PROMOTION OF RESEARCH

TOOLS TO AID RESEARCH

Discovering the oceans with Ifremer...

MISSIONS AND GOVERNANCE

As the French Research Institute for Exploitation of the Sea, Ifremer contributes, though its studies and expert assessments, to improving knowledge about the oceans and their resources, monitoring the marine and coastal environment and promoting the sustainable development of maritime activities. To this end, our Institute designs and deploys observational, experimental and monitoring tools and manages oceanographic databases. We also operate a great part of the ocean research fleet, including all underwater systems and large-scale mobile facilities (seismics, penetrometer, etc.). Since March 2011, the scheduling and development of the entire French oceanographic fleet are ensured by the UMS fleet unit, whose management has been entrusted to Ifremer for a four year period Ifremer is the source of knowledge, innovation, monitoring data and expertise for the marine realm, both in terms of public policy and of socio-economic activity. It is the only organisation of its kind in Europe.

As of 31 December 2011, Ifremer had a staff of 1,479 salaried employees (individuals on permanent and short-term contracts), 67 PhD students and 26 post-doctoralfellows, in addition to temporary positions and the 363 employees (permanent and short-term contracts) at Genavir, shipowners of the ocean research fleet (247 seamen and 116 shore-based personnel).

Ifremer is a public institute of industrial and commercial nature (EPIC) created in 1984 and placed under the joint supervision of the Ministry of higher education and research, the Ministry of Agriculture, food, fisheries, rural life and spatial planning and the Ministry of Ecology, sustainable development, transport and housing.

LOCATIONS

Ifremer is present on twenty-five sites along the coastline of metropolitan France and its overseas territories. Its structure includes five centres (Channel- North Sea, Brittany, Atlantic, Mediterranean and Pacific), nineteen stations and laboratories and the headquarters located in Issy-les-Moulineaux.

About Ifremer

BACKGROUND

Ifremer was created in 1984 with the merging of the Scientific and technical institute of maritime fisheries (ISTPM) and the National centre for exploitation of the oceans (Cnexo), themselves holding the legacies of two branches, one working to develop maritime fisheries and aquaculture and the other devoted to oceanology.

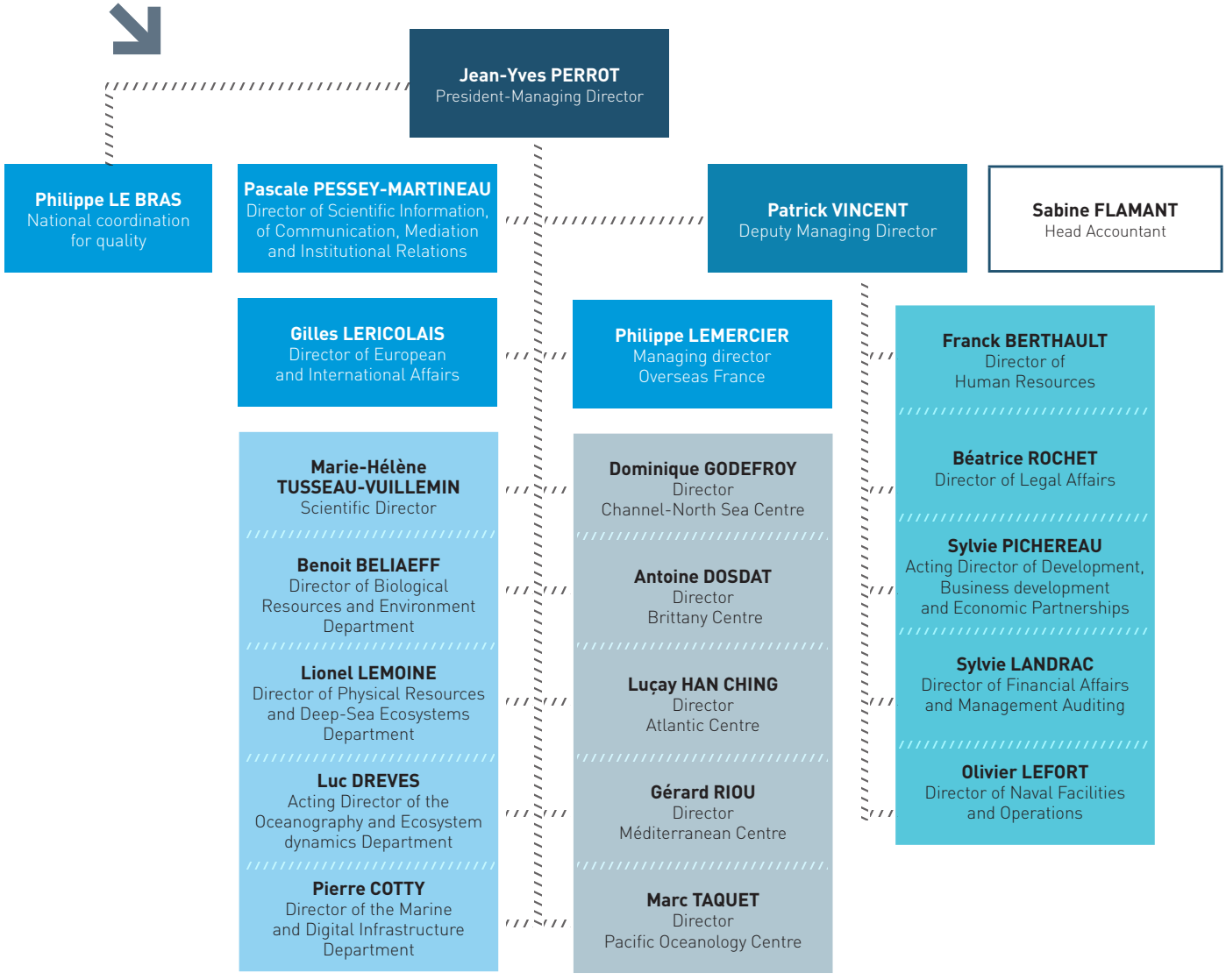
In 1862, Victor Coste was appointed "Inspector general for maritime inshore fisheries" by Napoleon III. The maritime fisheries technical service pursued its work up to the late 1ninetieth century. At the turn of the twentieth century, the maritime fisheries scientific service, coordinated by Paul Fabre-Domergue, enjoyed the collaboration of naturalists based all along the coasts of France.

The maritime fisheries scientific and technical office (OSTPM), the first financially independent body, was then created to represent France in international meetings, centralise shellfish health inspections and study all issues related to fisheries and mariculture. ISTPM became its successor in 1953.

The second branch of the Institute, initiated through the concerted action entitled "Exploitation of the ocean" came from the Scientific committee for exploitation of the oceans (Comexo), which was launched under the impetus of General de Gaulle. Work began as of 1961 with the building of the *Jean Charcot* vessel, followed by the SP 3000 "diving saucer" later to become Cyana. Cnexo then took over from Comexo, carrying on its research work from 1967 to 1984. From 1984 onwards, Ifremer developed the activities of both organisations with all of the disciplines already engaged, such as fisheries and aquaculture, marine geosciences, biology, the environment and underwater technologies.

ORGANISATION

As of 31 December 2011, the Institute's organisation chart looked like this:




marine energy
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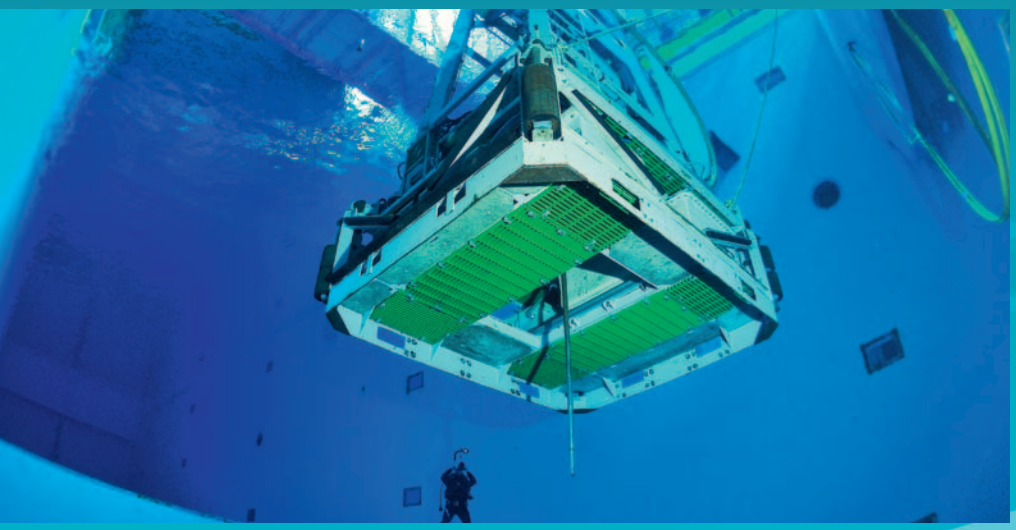
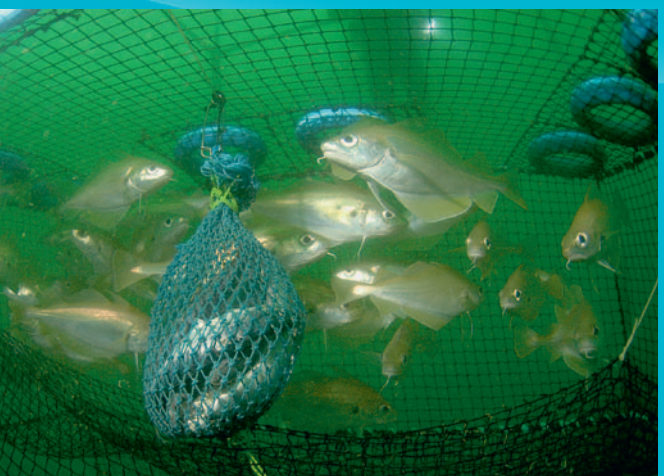
RESEARCH AND EXPERTISE ACTION






“Promoting sustainable development of marine resources”

Contributing to social and economic development of the maritime world

The work carried out by Ifremer in the field of marine resources aims to contribute to sustainable fisheries and aquaculture, develop knowledge about and utilisation of biological resources using biotechnologies and bio-prospection.
As a research institute, our missions focus on learning about, assessing and enhancing these resources and managing them sustainably, and supporting public policy, with the aim of promoting the socio-economic development of the maritime world, especially the fisheries and aquaculture sectors.

The implementation of the Marine Strategy Framework Directive, the reform of the Common Fisheries Policy now under way, the strategy of the European Commission for sustainable development of aquaculture and the commitments undertaken in the Grenelle de la Mer marine environmental summit with the perspective of an integrated maritime policy are all particularly structuring elements for Ifremer's activities of monitoring, research and expertise

Know, assess and enhance resources and enable their sustainable management

FISHERIES SCIENCE, AN ECOSYSTEM-BASED APPROACH

SUSTAINABLE MANAGEMENT OF KING SCALLOPS IN THE ENGLISH CHANNEL

The *Pecten maximus* scallop is currently the most important species in terms of landings (tonnage and value) for French coastal fleets on the Channel seafront. Each year, in July, Ifremer conducts a survey to assess the stocks in the Bay of Seine and the Bay of Saint-Brieuc (Comor cruise).

© Ifremer/Olivier Dugornay

King scallops

In order to supplement these data and improve knowledge about scallops through an ecosystem-based approach to fisheries, in early 2011 Ifremer launched the Comanche project on "ecosystem interactions and anthropogenic impacts on king scallop populations in the English Channel". As an approved Channel programme project, it calls upon a wide range of scientific disciplines (physics, chemistry, genetics, ecology, geostatistics, modelling, economics, etc.) to provide better understanding of the biological phenomena related to scallops population dynamics going so far as to analyse fisheries-related economic aspects. The Comanche project is scheduled to last three years and receives ANR-Systerra funding.
See website: http://wwz.ifremer.fr/defimanche/Projets/En-cours/COMANCHE.

ASSESSMENT OF FISHERY POPULATIONS IN THE ENGLISH CHANNEL AND THE NORTH SEA

© Ifremer/Olivier Dugornay

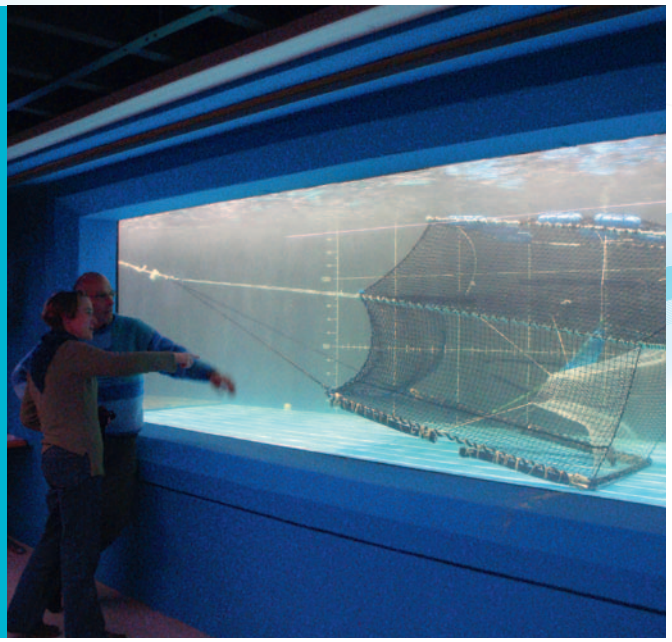
Phytoplankton sampling and water analysis aboard a Ferry between Roscoff-Plymouth (CHARM3 project)

The CGFS (Channel Ground Fish Survey) cruise is an Ifremer mission which has taken place in October every year since 1988, to assess the stocks of the main commercial species in the eastern English Channel and in the southernmost part of the North Sea. The cruise is part of the EU data collection contracting (DCF) project for basic fisheries data. It supplies the indices of abundance and recruitment used by the International Council for Exploration of the Sea (ICES) working group and supplies data to the databases which are vital for developing Channel programme projects (including Interreg IVA Charm 3). Finally, the CGFS data will help establish the baseline status for the impact of marine aggregate extractions in the eastern English Channel. The CGFS 2011 cruise was performed aboard RV *Gwen Drez,* from the 1st to 31st October.

Also under the supervision of the European ITBTS programme (International Bottom Trawl Survey), the yearly cruise (RV *Thalassa*, 13 January-14 February 2011) steered by ICES, provides monitoring of trends for commercial stocks fished in the eastern Channel and southern North Sea (whiting, cod, haddock, Norway pout, herring, sprat, mackerel and plaice). It provides the basis for the process of drawing up the Common Fisheries Policy (CFP). In 2011, an acoustic assessment of the biomass of herring in the English Channel, plaice and cod eggs in the Eastern Channel and North Sea and zooplankton was made in addition to the usual sampling.

Alternative fishing gear: the Nasse project

The bio-economic context in the fisheries sector has raised particular interest in alternative techniques to fishing with towed gear (trawling). The Nasse project falls under the 2007-2013 State-region of Brittany plan contract. It plans to develop a software interface to design fishing gear and fish traps in particular. During the Nasse experimental cruise conducted aboard RV *Thalia* off Lorient from 4 to 16 May 2011, instrumented fish traps were deployed in order to describe their behaviour in open water, compare their potential and performance for target species catches using different funnel designs, while respecting the ecosystem.



© Ifremer Lorient

Trials of Norwegian 2-chamber fish pot in Ifremer's test tank in Lorient

FRANCO-DUTCH AGREEMENT TO STUDY FISHERIES IN THE EASTERN CHANNEL

After French fishermen blocked Dutch vessels' access to Channel fishing harbours in April 2011, a Franco-Dutch agreement was signed between the Fisheries ministers and fishermen's representatives on 4 May 2011 in Brussels. French fishermen and professional organisations raised the issue of the impact of the Dutch fleet, which uses the Scottish seining or fly-ragging technique, on resources in the Eastern English Channel. The agreement entrusted Imares (Institute for Marine Resources and Ecosystem Studies in the Netherlands) and Ifremer with conducting a joint study aiming to summarise the available data on fisheries (including resources) including all fishing fleets in activity in the zone, i.e., from France, the Netherlands, Belgium and the United Kingdom. This summary will provide the basis for collecting new data to complement knowledge about the fishing practices of various fleets in the sector.

FISHERIES MANAGEMENT, IFREMER RESEARCH CRUISES IN 2011

• The Pelacus cruise (RV *Thalassa*, 24 March-22 April 2011) is an annual mission financed by the Spanish institute of oceanography (IEO). Its main objective is to assess stocks of sardine, horse mackerel, mackerel and anchovies in European Atlantic waters using acoustic measurements, in order to determine the volume of allowed catches.

• The Pelgas 11 cruise (RV *Thalassa*, 25 April-5 June 2011) was designed to monitor the distribution and abundance of pelagic species fished in the Bay of Biscay. The anchovy was chosen as the target species, since it is at the core of the pelagic ecosystem. This mission is the French contribution to the international Globec (Global Ocean Ecosystems Dynamics) programme and is part of the work done by ICES.

• The Evhoe 11 cruise (RV *Thalassa*, 17 October-1 December 2011) is a three-leg mission to observe demersal and benthic resources in the Bay of Biscay and the Celtic Sea, which has been organised yearly since 1997. Over one-hundred-sixty bottom trawl hauls and hydrology profiles (temperature, salinity) were performed concurrently with Spanish (IEO), English (Cefas) and Irish (Marine institute) research cruises.

© Ifremer/Michel Gouillou

Ocean research vessel Thalassa *to the south of Groix Island during the Pelgas 2011 cruise*

• The Medits-Fr-11 cruise (RV *L'Europe*, 23 May-26 June 2011), is the eleventh international cruise to assess demersal resources in the Mediterranean. It was directed by Ifremer this year in the frame of the European "Mediterranean international trawl survey" programme. A hundred bottom trawl hauls were performed in eastern Corsica and in the Gulf of Lion.


© Ifremer/Halieutique Méditerranéen Sète

Lifting trawl aboard research vessel L'Europe *during Medits cruise*

• The Pelmed-11 cruise (RV *L'Europe*, 27 June-1 August 2011) was devoted to assessing small pelagic stocks in the Gulf of Lion using echo-integration and trawling. This yearly assessment shows a noticeable drop in anchovy stocks over the past five years due to intensive exploitation since 1989 by trawlers and seine-netters in the Gulf of Lion, as well as by foreign fleets.

• The Juveceph-1 and 2 cruises (RV *Thalia,* 24-30 June 2011; 20-26 July 2011) were University of Caen missions to characterise the habitats which are essential for the development of cuttlefish and squid in the Bay of Seine, since the English Channel holds the largest stocks of the North East Atlantic. The studies complement the first two cruises performed in 2008 and made it possible to specify the habitat and ecology of these species' first stages.

• The Coper-12 cruise (RV *Thalia,* 18-26 August 2011) aimed to estimate the biomass of king scallops in the Pertuis Charentais area. The quantitative results of this mission, carried out each year by Ifremer, contribute to fisheries management, making it part of the State-Poitou-Charentes region plan contract.

• The Cosb cruise (RV *Thalia*, 1-20 September 2011) is an observation mission directed by Ifremer each year to monitor the dynamics of the main resources, especially king scallops, in the Eastern English Channel. This annual evaluation is used as the basis for organising fisheries for the following two years. The resource status is currently flourishing, with a high production phase recorded over the past seven years.

Research Vessel Thalia

© Ifremer/Olivier Dugornay

• The Langolf cruise (RV *Gwen Drez,* 13-31 May 2011) is focused on the abundance index and the size structure of Nephrops in the Bay of Biscay. Nephrops populations are particularly concentrated on the Grande Vasière mudflat area and represent vitals stakes in terms of biology and the ecosystem. Therefore, exploitation of the stock is scientifically monitored on a permanent basis and an annual diagnosis is complemented by recommendations for sustainable management drawn up under the aegis of ICES.

© Ifremer-DOI/Loic Le Ru

Swordfish catch aboard a Reunion Island long-liner

Assessing fisheries resources in the Indian Ocean

• Agreement was obtained from the European Fisheries Fund (EFF) and the Regional Council of Reunion Island in April 2011 to finance the project called Ancre-Dmx for the "analysis of small-scale coastal fisheries in Reunion". The project deals with fishing of deep demersal species (comet groupers, tropical red snapper, mochong pomfrets, etc.) using electric reels.
A preliminary experimental cruise identical to the prospecting cruise conducted by Ifremer in 2000, west of the island, was made on the same fishing sites using the same equipment and methodology, between April and July 2011. The assessment shows a significant drop (more than 90%) in deep demersal stocks around Reunion Island and a noticeable decrease in the size of fish caught, which are characteristic of overfishing of these resources over the past ten years.

• Funding for the Ancre-Pechtrad project was renewed in 2011 for the summary of shore fishing done in the Marine nature reserve of Reunion Island (RNMR).

• The 9th session of the Indian Ocean Tuna Commission (IOTC) working party on billfish, which Ifremer takes part in, was held from 4-8 July 2011 in the Seychelles. According to the experts' conclusions, swordfish stocks appear to have returned to a stable situation. Therefore, no specific management measures are required for the coming years.

“ Ifremer is the reference in the field of research on the behaviour of marine fishes” ”

Marie-Laure Begout

Interview

Marie-Laure Bégout is a researcher in behavioural ecology of fish at Ifremer’s station in La Rochelle. Most of her research focuses on studying the behavioural and physiological responses of fish in the context of aquaculture resources (biological foundations and indicators of fish welfare) and fisheries resources (behavioural performances and spatial dynamics of fish in response to the structuring factors of the habitat and to chemical contaminants).

What are the main achievements that you’ve contributed to recently and that you are proude?

Over the past ten years, I’ve been able to progressively establish the relevance of the behavioural approach applied to fish and in various fields. Studies on seabass behaviour (awarded the 2010 trophy for a PhD thesis) have improved the genetic improvement approach conducted on this species. As part of European projects, these studies have made it possible to acquire knowledge about behavioural indicators of well-being of fish. Thanks to a new PhD thesis, these studies have been supplemented by better understanding of the effects of domestication. The knowledge and methods to explore behaviour are now being used in a new European FP7 project called Copewell which is exploring the behavioural, physiological and genomic bases of fish adaptation and coping styles. I’m proud that this consortium of European colleagues has asked me to further study this theme and conduct research on the personality of fishes, with the help of a PhD student.

I am also highly satisfied by the latest developments achieved in ecotoxicology with the ANR-funded projects SoleBeMoL and ConPhyPOP, whose results distinguish the effects of contaminants and which open the way towards relevant behavioural indicators. This experimental approach offers new perspectives in terms of understanding the mechanisms which regulate activity in fishes and their deregulation by pollutants. Currently the studies are continuing with the focus on alterations in fish reproduction in order to determine the link between contaminants and recruitment, from individuals to populations.

How is Ifremer perceived in these fields of research?

Ifremer is seen as a reference, particularly in the field of research on the behaviour of marine fishes like seabass, and this is true on the European level. The Institute is also quite renowned nationwide for its research in ecotoxicology.

What is your perception of Ifremer?

Ifremer offers a very good work setting to conduct specialised research while staying strongly in touch with societal expectations. I like this balance, being free to develop innovative approaches while remaining faithful to our Institute’s missions. In fact, I chose to work at Ifremer and I am very much attached to it, because there is also a relationship of mutual confidence between a research scientist and his or her Institute. I appreciate the recognition and support that I receive.

What are the main topics you are asked about as an expert from Ifremer?

The studies I have conducted in the past and still today, also focus on the spatial dynamics and utilisation of fish habitats in the natural environment. This is the field where my expertise is recognised. I am regularly asked to take part in PhD thesis committees at IRSTEA, scientific project committees like that of the salmon conservation plan in the Loire river led by MNHN and INRA, and IEED low-carbon energy platforms like France Energies Marines, as well as requests on more methodology-related issues on the scale continuum to study the behaviour of fish, from the smallest to largest of them!

ECOSYSTEM-BASED APPROACHES FOR FISHERIES SCIENCE

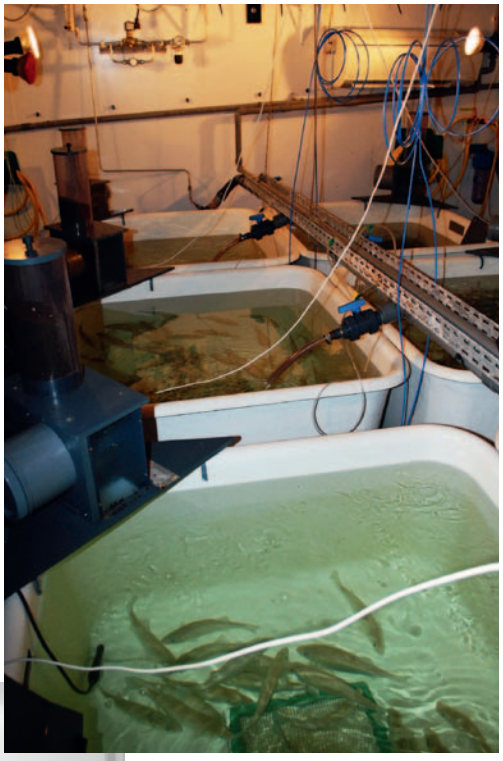
ANALYSIS OF FISH BEHAVIOUR

The FP7 European project Copewell (A new integrative framework for the study of fish welfare based on the concepts of allostasis, appraisal and coping styles) begin in July 2011 for a four-year period. The adaptive responses of fish (in behavioural, neurophysiological, physiological and genomic terms) will be analysed in order to specify to what extent domestication and selection for certain criteria (growth or species) affect their ability to adapt. Further studies will be conducted based on a study on seabass (*Dicentrarchus labrax*) in the context of a PhD thesis at Ifremer, in close collaboration with CCMAR (Spanish marine science centre) focusing on sea bream. Comparative experiments on populations of different known origins will be used to assess the interrelationships between the environment and physiological, behavioural and genomic responses.

ELOSOLE PROJECT

With the prospect of better understanding and predicting the long-term effects of environmental changes on fish populations, the Elosole project, which is supported by the Singer-Polignac Foundation, is studying physiological functions in individual fish and, more generally, conditioned biological processes in juvenile sole subjected to different temperatures in the larval stage. The study is based on analysis of large-scale gene expression (DNA microarray) performed on cardiac and hepatic tissues. It is combined with an analysis of fish otoliths (true biological record of individual life histories). This will further hone our ability t o diagnose the status of populations.

> “Evaluating the effects of environmental changes on fish populations”



© Ifremer/Didier Leguay

Fish behaviour study room – Fish ecophysiology platform

© Ifremer/Sébastien Ferrari

Maze to study fish behaviour

Capturing spat in the bay of Brest

© Ifremer/Stéphane Pouvreau

Oyster spat on limed collector cup

PROMOTING SUSTAINABLE AQUACULTURE

VELYGER, AN APPROPRIATE TOOL FOR MONITORING NATURAL SPAT COLLECTION OF PACIFIC OYSTERS

Oyster farming is the main French aquaculture activity. Based on the rearing of Pacific *Crassostrea gigas* oysters, it relies heavily (for 70%) on natural recruitment of the species. Mostly likely due to the warming of waters, Pacific oyster breeding is extending increasingly northward in France. Over the past ten years, the activity of collecting or capturing spat has become quite unsteady, both in traditional areas like the Arcachon and Marennes-Oléron basins as in newer locations in the Bay of Brest and Bay of Bourgneuf.

At the request of the National shellfish farming council, in 2008 Ifremer implemented the Velyger project, whose aim is to "observe, analyse and manage variability in Pacific oyster reproduction on the French coasts".

In 2011, the project's first phase ended with a summary report drawn focusing on three complementary actions, i.e. observing, analysing and informing.

The report presents the results from the monitoring network set up on four collection sites nationwide. These data are supplemented by a series of analyses which highlight for each year and each sector, the chain of factors involved in the recruitment performance observed. The last part is devoted to presenting the project's website. Designed for professionals, the http://www.ifremer.fr/velyger website supplies downloadable bulletins and dynamic pages with the first level of information about the oyster's reproduction cycle in each of the basins.

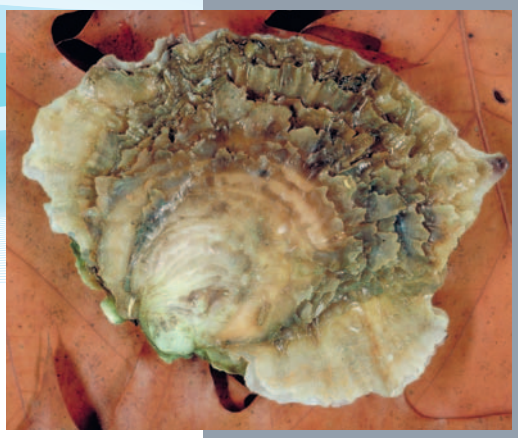
© Ifremer/Argenton

Oyster larva

Against the backdrop of the oyster farming crisis, the "monitoring network" part of the Velyger project will serve as a future operational tool. It will be particularly useful for professionals seeking natural spat supplies. A request to maintain this monitoring network has been submitted to the Directorate of marine fisheries and aquaculture in the framework of a core agreement with Ifremer.

DIVERSIFYING OYSTER-FARMING ACTIVITIES

In France, production of the European flat oyster *Ostrea edulis* native to European coasts made up the bulk of oyster farm production up until the 1950s. The species is hard hit by two parasitic diseases and is now on the Ospar List of Threatened and/or Declining Species. Over the past few years, discussion has been on-going regarding a return to production of the flat oyster, with the aim of diversifying oyster-farming activities in France. The Perle project on "Programme of experimentation and research into the flat oyster" is the response to this objective. It brings together shellfish farming professionals from Brittany and the Pays de la Loire and researchers from Ifremer and CNRS. The research (ecology and genetics, pathology and epidemiology, zootechnics and control of early stages, etc.) aims for better knowledge about populations and their habitat, understanding of species dynamics (especially those present in the Bay of Brest), mastering spat production and making it more reliable with the prospect of "guided restocking". The Perle project was recently approved by the Brittany marine competitiveness cluster. By 2013, it will be able to propose methods for sustainably managing and farming natural flat-oyster beds, and conserving this natural asset and iconic symbol of the French Atlantic seaboard.



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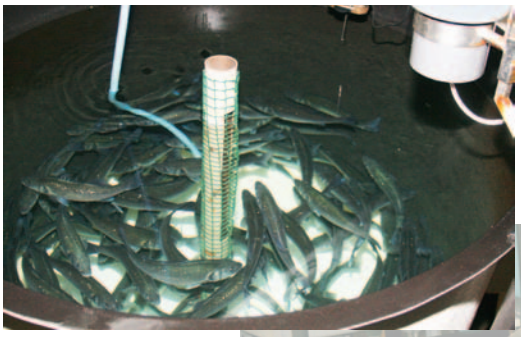
Ostrea edulis *native oyster*

DOMESTICATION AND SELECTION OF FISH

Replacing fish meal and fish oils by plant-derived products in fish farm feeds, provides a way to cope with limited raw materials obtained from fisheries. Numerous studies have tended to show that carnivorous fish can adapt to diets containing oils and meal which come from plants. However, the results obtained have also raised the hypothesis that there may be differences in carnivores' ability to adapt. This means verifying the interest of changing the selection programmes run by industrial firms to obtain fish which are better adapted to these feeds.



© Ifremer/Béatrice Chatain

© Ifremer/Béatrice Chatain

Feed tanks for farmed fish

GENETIC SELECTION

Studies financed by the Single interministry fund (FUI) and the Directorate of maritime fisheries and aquaculture, were launched in 2009 with the goal of improving the adaptation of trout, seabass, sea bream and meagre to diets rich in raw materials derived from plants. The VegeAqua project on the Genetics of adaptation to plant-sourced feeds in aquaculture aims to assess the level of adaptation of selected strains, to define appropriate selection methods for these new fish feeds and to qualify the benefits and potential risks of this sort of genetic selection.

Initial results have shown that it is impossible to entirely replace the feed. A selection experiment is currently underway. This programme, approved by the Aquimer, Brittany marine and Paca marine clusters, also involves Ifremer and Inra in particular. It will continue until 2014.

PROTECTING PEARL FARMING IN FRENCH POLYNESIA

GUARANTEEING VIABLE FARMED PEARL PRODUCTION...

The Polyperl project on integrated management and adaptation of pearl farming in French Polynesia in the context of global change: an environmental, economic and social approach was submitted to ANR on 31 March 2011 and accepted. It is coordinated by Ifremer and brings together some ten partners for a three-year period.

Pearl farming represents 80% of French Polynesian exports and is currently in the throes of an unprecedented crisis. Against this backdrop, the integrated Polyperl project is taking a series of applied research themes for pearl farming into account. They include understanding of biological phenomena, socio-economic aspects related to the activity and management of anthropogenic, sanitary and climate-related risks. Its main calling is to ensure production's viability thanks to better knowledge about the production system on the scale of French Polynesia, based on a systemic approach to the activity.

The project's originality specifically lies in the fact that it implements a research-action approach, associating scientists, pearl farmers and management authorities in the construction of scenarios. It is organised along four major themes and holds dual interest: firstly scientific, since it will enable progress on the biology of the species and its sustainable exploitation, and secondly operational, with proposals for technical innovations, decision-making tools, transfer and commercial utilisation of knowledge acquired.

©Ifremer/Yannick Gueguen

Pearls from Polynesia

Transport of pearl oysters

... OF GOOD QUALITY

• Studies have also begun to improve knowledge about the biomineralisation process *Pinctada margaritifera* pearl oyster. A global transcriptome analysis approach was developed based on constructing an EST base (expressed sequence tag) from pearl oyster mantle. The research showed up a profile revealing a tissue involved in biomineralisation functions.

• Concurrently, a candidate gene approach enabled a panel of genes which are biomarkers for pearl quality to be selected, assessed and identified. They will make it possible in the very short term to envisage the selection of genetic families of graft donor oysters with high biomineralising power.

An article describing all these results was published in the *BMC Genomics* journal and is one of the most consulted articles on the Biomed Central platform (1,458 times since its publication).

• An experimental nucleus graft was performed in a pearl farm in Tahiti, from 27 June to 1st July 2011, after Ifremer filed a patent (INPI No. 1056889 in June 2010) entitled "Nucleus coated with a film-forming coating having antibacterial and cicatrizing properties, and method for obtaining same". The first assessment was made in August 2011, forty days post-graft in order to evaluate the keeping and mortality rates of grafted oysters. The objective, at fifteen months, is to assess the quality, surface defects and thickness of the future pearls with respect to the type of nucleus used.

Mantle of an albinos oyster

©Ifremer/Yannick Gueguen

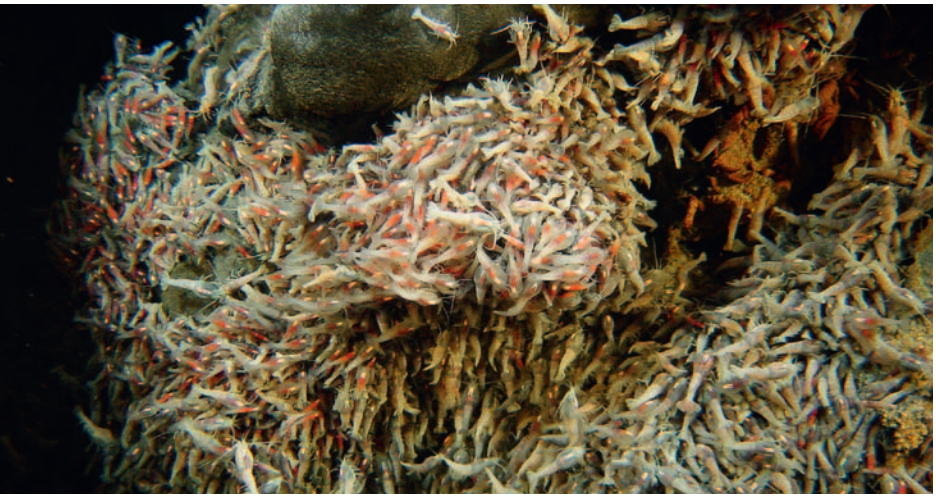
RESSOURCES BIOLOGIQUES ET BIOTECHNOLOGIES

BIOPROSPECTION AND BLUE BIOTECHNOLOGIES IN NEW CALEDONIA

In the framework of the policy to strengthen Research and Development actions in Overseas France, Ifremer fulfilled two missions in New Caledonia in 2011.

First of all, our Institute took part in the strategic discussions engaged on the issues of diversification of aquaculture and cultivation of microalgae. The delegation particularly highlighted the opportunities that New Caledonia can seize in terms of developing the farming of microalgae. The archipelago is most likely one of the most promising configurations for setting up this type of production on French soil. To this end, a Research and Development project established by the local and regional authorities of New Caledonia will be submitted to their Scientific and technical guidance committee.

In the field of bioprospection, Ifremer conducted a mission which carries on from a research programme begun in collaboration with the Pasteur Institute and the University of New Caledonia on «Bioprospection and biodiversity of micro-organisms from extreme environments in New Caledonian lagoons. Initial assessments of the potential of production of new molecules of biotechnological interest.»



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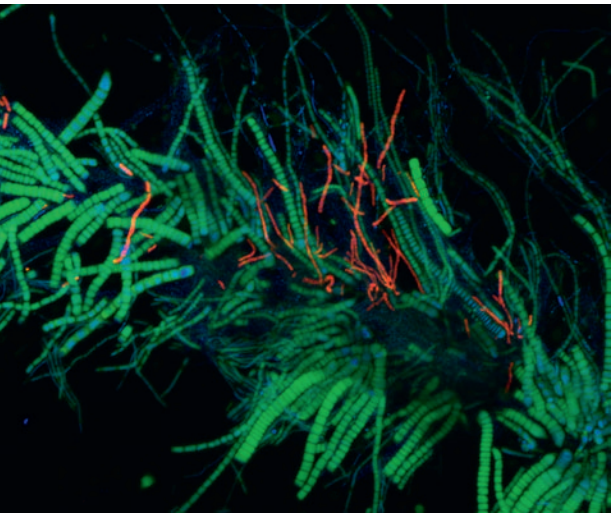
Aggregation formed by Rimicaris exoculata *vent shrimps on the TAG site of the Mid-Atlantic Ridge*

"A" RANKING FOR THE MICROBIOLOGY OF EXTREME ENVIRONMENTS LABORATORY

Under the supervision of CNRS, Ifremer and the University of western Brittany (UBO), the microbiology of extreme environments laboratory (LM2E) has been approved as a joint research unit, UMR 6197, since the 1st January 2004. Its fields of investigation include studying ecosystems, describing functional and phylogenetic microbial diversity (study of parental relationships in order to understand the evolution of living organisms), as well as understanding the processes of adaptation on cellular and molecular levels. In the conclusion of the assessment drawn up in March 2011, the Aeres committee highlighted the entity's very good scientific dynamics, as it addresses both coherent and novel themes, the relevance of the tools deployed as well as the teams' adherence to the policy proposed by management and strong involvement in teaching. The unit has thus achieved first rate results on the "extremophiles" theme, making it the top-ranking lab nationwide in this field and giving it international recognition (see Anne Godfroy interview, p. 39).



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Microorganisms associated with the cephalothorax cavity of the vent shrimp Rimicaris exoculata *(image created using fluorescence in situ hybridization technique, FISH*

MICROORGANISMS OF EXTREME ENVIRONMENTS

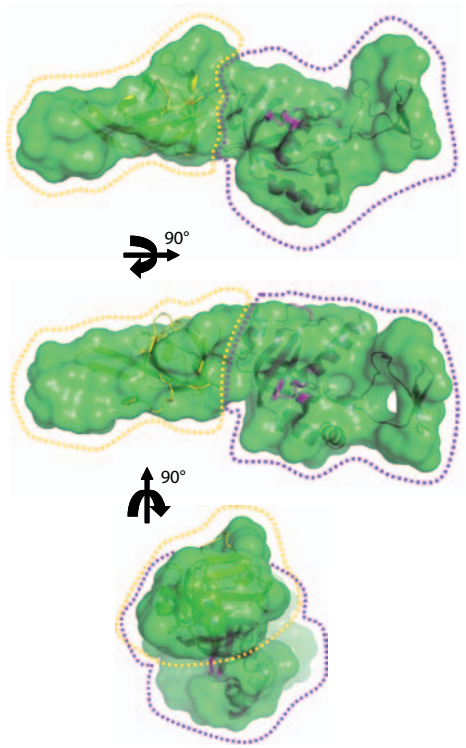
As the predominant species on most hydrothermal vent sites which it colonises along the Mid Atlantic Ridge, the vent shrimp *Rimicaris exoculata* displays the specificity of having an abnormally large cephalothorax in which an ectosymbiotic bacterial community develops. The presence and diversity of epibionts were studied in the moult stages in adult shrimp as well as in the first phases of its life cycle. The results showed that the epibiotic community evolves between the first life stages of shrimp (with a majority of Gammaproteobacteria) and the later stages (with a majority of Epsilon proteobacteria). The research also revealed the presence of methanotrophic bacteria in the cephalothorax of shrimp from the Rainbow (south of the Azores) and Logachev (off the West Indies) sites, which may be the first "epibiotic" association between methanotrophic bacteria and a hydrothermal crustacean. These outcomes were published in a well-known scientific journal.

MAKING INFORMATION SYSTEMS SERVE THE NEEDS OF BIOLOGY

Bioinformatics is gradually becoming an investigation technique that can be applied to many biological research studies. Ifremer is now studying how to make it part of our strategy.

Since 2010, with the hiring of an engineer trained in bioinformatics, our Institute has set up a number of software tools and sequence databases in a pooled approach on our Intranet. One of these tools is the Koriblast software designed to explore biological sequence databanks, using genomics databases for full genome comparisons, genomic monitoring and identification of species present in an environmental sample (metagenomics approach).

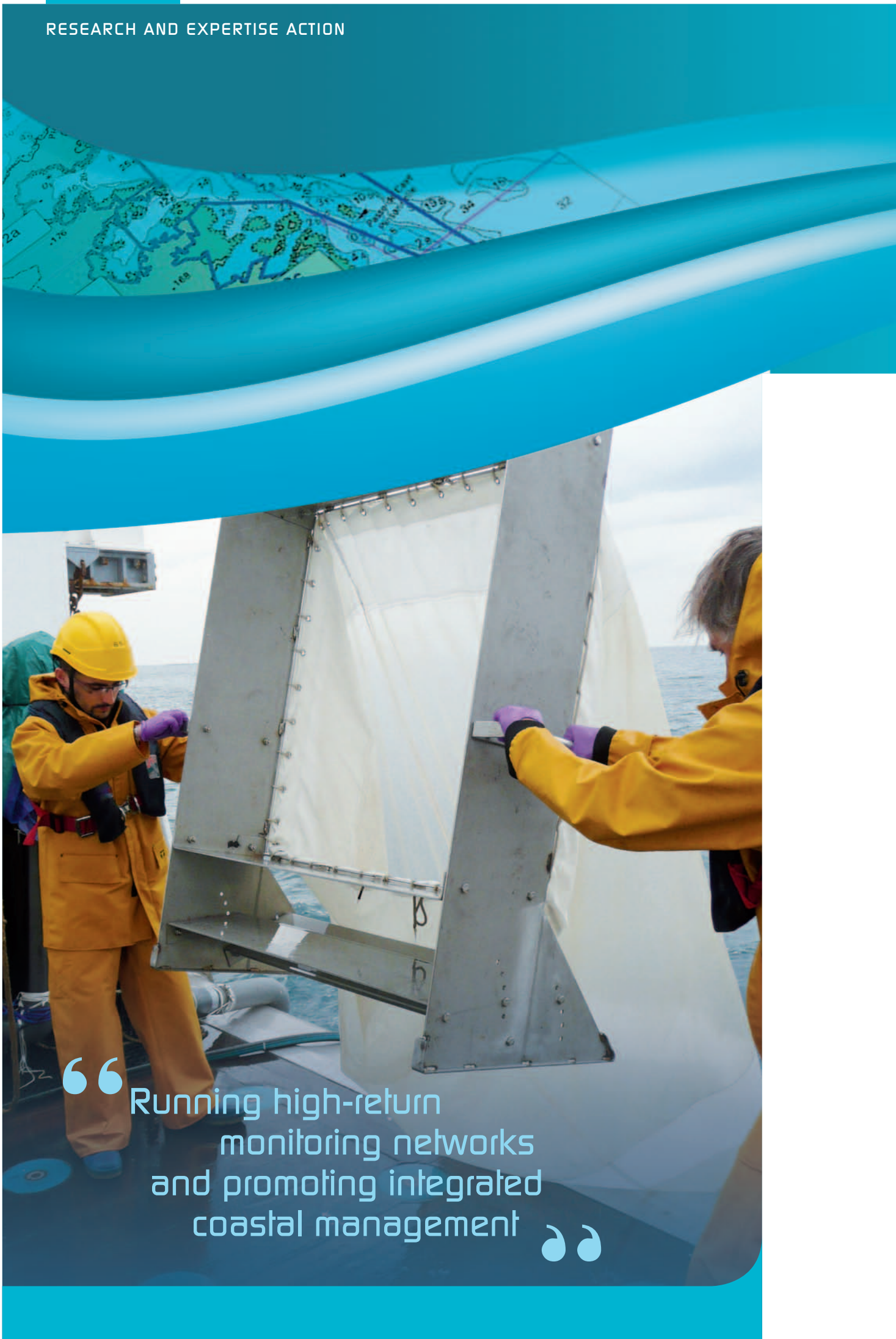
This research is based on Blast, the world standard for browser and reference databases. The program can display sequences, 3D structures, alignments, regions kept and phylogenetic trees, sorting of data (filters, taxonomy classification, Gene Ontology) and export them in various formats.



Developing commercial value of RPA molecule

Ifremer is pursuing research to characterise new activities related to genomic maintenance using *Pyrococcus abyssi* (an archaebacterium found in extreme environments) as model. The approach includes steps to develop potential uses of molecular biology tools, particularly that of the Replication Protein A (RPA) molecule. This protein binds single-stranded DNA with a very high affinity and has the ability to protect DNA in solution. Being extremely stable, it can be easily stored, including at ambient temperature, and even shows high resistance to heat (up to 80°C). These properties are found both in the complete RPA molecule and on the large subunit of this complex. A patent was filed under the co-supervision of Ifremer, CNRS and UBO. The project to mature this was presented by Bretagne Valorisation and was selected to receive funding from the Brittany regional council. Its objective is to establish the proof of concept for use of RPA as a molecular biology tool. At the outcome of the project, Ifremer hopes to canvass industrial firms in the sector.

Various orientations of RPA molecular envelope determined using small-angle X-ray scattering (SAXS) at the synchrotron facility in Hamburg



“Running high-return monitoring networks and promoting integrated coastal management”

Understanding coastal ecosystems in order to protect them

A priority in a rapidly changing regulatory context: drawing up the MSFD indicators

Overexploitation of living resources, contaminant discharges, eutrophication, alteration of seafloors, and others all deeply affect coastal ecosystems. Both understanding the role and functions of biodiversity and assessing the impacts (natural and anthropogenic) are closely linked to seeking appropriate solutions to protect them.

Ifremer's work falls under a rapidly changing regulatory framework which is defined at various institutional levels (national, European or even global). Its studies are part of the implementation of an integrated strategy for coastal ecosystem management which has received strong support from the European Parliament.

One priority for the 2009-2013 period is to draw up indicators for the European Marine Strategy Framework Directive (MSFD). On the national scale, commitments undertaken by the Grenelle de la Mer marine environmental summit meetings, with the prospect of an integrated marine policy, are also in phase with the four-year contract objectives.

Typical view of the seafloor in the Iroise marine nature park

DIAGNOSIS AND PROTECTION OF COASTAL SEAS

In compliance with the high-priority orientations defined in its strategic plan, Ifremer is contributing to the development of a general monitoring strategy (physics-chemistry, microbiology and phytoplankton) in coastal zones of metropolitan and overseas France. The studies conducted have consequences for enriching marine databases and for knowledge about biodiversity and benthic habitats, as well as for our understanding of sediment movements in estuaries.

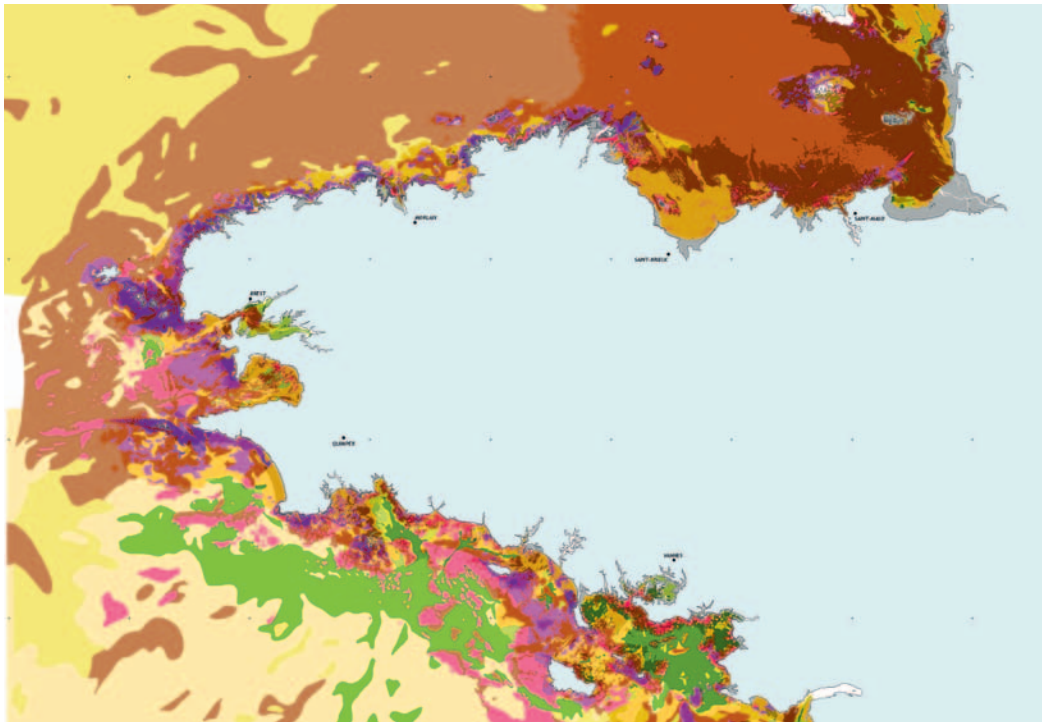
SYMPOSIUM ON THE VULNERABILITY OF COASTAL ECOSYSTEMS

A delegation from Ifremer took part in the Biarritz symposium in October 2011 on the "vulnerability of coastal ecosystems to global change and extreme events" jointly organised by Ifremer, CNRS and IRD amongst others.The multidisciplinary symposium was broken down into four sessions to try and better understand the nature of the main physical, chemical and biological processes which act in modifying the structure and functioning of coastal ecosystems. The themes addressed join observation and modelling (functioning of the ecosystem and the main processes which regulate it), forecasting (evaluating the system's response), management scenarios and operational aspects, as well as integrating knowledge into public policies (integrated management of the coastal zone and the ocean).

Combined with the symposium was the inter-professional forum called OceaNovation on "managing the marine and coastal environment for coastal regions: requirements and tools for public policies" organised in partnership with the competitiveness clusters. The idea was to cross check knowledge and know-how and promote exchanges between Research and Development.
Two main points were raised in conclusion:
- the need to predict how coastal ecosystems will evolve and their capacity of resilience in order to move from the precautionary principle to a preventive principle, in order to better adapt to changes;
- the urgent need for scientific information which is shared at all levels of society.

The symposium also gave Ifremer an occasion to meet with our Japanese and Canadian partners and to move forward in formalising international collaboration.

Physical habitat map of seabeds in Brittany using European Eunis typology (each colour corresponds to a different type of habitat), January 2011



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Plaice at Saint-Palais-sur-Mer (Charente maritime)

> “A methodology based on a systemic approach”

DEVELOPING INTEGRATED COASTAL ECOSYSTEM MANAGEMENT

The European Spicosa project on “Integration of science and research to assess coastal zone systems”, launched in 2007, reached its conclusion in January 2011. The programme was led by Ifremer and brought together fifty-four partners from twenty-one countries. It contributed to solving coastal zone management problems while taking account of the various ecological, economic and social aspects.

The main stakes for the programme were to implement new methodology based on a systemic approach integrating scientific knowledge (natural and social sciences), and linking science with public policy making.

The methodology was applied in real-time on eighteen study sites including two in France (Thau lagoon and Pertuis Charentais). Building numerical simulation models enabled possible trends in coastal zones to be investigated and the consequences of alternative management options to be assessed

MPA management tool, exemplary collaboration

The Pampa project’s originality was to bring together scientists and managers to validate Marine Protected Area performance indicators for the management of coastal ecosystems, resources and their uses.

Financed by the Ministry of Ecology, sustainable development, transport and housing (MEDDTL) Liteau III programme, the Pampa project receives strong support from the French initiative for coral reefs (Ifrecor) and the Agency for Marine Protected Areas (AMMP). The project was completed in May 2011.

The final Pampa seminar was held in Paris in March 2011, with a hundred participants, MPA managers, consultants, representatives from ministries and local authorities from metropolitan and overseas France, scientists, etc. in attendance. Tribute was paid to the significant amount of work accomplished and benefits reaped from this exemplary collaboration between managers and scientists, particularly in terms of fine-tuning the indicators. The seminar ended with a working day organised by the Agency for MPAs, Ifrecor and Ifremer to discuss pursuing Pampa’s activities and transfer of tools to French MPAs beyond those which were partners in the project. This continuity is already part of Ifrecor’s 2011-2015 national action plan, listed as a priority activity in the theme on MPAs cross-cutting interest. Information and deliverables are available on the project website: http://wwz.ifremer.fr/pampa

BIODIVERSITY DIAGNOSIS IN POITOU-CHARENTES

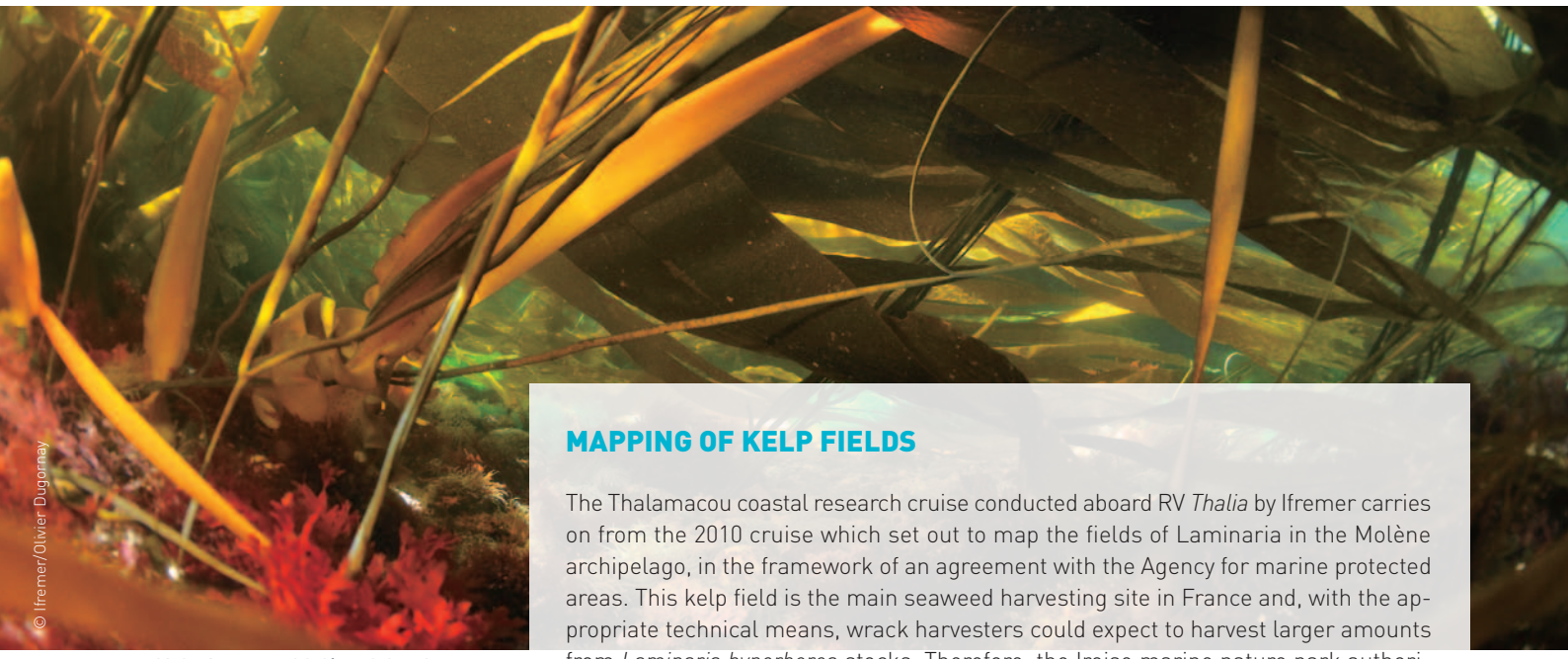
The project, entitled "ecosystem services of agrosystems in the Sèvre niortaise area: from catchment to coast", was selected in May 2011, in the frame of a call for tender by the PRES Limousin Poitou-Charentes research cluster. The project contributes to assessing and protecting ecosystem services in the Poitou-Charentes region, giving biodiversity its rightful place.

Its objective is to draw up a diagnosis using an integrated approach for human impacts on biodiversity from the catchment to the coast, with two main lines of research devoted to the cereal-farming plain and the estuaries. The partners involved in the project (universities of La Rochelle and Poitiers, CNRS) will work in these areas at the complementary levels of ecosystem and food webs. The study will provide element to assist in decision-making for sustainable management of natural resources on the scale of the territory.

Genetic analyses performed in both a bivalve (the carpet shell clam *Macoma baltica*) and the common sole (*Solea solea*), will make it possible to test the hypothesis of differential mortality related to anthropogenic disturbances; confirm the existence of population selection and identify the underlying mechanisms related to chemical contaminant effects highlighted during the SoleBEMol cruises (2007-2010).

BETTER MANAGING COASTAL RISKS

A project called Coselmar, French acronym for "comprehension of coastal and marine socio-ecosystems for better risk management", was submitted to the Pays de la Loire regional council in the framework of a call for structuring projects. Eighteen research teams from the Loire region will be working on the theme of "Sea and shore", responding to six of the ten research orientations set out by Ifremer in the frame its strategic plan for 2020. The project is itself structured along four lines of research: biodiversity and marine coastal environment (studying phycotoxins); exploiting and leveraging marine biological resources; geomaterials and marine systems; changes, conflicts and governance of maritime areas.



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Kelp forest at Molène Island

MAPPING OF KELP FIELDS

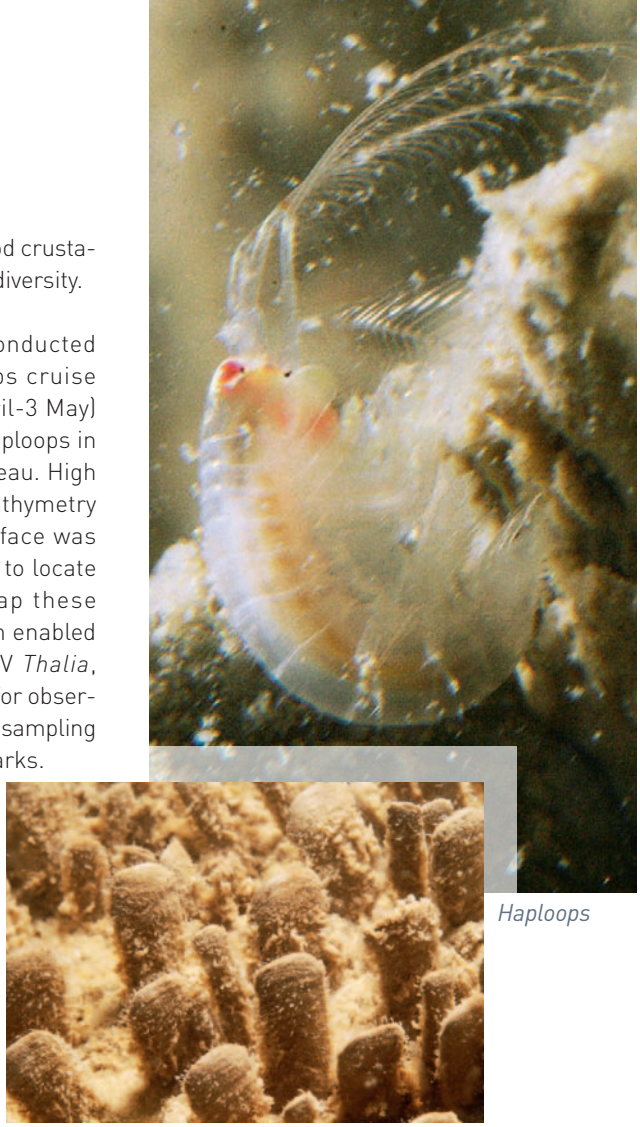
The Thalamacou coastal research cruise conducted aboard RV *Thalia* by Ifremer carries on from the 2010 cruise which set out to map the fields of Laminaria in the Molène archipelago, in the framework of an agreement with the Agency for marine protected areas. This kelp field is the main seaweed harvesting site in France and, with the appropriate technical means, wrack harvesters could expect to harvest larger amounts from *Laminaria hyperborea* stocks. Therefore, the Iroise marine nature park authorities wish to know about the stock's health status and construct a management plan based mapping and study of the zone's morphology and geology over a hundred square kilometres. During the 2011 cruise, acoustic detection and video filming provided comprehensive coverage of the area studied and confirmed the results obtained in 2010.

UNDERSTANDING THE HAPLOOPS

On the scale of the coasts of Brittany, the populations of haploops are spreading. Not much is known about these small crustaceans which are similar to scuds. They live in tubes they have built and cover the seabeds over thousands of hectares. Their habitat is characterised and physically structured by pockmarks, which are underwater craters (from 2 to 20 m in diameter) produced by methane emissions.

In 2009, Ifremer launched its first studies on these populations in the Ploop project, aiming to know more about the biodiversity of the fauna associated with this unique habitat unique and to better determine its role in the benthic ecosystem in Brittany. Initial results have shown that the arrival of Haploops in an environment leads to a modification in its ecosystem, with the presence of rare species (marine worms and amphipod crustaceans) and greater diversity.

In 2011, Ifremer conducted a new Pock&Ploops cruise (RV *Haliotis*, 13 April-3 May) on mudflats with haploops in the Bay of Concarneau. High resolution swath bathymetry of the seafloor surface was performed in order to locate and accurately map these habitats, which then enabled a third mission (RV *Thalia*, 10-16 August 2011) for observation and sediment sampling from twenty pockmarks.



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Haploops

STUDYING INVASIVE JELLYFISH IN THE NORTH SEA

Selected in the framework of the European Interreg IV A 2 Seas cross-border cooperation programme and co-funded by ERDF, the international research programme called Memo, for "*Mnemiopsis leidyi*: Ecology Modelling and Observation", is devoted to studying invasive *M. leidyi* jellyfish in the North Sea. The presence of these invasive jellyfish coming from American coasts may indeed have disastrous effects on commercial fish stocks and other aquaculture resources.

Research work planned over a three year period will mobilise some twenty scientists for three activities. It aims to improve knowledge about *M.leidyi's* identification, biology and physiology (feeding behaviour, natural enemies, modelling of potential habitats, population dynamics and so on); monitor its presence, behaviour and impact in the North Sea through an ecosystem-based approach and develop forecasting models to assess the ecological and economic impact in the English Channel and the North Sea.

One of the project's purposes is to determine the appropriate measures to counter this threat. For Ifremer, this will also mean informing economic and professional players in the fields of maritime activities and tourism, as well as the general public, about the potential risks posed by *M. leidyi* for the marine ecosystem and activities in the two seas region. See website: http://wwz.ifremer.fr/defimanche/Projets/En-cours/MEMO

DEFINING A BIODIVERSITY DATABASE SCHEME

In order to fulfil the requirements of European and French initiatives in the field of biodiversity, particularly in applying the Marine Strategy Framework Directive (MSFD) and examine how to renovate the software of the Biocean deep environment database, Ifremer brought together a working group on "Biological data management". It will:

- pursue the concerted study on Ifremer's needs in terms of managing deep sea biological observations, as well as their related environmental and molecular biological data;
- propose a management plan for these data which takes account of the existing systems at Ifremer, especially Quadrige² for the coastal environment and Harmonie for fisheries science;
- define the functional specifications and techniques by which existing software programs can evolve.

The working group is made up of computer scientists, data managers and scientists representing the disciplines involved. It aims to define a biodiversity database scheme which shall become the computerised taxonomy reference shared by all the information systems which need it.

FATE AND EFFECTS OF CHEMICAL CONTAMINANTS, THE SOLEBEMOL ASSESSMENT

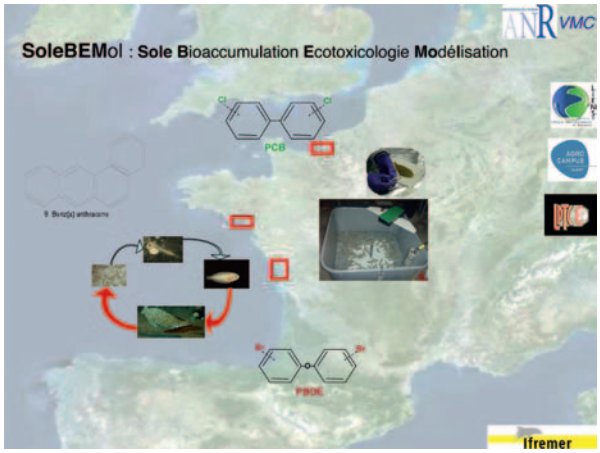
Understanding the fate and effects of different types of contaminants in marine organisms consumed by humans is a major challenge in terms of scientific knowledge, public health and aid for ecosystem management.

The main objective of the SoleBEMol study (2007-2010) was to assess the fate and effects of three families of persistent organic pollutants (PAH, PCB and PBDE) in the common sole, in order to predict fish's potential response to chemical contamination. The results obtained demonstrated the relevance of the scientific strategy adopted. It was based on a multidisciplinary (chemistry, physiology, fisheries ecology, etc.) approach and on the complementarity of an *in situ* approach, an experimental phase and modelling. The outcomes call for supplementary studies to be conducted to better understand and further explore the phenomena which have been shown up and quantified.

The SoleBEMol project will also lead to lasting structuring effects thanks to the experimental platform set up. The latter is an operational technical tool which is well adapted to studies on hydrophobic organic contaminants.

The bioenergetics growth model, combined with the PCB bioaccumulation model, could be transposed to other families of contaminants (especially PBDEs). It effectively provides a sound foundation for testing various scenarios on metabolic costs which can be generated by contaminant effects.

Finally, the project showed that it was relevant to look at the effects of contaminants on broodstock (reproductive function) and early stages (embryonic and larval development) with the prospect of modelling the entire life cycle and the potential effects of contaminants in different stages. A new project was submitted in the framework of the ANR's 2012 "Contaminants and environments" (CESA) programme, so as to pursue research which carries on from the SoleBEMol study.



SETTING UP THE ELECTRONIC ATLAS ON REUNION ISLAND WATER QUALITY

The "Atlas-SI" project conducted in collaboration with the Reunion Island environmental and planning directorate (DEAL) aims to produce an on-line electronic atlas of water bodies there (based on WFD networks and indicators), combined with the Reunion Island Polmar plan sensitivity atlas. The objective is to develop interfaces in Quadrige² to key in data obtained in the framework of regulatory monitoring of discharges by industrial firms and by managers of waste water treatment stations (STEP) in Reunion Island. Ultimately, this regulatory monitoring will provide an operational control network for the Water Framework Directive in Reunion Island.

CREATION OF THE «COTE» LABEX

The "COTE" Laboratory of Excellence, sponsored by the PRES cluster of the University of Bordeaux and coordinated by INRA was selected during the first Investments for the future series of call for projects in February 2011. It is part of partnership-based dynamics for research, education and methodology transfer over the long term (ten years). Two hundred research scientists in ten laboratories are involved in the Labex, studying how ecosystems respond to environmental changes. Its activities meet three orientations of Ifremer's strategic plan, based on a marine environmental monitoring mission, expertise supplied to support public policies and research on the fate and effects of contaminants in the marine environment.

This partnership of excellence gives Ifremer access to the appropriate experimental systems (aquatic mesocosms) for ecotoxicology studies and to a high performance analytical platform.

The medium- to long-term spin-off effects include recognition for our Institute in the research network of marine ecotoxicologists and biogeochemists, as well as the «COTE» approved designation for projects to be built on to it.

FATE OF NUTRIENTS IN THE SEINE ESTUARY

Coastal and estuarine areas are extremely sensitive zones of transition in terms of uses. They are the focus of both significant economic activity and vital ecosystem services. The Flumes project (2008-2011) on "fluxes of matter in the Seine estuary" is receiving new funding in the framework of the National coastal environment programme (PNEC/EC2CO). Studies are carrying on from the research conducted on the theme in the frame of the Seine-Aval scientific programme. The objectives of Flumes 2 are to study the fate of nutrients in the estuary and the coastal sea. In the framework of the MEEDTL's programme on management and impacts of climate change (GICC) Ifremer is also coordinating a project on the "consequences of climate change on the ecogeomorphology of estuaries".

UNDERSTANDING THE ROLE PLAYED BY ECOSYSTEMS IN FLUXES OF CO_2

Major international and national research programmes focusing on the role of greenhouse gases for the planet, particularly that of carbon dioxide (CO_2), recommend that coastal ecosystems and their response to increased atmospheric CO_2 be studied. Although most global climate models leave it out, studying how the continental shelf's coastal ecosystems participate in global CO_2 fluxes has taken on scientific stakes.

The Comor-1 cruise (RV *L'Europe*, 24-30 April 2011) directed by Ifremer, was devoted to collecting data on CO_2 parameters, from the inner estuary of the Rhone to the Gulf of Lion. The first mission took account of seasonal variability in air-sea fluxes of CO_2, while determining the biogeochemical processes which control these fluxes, in order to compare the results with other estuary plumes, with the objective of progressively ensuring their integration in the international summary of CO_2 fluxes between air and sea.

Mapping the bay of Seine seafloor

The Recosom cruise (RV *Thalia*, 4 October-5 November 2011) was set up in collaboration between Ifremer and the Universities of Rouen and Lille to study the type of seabeds in the Bay of Somme and the architecture of successive sedimentary deposits. The mission mapped the seafloors in the bay in order to supplement the surveys made north of the zone in 1984 and off Dieppe, in the framework of the four-yearly monitoring of Penly nuclear power plant. Another goal was to understand the process infilling the estuaries in the Picardy region and the conditions of sediment transfer from the coast. Recosom covered a zone of 200 km² (at depths of 15-25 m).

ORIGINS OF GREEN TIDES IN BRITTANY

Ifremer was coordinator for the joint responses by the European research centre for algae (CEVA), INRA and our own teams, subsequent to two successive referrals for advice on the origins of green tides by the prefecture of the Brittany region:
- three research bodies (Ifremer, CEVA, INRA) refuting the unfounded claims by farming unions (FDSEA and Young farmers) and the Institute of the Environment on the absence of correlation between agriculture and the origin of green tides in Brittany;
- the response to questions raised by the European Commission asking the Secretariat general for regional affairs (SGAR) about the justification for nitrate thresholds to be complied with in rivers and streams to reduce green tides.

Ifremer also took part in two meetings held by the Scientific committee on the green algae plan to draw up an opinion on the third project for a catchment with very low nitrogen loss (Fouesnant-Concarneau).

Green tides on the beach at Saint-Michel-en-Grève

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Pearlnets (spat grow-out structures) hanging under a pearl farm rack

BETTER WAYS TO MONITOR AND COMBAT PHYCOTOXIC ELEMENTS

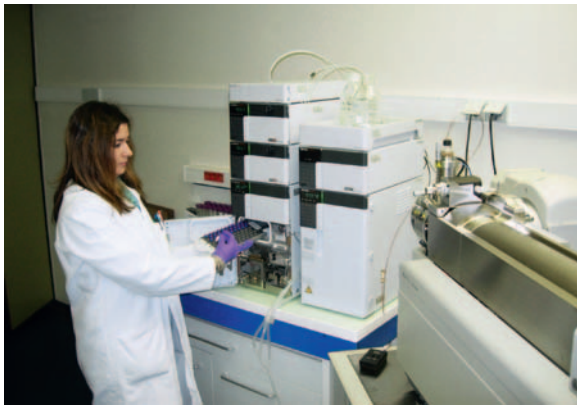
Ifremer is greatly involved in monitoring the health quality of marine waters and living resources. Our Institute is pursuing its research in order to improve knowledge about the factors behind biological balances or imbalances. Studies mainly concern noroviruses (conditions of transfer, diversity of strains and risks), monitoring foodborne infectious disease outbreaks, toxic algae blooms (diversity and risk), toxins in the marine environment, especially those accumulated in shellfish (identification, measurement, detoxification), and finally, identifying toxins and species by using sensors located *in situ* or in the laboratory.

DECENTRALISATION OF CHEMICAL ANALYSES OF LIPOPHILIC TOXINS

During the Shellfish farming conference in 2010, the Ministry of Agriculture, food, fisheries, rural affairs and spatial planning, promised professional shellfish farmers to shorten the waiting time to get the results of chemical analyses for lipophilic toxins (from *Dinophysis acuminata* algae) in shellfish to seventy-two hours. This time limit for dissemination of results could only be obtained by reducing the time required to send the samples, whence the decentralisation of part of the analyses.

> “Optimize the monitoring of coastal zones”

With financial assistance from the Ministry in early 2011, Ifremer set up two new laboratories to analyse lipophilic toxins using liquid chromatography combined with mass spectrometry (LCMS-MS) in Concarneau and Sète. An inter-comparison exercise was launched with the Ifremer labs involved in the 2011 monitoring system for lipophilic toxins. In May 2011, the DGAL issued its approval for the laboratories in Sète and Concarneau.



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Liquid chromatography (CL) analysis system combined with mass spectrometry in tandem

In 2011, toxic algae appeared in March, a month earlier than in previous years. A return to normal was observed in summer, with a slight rise in contaminations in September.

MONITORING AMNESIC TOXINS (ASP)

The large blooms of *Pseudo-nitschia australis* which were observed following the cyclone Xynthia contaminated molluscs in areas extending from the Pertuis Charentais to Southern Brittany. Shortly following the disappearance of this diatom, all the bivalve molluscs were rapidly decontaminated, except for scallops whose domoic acid concentrations remain higher than the standards set for contamination.

In the Bay of Seine, contamination of king scallops in early October 2011 delayed the opening of fisheries in one sector.

> “Ifremer is a key stakeholder for transcribing the European commitment to maintain and restore good environmental status of water bodies.”

Interview

Emmanuelle Roque d’Orbcastel

Emmanuelle Roque d’Orbcastel is the head of the Environment aquaculture resources laboratory in Languedoc Roussillon (LERLR).

What main achievements have recently given you the most satisfaction?

Taking part in developing sustainable aquaculture is the driving force in my research studies. The European Aquaetreat (2004-2007) project led to proposing concrete solutions for the fish farm sector to treat their effluents. Along with my colleagues at Palavas, the Federation of European Aquaculture Producers and partner countries (Italy, United Kingdom and Denmark), we contributed to developing treatment systems and farming systems which use less water and energy and can reduce environmental impacts.

Today, as a laboratory director, my satisfaction is also derived from that of the team, from the success of our projects in understanding environmental fluctuations and their impacts on coastal zone uses.

What types of networks do you deploy for you monitoring activities?

Monitoring at Ifremer has the twofold objective of environmental observation and health monitoring of aquaculture resources, fulfilling our missions in terms of research, support for the maritime economy and expertise for the State on a number of levels. To this end, the following Aquaculture resource environment laboratories (LER) deploy and optimise networks to monitor the environment and resources: Rocch (monitoring network for chemical contamination), REMI (network for microbiological checks in shellfish farming zones), Rephy (phytoplankton and phycotoxin monitoring network), Resco (shellfish farming network), Repamo (shellfish pathologies monitoring network), Rebent (benthic network), Velyger (larval ecology) and for LERLR, the regional RSL (lagoon monitoring) network. These networks meet the requirements established by the Water Framework Directive and the EU Hygiene Package. This monitoring also contributes to creating special links with people in the field which can lead to questions and research projects developed along similar lines.

Why is monitoring an important activity for Ifremer and for regions where the Institute is established?

In Sète, the LERLR ensures the monitoring of water and aquaculture resources in four coastal counties. The Languedoc Roussillon region’s coast, particularly with its 40,000hectares of lagoons, represents a treasure to be preserved in terms of its ecology and heritage. These aquatic ecosystems are reservoirs of biodiversity and the pillar of developing traditional economic activities such as fisheries and shellfish farming, which account for nearly 50 million euros in turnover and over 3,000 direct jobs. Ifremer is a key stakeholder in France for transcribing the European commitment to maintain and restore good environmental status of water bodies.

The LER-LR is involved in activities to monitor and forecast environmental quality and to perfect decision-making tools for sustainable management of activities. It is in charge of taking samples, performing analyses and transmitting and commercialising the data acquired. The operating modes and procedures applied to the LER laboratories guarantee the quality of the results and ensure the lack of any bias in the interpretations supplied to the State services. This regional presence of Ifremer, close to the profession, keeps it at the heart of the social and economic fabric, whilst creating significant scientific value for the Institute.

Why did you choose Ifremer? As a young manager, what do you feel you bring to the institute?

For me, Ifremer represented the perfect balance between research and a maritime profession. Today I am proud to help spread the values of this institute, the only one of its kind in France. As the head of an Ifremer team, I represent the team within the Institute as well as outside of it, in contacts with State services, scientific partners and professionals (CRCM and CRPMEM regional advisory councils). I ensure the scientific running of the group and that the quality of our outputs (analyses, data, publications, reports and advice) is maintained. I bring my utmost energy to my team and to Ifremer to ensure the good working of the department, well-being of the team and achieving our scientific goals.

UNDERSTANDING TOXIC ALGAL BLOOM EVENTS

For several years, Ifremer has considered that understanding the dynamics of the major toxic algae present in the marine environment is vitally at stake.

• In 2011, our Institute, working with the marine research institute of Vigo (Spain) in the frame of the European Asimuth project, conducted a ten-day laboratory experiment on mixotrophic nutrition (ability to use several sources of carbon) in the microscopic algae *Dinophysis*.

• Ifremer also set up the Dinophag project on the presence of *Dinophysis* in coastal waters of the Pays de la Loire region. This project was selected in the call for tenders entitled "Expertise to benefit the territory" launched by the regional council. It includes a research strand aiming to define new leads for monitoring this toxic alga, as well as a strand on communications and economic studies on its impacts.

• One of the ANR-funded Paralex project's objectives (2010-2014) is to identify the natural parasites of the microalgae *Alexandrium minutum* responsible for "red tides", in order to better understand its role in the recovery and stability of marine coastal ecosystems. The project's first annual assessment presented the experimental strand which will enable the behaviour of healthy or parasite-ridden dinoflagellate cells and parasites to be visualised over a salinity-stratified water column.

© Ifremer/Clément Dromer

Caribbean spiny lobster Panulirus argus

Martinique, action plan to combat chlordecone pollution

Preparations were made for the second coordinated national action plan (PNAC-2, 2011-2013) based on an assessment of the previous plan. To this end, Ifremer took part in numerous meetings with authorities and experts, particularly in the framework of the Allenvi national alliance for environmental research. Our Institute also participated in meetings of the plant protection working groups for Guadeloupe (GREPP) and Martinique (Grephy) to present its study results and the research perspectives.

At the request of the Directorate for agriculture, food and forest (DAAF), in 2011 Ifremer launched a study on the distribution of chlordecone contamination in the Caribbean spiny lobster *Panulirus argus* and the spotted spiny lobster *Panulirus guttatus* in the central-southern coastal zone of Martinique. The programme plans to measure the chlordecone concentrations linked to several parameters such as geographical location, age, sex and organs (cephalothorax and tail). The sampling surveys began in May and ended in August 2011. The target of two-hundred and seven samples was almost entirely reached.

In May 2011, the report of the Chloretro study devoted to the fate of chlordecone in food webs of marine species consumed in the West Indies was published. This study brought new knowledge about the modalities of chlordecone transfer in the marine environment, particularly about the molecule's capacity for transfer in food webs, on bioaccumulation by organisms and on the influence of species lifestyle and diet on their level of contamination. The report highlights the ecological role of species in the level of contamination.

STUDYING THE PRESENCE OF BIOTOXINS IN SHELLFISH

Pinnatoxins are a group of lipophilic marine biotoxins which rapidly cause death in mouse bioassays. Toxins from this group were also found for the first time in Europe (in Norway).

Ifremer undertook an examination of the presence of this group of toxins in French shellfish in the framework of the Colnacoq project (2010-2012) entitled "natural lipophilic compounds in shellfish, identification and bioactivity".

By identifying and culturing the dinoflagellate *Vulcanodinium rugosum*, the pinnatoxin-G was identified as a major algal metabolite.

A retrospective analysis of pinnatoxins run concurrently on mussel and oyster samples taken on French coasts in 2010 showed an unusual peak in mussels at Ingril (Palavas lagoons) in mid-August 2010 (estimations, since no certified standard is available). Upon DGAL's request, Ifremer prepared a study proposal to explore the extent of the problem. The project enjoys the participation of the Anses national reference laboratory for marine biotoxins, as well as international actors from New Zealand (Cawthron), Norway (National veterinary institute) and Canada (institute for marine biosciences Halifax).

AUTOMATING IN SITU IDENTIFICATION OF TOXINS

After the SPR (Surface Plasmon Resonance) biosensor and the *in situ* method to detect domoic acid were validated in 2010, Ifremer studies focused on analysing and exploiting data in order to automate the identification and quantification of various species of microalgae.

In the framework of this project, a tool interfacing a CTD probe with a Pocket PC equipped with a built-in GPS was developed and tested during the ANR-Paralex 2011 cruise in the Rance. The device can optimise sampling quality based on observation of the data supplied by sensors: thermal stratification, detection of phytoplankton abundance layers, etc.

IFREMER / 2011 RESEARCH CRUISES

• The 2011 Costeau 5-1 (RV *L'Europe*, 22 January-10 February) and Costeau 5-2 (RV *L'Europe*, 14-23 April) cruises are part of the ANR Costas project's sampling strategy. This research programme aims to determine the transfer processes and fate of organic and metallic (PCB, toxic trace metals and polonium 210) contaminants from the first links in the food chain up to small pelagic fish (anchovies and sardines) in the Gulf of Lion.

• The Edo-1 cruise (RV *Thalia*, 28 January-7 February 2011) was performed in order to map the distribution of brittle stars (echinoderms akin to sea stars) at the tip of Brittany. The cruise was designed to check the hypothesis of a correlation between the increase in organic matter inputs and the massive development of these brittle star populations.

• The objective of the Mytiturk cruise (RV *L'Europe*, 17 March-13 April 2011) was to take stock of chemical contamination around the coasts of Turkey and Cyprus, based on a standardised protocol. The mission complements the Mediterranean assessment carried out in the frame of several Interreg Med projects. It meets the requirements of the Water Framework (WFD) and Marine Strategy Framework (MSFD) Directives.

• The Crepised cruise (RV *Thalia*, 27 March-4 April 2011) studied the impact of crepidula slipper limpets in the Bay of Mont Saint-Michel using core samples of sediments colonised by them.

• The Melba cruise (RV *L'Europe*, 1-19 May 2011) involved both Ifremer and Italian partners looking for new approaches for environmental quality monitoring (effects and fate of chemical pollutants). The objective was to use hydrodynamic models to simulate pollutant transport and predict the consequences of an accidental spill, particularly off Tuscany, Corsica or Sardinia. Over two-hundred samples were taken on hard-to-access sites in order to draw up an overall assessment of contamination linked to immersion of residual red sludge.

Black brittle star Ophiocomina nigra

“Identifying the sources which will supply tomorrow’s energy”

Exploring deep sea resources

Contribute to developing production systems in order to ensure the sustainable use of resources

The Ifremer-Edrome Carnot Institute for Sustainable exploration and exploitation of oceanic mineral and energy resources received approval in April 2011 for a new period, from 2011-2015. The objectives set for the five coming years mainly concern increasing the share of means and resources from contractual research with industrial firms and especially SMEs.

Our Institute's scientific activities cover studying the basins, margins and ocean ridges holding resources; characterising the associated deepwater ecosystems; contributing to the development of production systems (particularly in the field of marine renewable energies) linked to studying impacts on the marine environment and monitoring of ecosystems so as to guarantee sustainable exploitation of these resources.

Ifremer has established strong relations with teams from Universities (UBO, Paris VI, Nice, Perpignan, etc.), national and international research institutes (BRGM, IFP, CNRS, IFM Geomar, NOCS, IPG, INSU and INEE) and private-sector companies (Total, Technip, Eramet, Areva, Petrobras, Sercel and NKE) in the frame of contract-based research.

In 2011, various operations were conducted with partners from the oil industry. They include the SanBa cruise with Petrobras, continuation of the GOLO programme with Exxonmobil and Total and cruises to study cold seeps in the Gulf of Guinea (WACS).

In the field of marine renewable energy sources, our Institute contributes to Labex Mer, participates in the Ademe demonstrator projects and is steering the France Energies Marines IEED institute of excellence in low-carbon energy proposal currently being evaluated.

© Ifremer/Clémentine Jung

Core sample (Wacs 2011 cruise)

IDENTIFYING THE SOURCES WHICH WILL SUPPLY TOMORROW'S ENERGY

LOOKING FOR DEEPWATER DEPOSITS

The SanBa (Santos Basin) project is part of a vast programme for scientific cooperation between Ifremer, the Universities of Lisbon and Brasilia, the European Institute for marine studies (IUEM) and the Brazilian oil company Petrobras. The mission's objective was to produce a complete cross-section of the Santos basin for the imaging of its deep structure. The basin is located on the southern Brazil margin off Rio de Janeiro, where major discoveries for deepwater oil resources have been made since 2006.

During the SanBa cruise (RV *L'Atalante*, 27 December 2010-25 January 2011), one-hundred-ninety ocean bottom seismometers (OBS) were deployed. The first results from the mission were presented in January 2011, confirming Ifremer's scientific hypotheses and validating the interest of using wide-angle seismic surveys combined with kinematic studies.

GOLO EAST-CORSICAN MARGIN RESEARCH PROGRAMME

This research programme aims to better understand the formation of the Golo sedimentary system. In the same zone located between Corsica, Elba and Pianosa islands, is a concentration of all the types of sedimentary deposits found on a continental margin, especially the sandy edifices which provide excellent analogues for older deposits of energy resources. The programme began in 2009 through research partnerships between Ifremer, ExxonMobil, Total and Fugro and continued with two research contracts signed in 2011 with partner oil companies:

- One contract involves the third phase of the Golo programme, signed with ExxonMobil and Total. It will carry out sedimentology analyses of core samples from Golodrill cruise (2009) drilling performed off Bastia in the Golo river delta.
- The second contract deals with Total's financing the processing of seismic and bathymetric data acquired during the Sigolo cruise (2008), on part of the Golo submarine sedimentary edifice.

Elucidating deep sealoors

The Reprezai mission, for retrogression/propagation in the Zaire fan, is co-directed by Ifremer and CNRS. It involves pursuing studies carried out on the internal architecture of the turbidite edifice of the Zaire River and its channels. The research aims to determine the origin of the successive cycles of sedimentary deposits shown up in previous studies (ZaiAngo project, 1998-2003), by analysing their migration.

Some forty core samples were taken during the Reprezai-1 cruise (RV *Pourquoi pas?* 27 December 2010 to 25 January 2011). All of this research should test the hypothesis of the climate factor's influence on the distribution over time and space of Zaire deep-sea fan depocenters.

The Reprezai-2 cruise (RV *Le Suroît*, 13-29 April 2011) led to acquisition of geophysical data (multibeam swath mapping and high resolution seismics) and new core sampling. The Universities of Bordeaux, Paris, Montpellier and Oxford also participated in these studies.

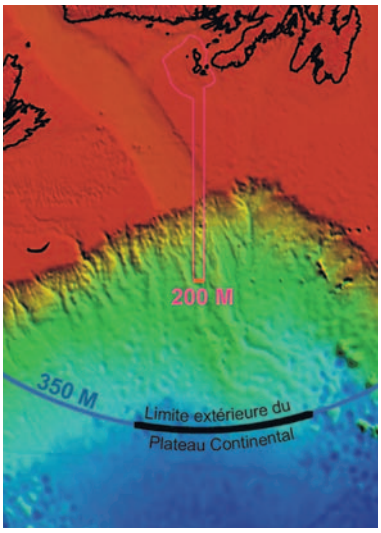
33-metre long core sample taken at depth of 4,963 m during Reprezai-1 cruise

© Ifremer/Patrice Woerther

PURSUING THE NATIONAL CONTINENTAL SHELF EXTENSION

The SPMPLAC cruise (RV *Le Suroît*, 4-22 July 2011) falls under the framework of the national continental shelf extension programme called Extraplac funded by the MEDDTL. Its objective was to acquire all the seismic, swath bathymetry and geophysical data required to draw up a claim to extend the French continental shelf off the islands of Saint-Pierre-et-Miquelon. A letter of intent was submitted to the Secretary General of the United Nations in May 2009. The studies conducted took place in international waters, outside of waters under Canadian or Portuguese jurisdiction and within the Saint-Pierre-et-Miquelon Exclusive Economic Zone.

In the difficult economic context, notably due to the disappearance of cod stocks, the local population is extremely aware of the economic stakes of the continental shelf and its potential resources. 'Ifremer co-moderated a conference for the general public, presenting the Extraplac national programme and how the rules of the United Nations Convention on the Law of the Sea apply to the specific situation of Saint-Pierre-et-Miquelon. For the moment, the potential energy and mineral resources of the extended shelf remain hypothetical and must still be proved.



Limits of 200 and 350 m from baselines at Saint-Pierre-et-Miquelon (SPM) and position of continental shelf outer limit off SPM (Mercator, ETOPO-1 bathymetry)

© Ifremer/Herlé Goraguer

RV Le Suroît *at Saint-Pierre-et-Miquelon*

EXPLORING DEEP SEAFLOORS TO FIND MINERAL RESOURCES

The scientific report of the Futuna 2010 cruise was given to the project partners. A new cruise was conducted in November and December 2011, in a public-private funding framework. This cruise completed the regional exploration and carried out detailed studies on the most important sites discovered in 2010. In order to measure the thickness of mineralisation, 3D high resolution seismic operations were successfully performed on the largest mineralised site (1 x 1.7 km). This is the first time worldwide that this type of approach has been used on a mineralised volcanic structure. Short core samples were taken in the structure in order to start the 3D mineralisation study. After two months of exploration, there are now eleven known hydrothermal fields in the Exclusive Economic Zone of Wallis and Futuna. Four of them are active hydrothermal fields and three are only known by the chemical and particulate plumes present in the water column. A new diving survey is being prepared to study the mineralised zones in 2012.

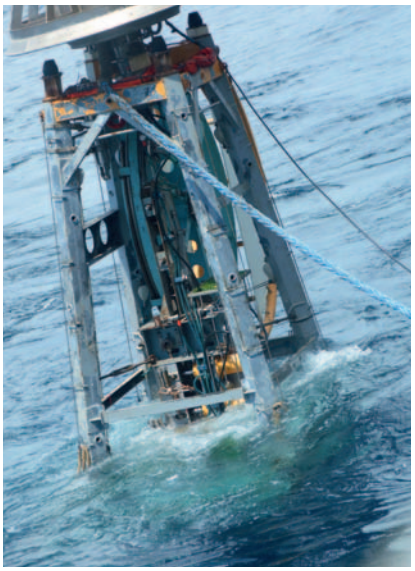
The strategy for potential mineral resources in oceans was discussed in the framework of the Comes inter-ministerial committee on strategic metals at its 5 May 2011 meeting.

In 2011, the European Union also organised several meetings to set up a strategy aiming to make it less dependent and diversify its metal supplies. They included a briefing session on marine resources at the European Parliament; a case file on strategic metals; setting up an Era-Net on raw materials; technology think tanks; indicating resources in FP7 marine call for tender and the European Deep Sea Frontier working group, with a mineral resource strand. All these discussions involve both land and sea components.

France has a licence granted by the ISA (International Seabed Authority) on polymetallic nodules in the Pacific region and should be poised for a second licence for hydrothermal sulphide deposits in 2012.

GAS HYDRATE FORMATION IN THE GULF OF GUINEA

The Guineco Mebo cruise (RV *Pourquoi pas?*, 6 November-9 December 2011) was a Franco-German mission led by Ifremer, for geological, geochemical and geotechnical studies of a pockmark zone in the Gulf of Guinea (Niger delta). Pockmarks are circular depressions with a typical inner architecture made up of sediments which are rich in gas hydrates. The cruise's objective was to understand the mechanisms of their formation and how they evolve. Its design was built on two innovative devices, the MeBo drilling system (remotely operated corer developed by the University of Bremen's Marum centre) and the Penfeld penetrometer. The mission relied on the implementation of various techniques (X-ray tomography imaging) used to determine and quantify gas hydrates and free gas present in deep sediment core samples and the activity of methanogenic microorganisms.



© Campagne Guineco-MeBo

Deployment of Penfeld penetrometer for a ten-hour dive to detect and quantify gas hydrates present in the central part of a pockmark.

STUDYING GAS SEEPS IN THE ARCTIC ZONE

With the aim of better understanding the hydrate system in the Arctic zone and the interactions between gases from the seafloor and the ocean, European cooperation was set up around the the European AOEM (Arctic Ocean Esonet Mission) project led by the Esonet Network of excellence. Combined with the Masox (Monitoring Arctic Seafloor–Ocean Exchange) underwater observatory, a series of research cruises was programmed from 2010 to 2012 in order to ensure the deployment and maintenance of the observatory and to conduct acoustic, geochemical and geophysical studies. In this context, the Svalbard 2011 expedition (JCR269), the outcome of cooperation between NOCS (National Oceanography Centre, Southampton) and Ifremer took place aboard the ice-strengthened RRS *James Clark Ross*, operated by the British Antarctic Survey. It aimed to conduct a geophysical study of two Hydrate systems by combining very high resolution seismic imaging and electromagnetic sounding techniques. The results from high resolution seismic imaging and electromagnetic soundings, combined with other geophysical and geological data, made it possible to identify gas hydrates and free gas in surface marine sediments and give detailed definition of the sedimentary architecture and structures which control gas migration. Its results will be used in order to test the hypothesis of gas emission associated with dissociation of methane hydrates engendered by warming and will supply information about the phenomenon of gas released into the ocean, and particularly its duration. The BOB "Bubbles OBservatory module" was also deployed. This standalone lander whose design is based on a fisheries sounder (Simrad ER60) will be used to observe seeps of fluid escaping from the seabed in the form of clouds or plumes of bubbles.

EXPLORING DEEP SEA CORALS TO BETTER PROTECT THEM

To apply European directives and international agreements, France must implement measures to protect vulnerable coral ecosystems.

The BobEco (Bay of Biscay-Ecology) mission began in 2009. It is part of the European CoralFish project (sixteen partners) coordinated by the University of Ireland. The cruise, supported by the Agency for marine protected areas and co-directed by Ifremer (aboard RV *Pourquoi pas?*, 9 September-11 October 2011) took place in two legs in the Bay of Biscay and west of Ireland. It aimed to map and study the communities associated with deep corals. Exploring some ten canyons in the French zone enabled different types of of coral formations (cliffs, colony fields or reefs) to be located.

Decapod crustacean on coral

© Ifremer-Victor/Campagne BobEco 2011

A PUBLIC INTEREST SERVICE FOR THE OCEAN

MONITORING GEOLOGICAL RISKS IN THE MEDITERRANEAN

Ifremer has a long-standing interest in the case study provided by the slide on the slope area of the Nice airport in 1979 which caused a tsunami. Sedimentary instability studies already conducted showed how vulnerable this densely populated area is, being exposed to geological hazards. Therefore, the Step cruise (RV *L'Europe*, 24 September-14 November 2011) was set up to place instruments on site for monitoring and *in situ* measurements. Two piezometers installed in April 2010 were recovered and replaced in order to pursue the continuous, long-term analysis of interstitial pressure. Single-point piezometer measurements (approximately thirty-six hours) were performed at six stations, along with sediment coring. The new geophysical and geotechnical data show the strong activity in the area and suggest the presence of slow deformation processes which could lead to new slides. Acquisition of electromagnetic profiles complements the seismic data collected over the past few years and makes it makes imaging of the sedimentary structures under the gas front possible. They will be analysed to detect the zones which are partially saturated in free gas and the zones of fresh water upwelling.

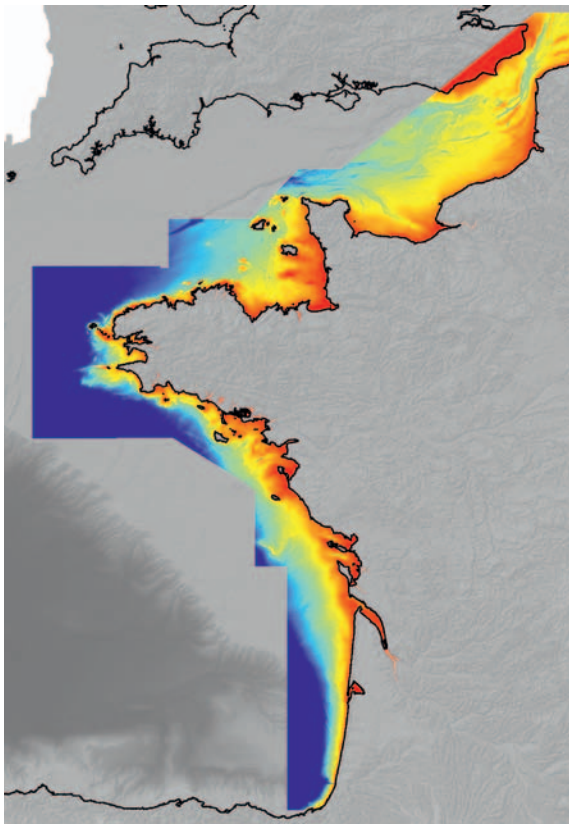
© Ifremer/GM CTDI

Deployment and retrieval operation for piezometer

MAPPING THE FRENCH CONTINENTAL SHELF

Ifremer is continuing to develop a programme to map the French continental shelf and its habitats. A report summarised the results of the work to inventory and database marine geoscience data, and the publication of baseline digital elevation models for the Channel-Atlantic and Mediterranean seafronts. The inventory and databasing covers eighty-seven cruises, i. e. 270,000 km of data in over 8,100 profiles. The Sextant guide was published with the aim of defining, within Ifremer, a single format for inputting metadata in the Sextant portal. It is compliant with the ISO19115 standard and in the next version it will be compliant with the Inspire directive (http://wwz.ifremer.fr/drogm/Cartographie/Plateau-continental/Inventaire).

> “87 research cruises, 270,000 km of data in over 8,100 profiles”



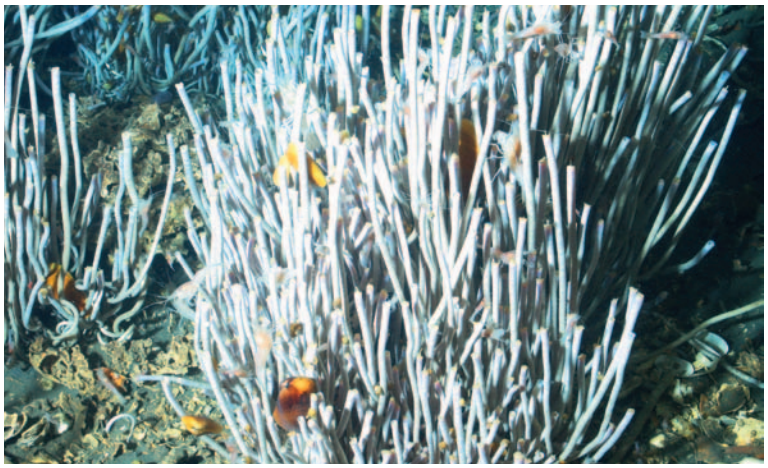
© Ifremer (GM, Dyneco, Sismer) et Shom

Bathymorphology of the continental shelf, English Channel and Atlantic, 100 m resolution

OBSERVING DEEP SEA ECOSYSTEMS

UNUSUAL DEEP SEA ECOSYSTEMS

There were two legs to the WACS (West Africa Cold Seeps) cruise, directed by Ifremer, aboard RV *Pourquoi pas?* from 27 January to 28 February 2011, in the Gulf of Guinea. The mission's objective was to study unusual ecosystems living on seafloors with different characteristics, i.e., cold seeps from pockmarks (mud volcanoes), and the terminal lobes of the Congo River at 5,000 m in depth.

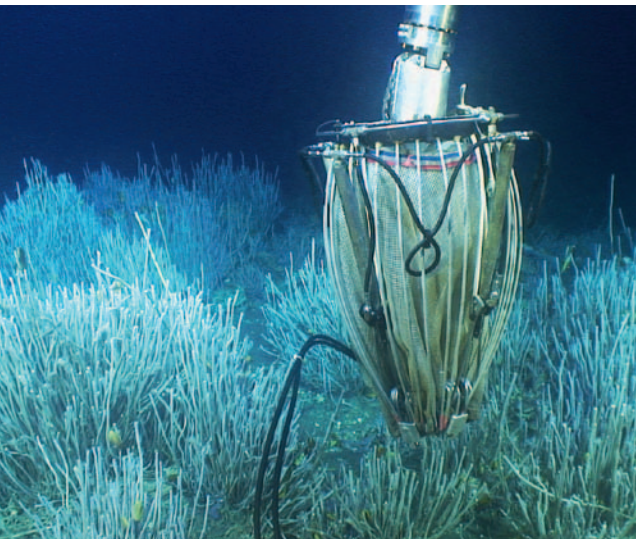


Siboglinidae polychaete beard worms

POCKMARKS AND COLD SEEPS

During the first leg, targeted samples were taken on the giant Regab pockmark (3,200 metres deep) and on two other pockmarks recently identified by German scientists, on various dives by the *Victor 6000* ROV (eleven dives over twenty days). This sampling will enable the biodiversity to be described on different spatial scales. The ROV's underway measurement module, the only one of its kind in Europe, was used to perform high resolution mapping of the pockmarks, associating microbathymetry and optical imaging. *Victor 6000's* deployment of devices like a microprofiler or benthic chambers provided highly accurate measurements of the chemical gradients and fluxes at the water-sediment interface.

The combined analysis of biological, chemical and geological parameters will supply new elements towards understanding how these ecosystems function and their variability on the regional scale. On the global scale, a comparison was made with similar ecosystems in the Gulf of Mexico to better understand the biogeography of species in deepwater chemosynthetic ecosystems. Finally, the new data acquired will be used to assess the temporal dynamics of cold seep ecosystems over a ten year period.



The "Bushmaster" used to collect a bush of worms

UNUSUAL HABITATS IN THE TERMINAL ZONES OF THE CONGO RIVER

The second leg of the cruise was devoted to exploring the ecosystems associated with the terminal lobes of the Congo River's submarine system. This zone receives large inputs of terrigenous material rich in organic matter, which creates an exceptional environment in the abyssal depths which are usually oligotrophic (nutrient depleted). By deploying different devices which are autonomous (respirometer), tethered (multitube and Calypso corers) or operated by *Victor 6000*, an initial estimation of the habitat's heterogeneity will be made. Biological communities very similar to those of pockmarks were observed for the first time at this depth and in a very different geological context. One of the mission's objectives is to understand the origin and production of hydrogen sulphide they need for their development. The initial data will be fed into the Congo-lobe project. It focuses on a cruise which will map, measure and take detailed samples of this special ecosystem at the interface between the margin and the abyssal plain.

> “By merging the two laboratories CNRS and Ifremer, it has been possible to establish the unit’s visibility, not only nationally but internationally as well”

Anne Godfroy

Interview

Anne Godfroy is a specialist in thermophilic and hyperthermophilic microorganisms in hydrothermal vent ecosystems and she is the director of the Extreme environment microbiology laboratory (LM2E) in the deep sea ecosystem unit. The LM2E is a joint research unit (UM6197) where CNRS, Ifremer and the University of Brest are associated. Anne Godfroy has taken part in twelve oceanographic cruises including the Exomar cruises on the Mid-Atlantic Ridge in 2005. She was head scientist on the BIG cruise in the Gulf of California in 2010

What recent achievements stand out for you?

The first is the BIG cruise, a multidisciplinary project which aims to compare how two chemosynthetic ecosystems, i.e., hydrothermal vents and cold seep zones, function. The second goes back further in time, and was the development of a tool to culture thermophilic microorganisms. This tool was initially designed to produce biomass, and is used regularly used in the lab to produce our “favourite microbe” P abyssi. It has also been used to cultivate microbial communities.

What is a UMR? Why is it important for Ifremer to develop UMRs?

A UMR is a joint research unit which brings together researchers, research faculty members, engineers and technicians from several research institutions to work on a joint scientific theme, in this case, microorganisms from extreme environments for our unit, called LM2E. The way it has been set up is exemplary, making it possible to bring together two teams just a few metres apart in the same laboratory, working on the same topics, sometimes in symbiosis but also occasionally in competition. By merging the human resources of the two laboratories, as of 2004, it has been possible to establish the unit’s visibility, not only nationally but internationally as well. We work much more effectively and efficiently together; I don’t think my colleagues will contradict me on that point!

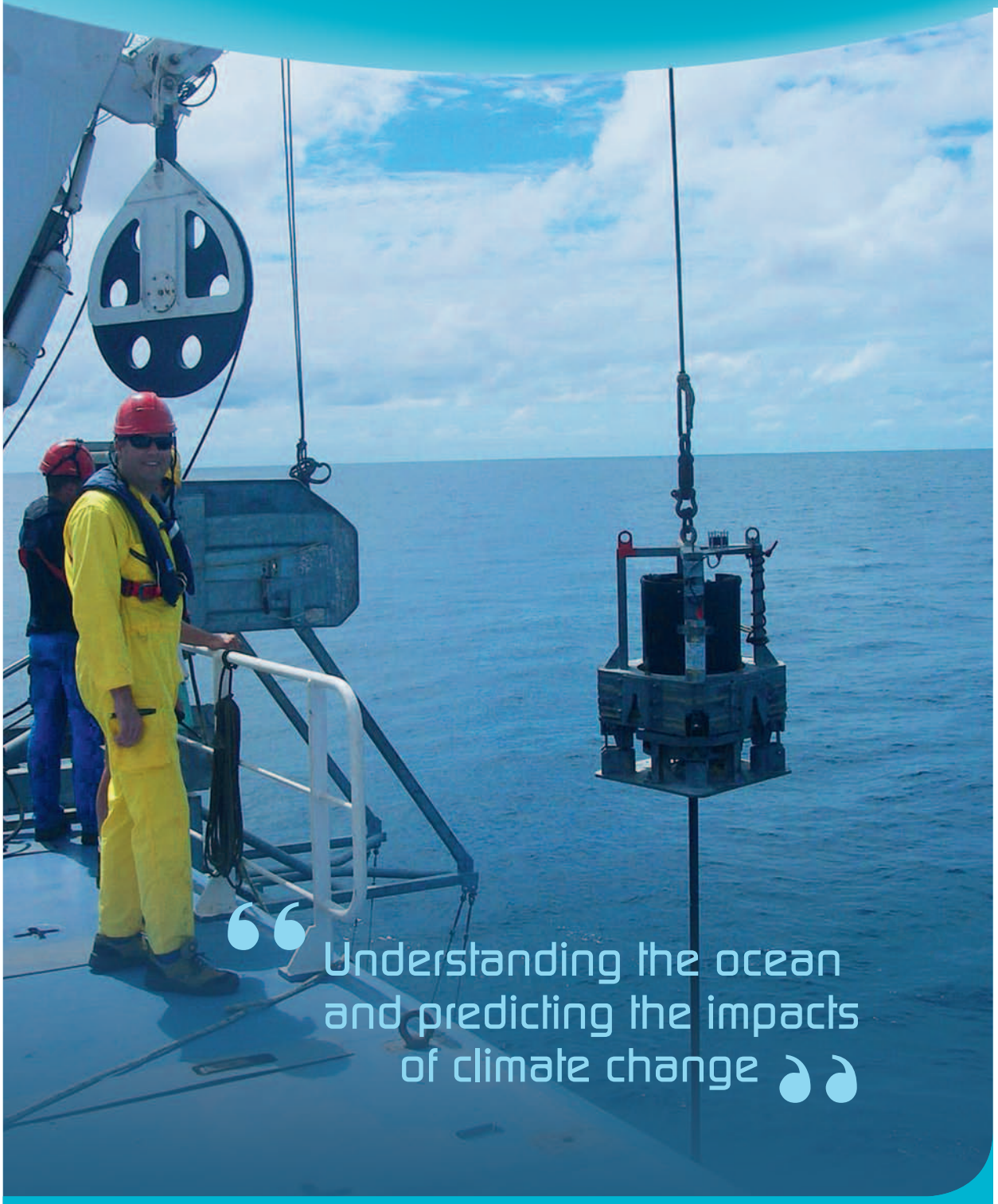
How do you manage a UMR? Compared to a 100% Ifremer lab?

Managing a joint research unit obviously means ensuring scientific coordination and facilitation, making new fields of research our own, making sure that research actions conducted are coherent, not only in the framework of the five-year project presented at the AERES assessment, but also with respect to our three supervisory authorities whose policies do not necessarily always converge. In administrative terms, account must be taken of the way the three different organisations operate financially and their hiring policies, and for that I am very well supported by the LM2E’s deputy director and by my two assistants.

How is Ifremer perceived in your core business? How do you contribute to that? What is the impact of the various communication actions that you conduct along with your work?

In the scientific realm where I work, Ifremer is particularly outstanding for its implementation of facilities at sea: that is one of the images that I like to highlight. I also think that it is essential to show the national scientific community that Ifremer also conducts “very high calibre research”.

And finally, it is important to communicate with the general public, even though it is time-consuming. This is especially true in that our laboratory’s field of study lends itself to this wonderfully well.



"Understanding the ocean and predicting the impacts of climate change"

Improving the diagnosis of global change

Observe, analyse, understand and predict ocean dynamics on different scales of time and space

The scientific stakes are high for knowledge about the deep sea, seeing the variety of geological, ecological and biological processes occurring there, the rich and diverse ecosystems it holds and their contribution to global biogeochemical cycles.

Today it is essential to understand the relationships between the ocean and the climate to supplement the climate change diagnosis. These are the first of the ten structuring orientations identified in Ifremer's strategic plan for 2020.

The Institute's research programmes are based on observing, analysing, understanding and predicting the ocean's dynamics (physical, biogeochemical and biological) at different scales of time and space.

The scientific themes addressed cover offshore ocean circulation at various scales (including very high resolution) to reliably estimate the ocean's role in the climate system; coastal hydrodynamic circulation; waves and swell for definition of sea states, computation of ocean-atmosphere exchanges and mechanical energy returned; sedimentary movements including morphological changes, characterisation of turbidity and particulate fluxes.

THE OCEAN PHYSICS LABORATORY RANKED A+

In May 2011, the Aeres assessment report and its rating of the UMR LPO ocean physics laboratory joint research unit were published. The committee designated the LPO as being a *"... reference laboratory for ocean physics in the French context and on numerous points internationally. Its scientific and experimental production is excellent in quality and attains the highest world class level on several points. In particular, Goodhope and its results on the Southern African margins, Ovide and its significant outputs in the context of climate change, France's participation in Argo and the sub-mesoscale processes where the laboratory is one of the two leading groups worldwide can be mentioned..."*

STUDYING THE OCEAN'S INFLUENCE ON CLIMATES

STARTING UP NEW PROJECTS FUNDED BY THE NATIONAL RESEARCH AGENCY

Ifremer is participating, either as pilot or partner, in six new projects financed by ANR, whose studies began during the last quarter of 2011:

- the OLA project, on "ocean layering: a pathway towards dissipation in seas? ",
- SMOC, on "ocean submesoscale modelling to better understand the climate",
- Ocean-Atmosphere, on "influence of SST gradients and high resolution on atmospheric variability",
- Comodo, for "Community of oceanographic modelling",
- Epure, for "metallic trace elements, climate perturbations, upwelling and resources",
- Synbios, on "submesoscale dynamics and biology on the slope".

OVIDE, A TOOL TO STUDY VARIABILITY IN THE ATLANTIC OCEAN

Ovide (Observatory of interannual to decadal variability in the North Atlantic), launched in 2002, is a ten-year programme to monitor currents and properties of water bodies in the North Atlantic subpolar gyre.

The East Greenland current is the western boundary of the Atlantic subpolar gyre and is essential in feeding the deep convection zones in the Labrador Sea. For the first time, Ovide observations enabled the mean transport of this current (17 million m^3/s) to be quantified. Current measurement monitoring over two years, combined with satellite altimetry, led to a time series of the variability of East Greenland Current transport for a nineteen year period. It shows a decrease in the intensity of the subpolar gyre in the second half of the 1990s. However, over the period in question, the East Greenland current's transport remained stable.

An article written by scientists from the Ovide programme and published in the *Geophysical Research Letter* was selected to be included in the *Research Spotlight* of the 27 April 2011 issue of the American Geophysical Union's EOS journal.

Recovering one of the moorings equipped with current meters off Greenland

© Ifremer/Ovide / Nolwenn Carn

Image taken on 17 August 2011 by Meris instrument aboard the European Envisat satellite

LABEX MER, THE OCEAN AT VERY HIGH RESOLUTION

The "Changing ocean" LabEx cluster of excellence, coordinated by the European Institute for Marine Studies (IUEM), was approved in March 2011. Ifremer coordinates work package 1 on "The ocean at very high resolution" This is a fast-growing theme internationally and major progress is expected in the next ten years thanks to experimental projects underway (like Swot, for "Surface Water and Ocean Topography"), and the development of next generation high performance computers. Our institute is also contributing to developing LabEx Mer's work package 6, on "marine habitat evolution and adaptation of populations", proposing an approach using modelling combined with physical, biogeochemical and biological processes in the coastal ocean. Finally, Ifremer teams working with those of the Ecole Centrale de Nantes (ECN) are supervising work package 7 on "deterministic ocean modelling and interactions with marine systems". The research work is tackling issues of non-linear wave propagation and interactions with currents, as well as the rapid dynamic aspects of wave breaking.

EXCHANGES BETWEEN THE COASTAL OCEAN AND THE HIGH SEAS

During the last Aspex cruise (RV *Thalassa*, 6-15 August 2011), twelve current meter moorings deployed in 2010 in the Bay of Biscay were retrieved for good.

The Aspex project is the first step in studying exchanges between the offshore ocean and inshore ocean (Océal) in the Bay of Biscay. It is led by Ifremer and contributes to the inter-organisational research effort called Epigram, studying the processes governing the properties of water bodies on the French Atlantic margins, Bay of Biscay and English Channel. The project is based on the large current meter array deployed in 2009 for two consecutive years on twelve sites, covering the continental margins of the Bay of Biscay, which were retrieved for maintenance at the halfway point (May 2010). Each instrumented point was equipped with a Doppler acoustic current profiler and a standalone CTD logger to monitor temperature and salinity. During each cruise high resolution hydrology legs were performed using the *Scanfish* undulating towfish.

© Ifremer/LPO

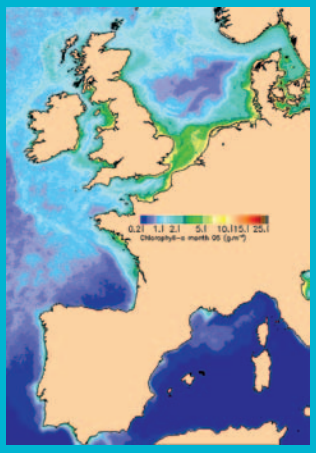
Various steps to launch Scanfish *deployed during the Aspex cruise*

Ocean temperature and colour

An atlas of the temperature, chlorophyll concentration and surface turbidity of the French continental shelf and its Western European surroundings was produced upon request from the Ministry (MEDDTL) in order to characterise the initial status of the French EEZ for the Marine Strategy Framework Directive (MSFD).

Sea surface temperatures and their trends since 1986, as well as the mean situations of chlorophyll at the surface, and for the first time, those of turbidity from 2003 to 2009, are presented in this climatology atlas.
Ocean colour satellite data were validated using observations from twenty-eight coastal stations (Somlit/INSU and Rephy/Ifremer). The atlas also took advantage of data and methods developed for the MarCoast2 (European Space Agency) and MyOcean projects. All together, it gives an overall view of the Western European continental shelf's environment.

Studies continued in 2011 with an analysis of inter-annual variability for chlorophyll and turbidity, especially near the mouths of the Loire and Gironde rivers. The study was based on sets of *in situ* observations from the Rephy network as well as data (satellite, wave height, river inflow, etc.) and outputs from the combined model.



SEA MONITORING AND FORECASTING ON A EUROPEAN SCALE

The Pan-European operational oceanography project called MyOcean (January 2009 - April 2012) financed by FR7 R&D, is taking part in GMES (Global Monitoring for Environment and Security) for marine waters. Its objective is to set up European integrated capability for ocean monitoring, analysis and forecasting, from offshore to shore. French operational oceanography, represented by Mercator-Ocean and Ifremer, plays a important role in this project.

MYOCEAN, VERSION 1.1

Ifremer, being responsible for the systems producing *in situ* and satellite data (surface temperature and ocean colour), published the version 1.1, with new products, of MyOcean in July 2011. They were delivered after a long validation phase. Effectively, the central management system of the MyOcean catalogue was incremented for the version 1.1 to take account of users' remarks and new service reliability control functions. Likewise, to facilitate the development of web applications, the Oceanotron *in situ* data dissemination server was deployed in the distributed MyOcean centres. One year from the end of the project, the annual MyOcean meeting was held in Rome in late April 2011. It was noted there that the contractual commitments will be fulfilled with no delays.

MYOCEAN-II

The MyOcean-II proposal will cover the period from April 2012-September 2014, preceding the implementation of operational funding by the European Commission (GMES programme) in order to pursue the deployment of services. Ifremer is involved in the same way as for MyOcean-I, reinforcing the European *in situ* centre that it coordinates (European consolidation of Coriolis) and of the Cersat satelllite data centre (surface temperature and winds). Special effort will be devoted to preparing the batch processed data set for re-analysis and to consolidation of interfaces towards coastal systems such as Previmer/Snoco (national operational coastal oceanography service). Ifremer is also taking significant responsibility in the overall coordination (Board) and in cross-cutting activities related to information systems (Ifremer/CLS cooperation).

innovative technologies

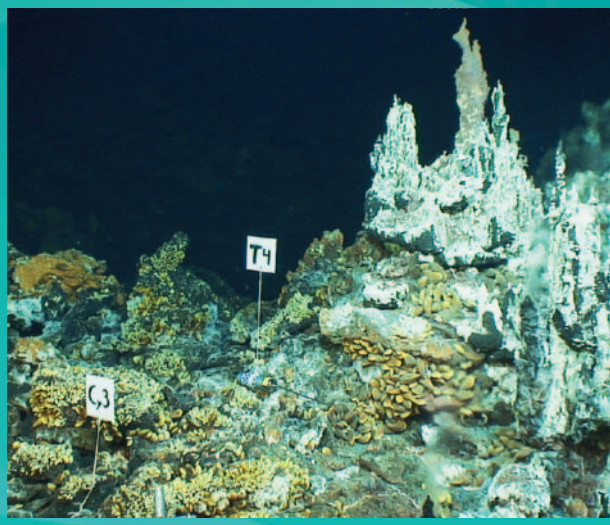
observation systems

oceanographic fleet

shipboard software

database

TOOLS TO AID RESEARCH



> “State of the art oceanography technology for observation, measuring and monitoring systems”

Developing innovative technologies

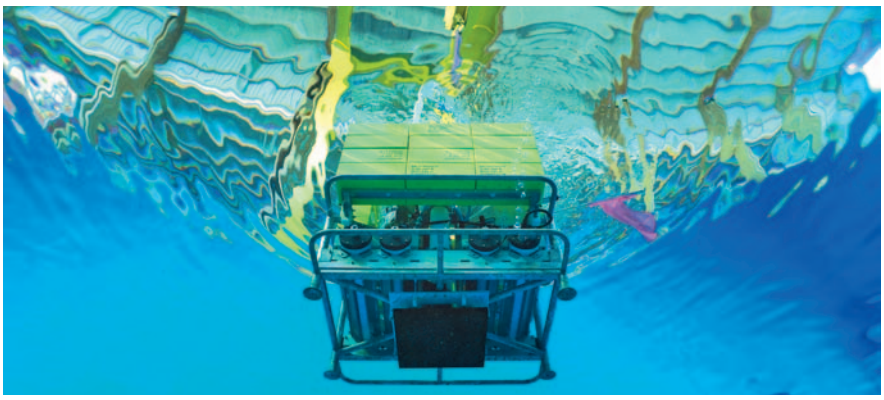
Promote a shared capacity for innovation on vectors, data transmission means and sensors

The main technological challenges taken up by Ifremer lie in developing oceanographic instrumentation and innovative, reliable equipment and facilities needed to make progress in observation, monitoring and *in situ* measurements of ocean and coastal seafloors.

These technological developments rely on multidisciplinarity of skills, from perfecting high-performance sensors to data transmission and management systems. Promoting a shared capacity for technological innovation on vectors (seabed frames, underwater gliders, oscillating profilers and drones), data transmission means (bottom-surface, surface-shore exchanges) and sensors (trials and validation of optical sensors, radars, etc.), is one of the orientations of Ifremer's strategic plan.

OBSERVING SEEPS IN THE ARCTIC

In August 2011, Ifremer took part in the cruise conducted aboard the British vessel *James Clark Ross*, with the objective of performing an acoustic study on a hydrate site located to the west of the Norwegian archipelago of Svalbard, in the Arctic Ocean. The National oceanography centre, Southampton (NOCS) headed this cruise, scheduled in the framework of the Esonet project, the European ECO2 project and G3 collaborative work (IFM-Geomar, NOCS and Ifremer), with the participation of the Universities of Tromsø (Norway), Southampton and Berlin. The standalone BOB, acronym for "Bubbles OBservatory", module designed for fluid seep observation was deployed at a depth of 387 metres, west of the Svalbard archipelago. For the first time, BOB was monitored during dives by the ROV HyBIS and then retrieved after sixteen days of operation. The initial visualisation of data showed the bubble plume was perfectly detected at 22 metres from the station.



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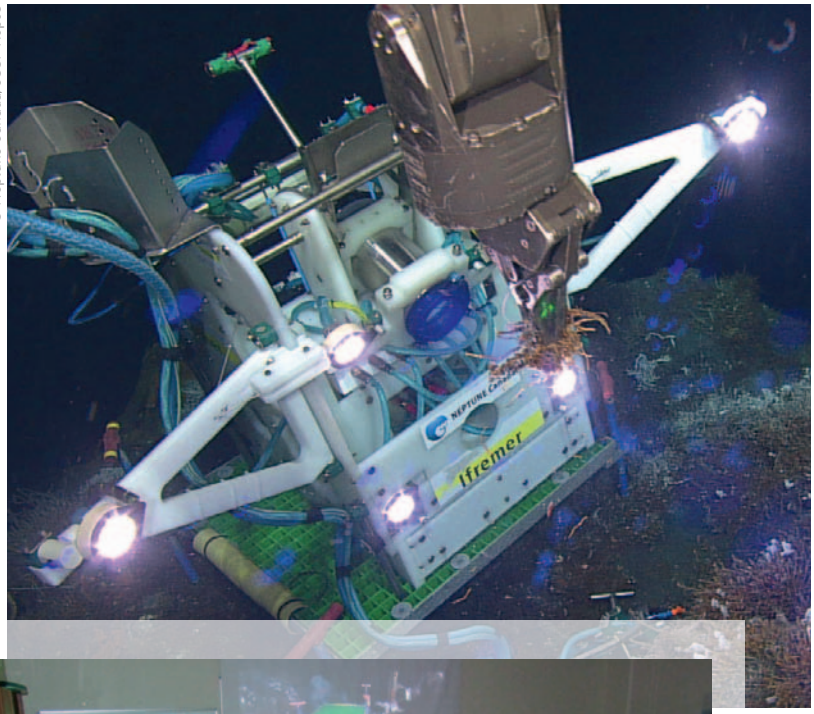
The autonomous "BOB" bubble observatory module lander in the Brittany centre's test tank

FIRST DEPLOYMENT OF THE TEMPO-MINI VIDEO CAMERA

The Tempo-Mini system combines a high resolution video camera with physical-chemical sensors for real-time monitoring of fauna assemblages associated with active hydrothermal vents. The oceanographic cruise conducted by the University of Victoria, aboard the US research vessel *Thomas G. Thompson*, took Tempo-Mini on board to connect it to the Neptune Canada cabled ocean floor observatory. The system was deployed for the first time, at more than 2,000 m in depth, on the Endeavour active hydrothermal site off Victoria, B.C. Ifremer's scientific teams steered the installation in interaction with the Neptune team on board.



© Neptune Canada/CSSF Ropos

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Ifremer's scientific team and technological research and development team talking with the Neptune team on board

> A successful deployment at more than 2,000 m in depth

Locating and recovery of black boxes at sea

Ifremer and Manopi, a subsidiary of the Alcen industrial group, signed an important research contract aiming to develop and qualify innovative solutions which could be used in the field of detecting, locating and recovery of black boxes at sea, at depths reaching 6,000 metres. The Manopi company's objective is to use these solutions in its service provision activity for stakeholders in the air transport field.

“France Énergies marines” national platform, a promising development

Ifremer greatly mobilised its forces in coordinating the project to create an Institute of excellence in low-carbon energy (IEED) called “France Énergies marines”. The project has been officially approved by the Marine competitiveness clusters and is structured around a broad consortium of industrial firms (both major groups and SMEs), French research and higher education institutions and local and regional authorities.
After being submitted in the Investments for the future call for projects, France Énergies Marines was short-listed in June 2011. In July, a file was submitted to the ANR to clarify the points requested by the panel before the final selection was made in February 2012.

- The governance processes were validated and a provisional joint council was set up, prefiguring the board of directors to come. The latter will be composed equally of sixteen public-sector and private-sector members and chaired by an industrial partner. The first chairmanship will be ensured by EDF.
- Partners from the private sector reasserted their will and commitment to actively participate in the provisional council and working groups. A new member, the PACA Capenergies competitiveness cluster, has joined the project.
- The research programme implemented fulfils the three priorities set by the industrial partners: overcoming technological obstacles; reducing costs to promote a competitive innovative value chain and knowing and mastering the impacts to ensure the acceptability of projects. The original aspect of the research programme lies in its cross-cutting nature and the various technologies which will continually supply the successive generations of products. Developing future generations of wind turbines is one of the major orientations of the programme, made stronger by working in association with the WIN wind energy testing platform set up in Upper Normandy.
- The investment and production costs were provided for each technology (fixed-bottom and floating wind, tidal current energy, wave power, ocean thermal energy conversion) with respect to its position on the maturity curve, validated by industrial partners and correlated with assessments made in Britain and by the European ocean energy association.

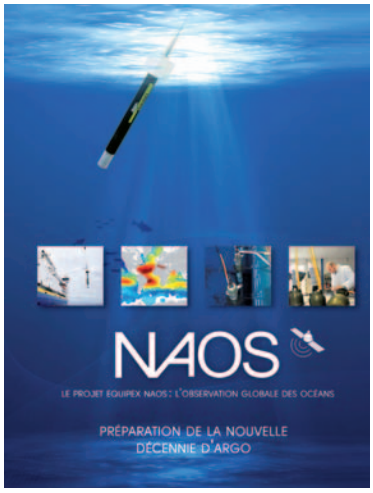
On the fourth anniversary of the Grenelle environmental summit, the French president was on an official visit to Mayenne, where he announced that the IEED “France Énergies marines” had been granted approved status.

UPDATED ASSESSMENT OF INVESTMENTS FOR THE FUTURE FUNDING

In 2011, funding for the Equipex Naos project selected as a facility of excellence and the “LabEx” status granted to three organisations led Ifremer to take part in eleven Equipex proposals, and coordinate four of them.

Two fleet facilities projects were submitted, sponsored by our Institute. One is devoted to seismics of the future (Sisdav) and the other to studying fluid circulation, ecosystems and metallogenic processes in very deep water (Immerse).

With the aim of supporting the operational coastal oceanography observation strand, the Fonce project was set up by Ifremer. It federates a large number of academic partners, including the INSU’s network of marine stations.



Finally, Ifremer proposed innovative numerical methods needed for data extraction in the spatial observation context, combined with Information system infrastructures, in the project dubbed Emocéan.

Bathytron, sponsored by the joint research unit UMR microbiology of extreme environments laboratory within LabEx Mer, and supported by the Institute of ecology and environment (INEE-CNRS), is also a potentially structuring project for the French community in biological explorations of deep seafloors.

Ifremer’s participation in LabEx SAFSI (Sustainable agriculture and agrifood systems) in the Pays de la Loire region was renewed. In addition, the University of Montpellier II requested support from Ifremer to take part in LabEx QualiPsEAU.

IDEX IC-Ouest (initiative of excellence) renewed its application with a more tightly focused theme scope, in keeping with recommendations. Ifremer is taking part in the national Infrastructure project on biology and health called Pepite, designed to support a national partnership for predictive toxicology and ecotoxicology, using its mesocosms for fish models and its aquaculture facilities in Palavas. The project directly follows the recommendations issued by several national working groups, included that formed by the AllEnvi and Aviesan alliances.

AN MRE TOOLBOX TO DEVELOP MARINE ENERGIES

Chosen in March 2011 by the Interreg IV (France-England) programme for a three-year period, the Merific project for "Marine energy in far peripheral and island communities" aims to increase the use of marine energy sources in the regions of Finistère and Cornwall. This means identifying the specific opportunities and issues faced by peripheral and island communities in exploiting marine renewable energy resources with the aim of developing relevant tool kits. In the framework of the project, Ifremer is mainly working on technological developments: assessing resources, environmental impacts and mooring systems for installations at sea.

The partners are the Finistère general (county) council, Iroise marine nature park, the Technopôle Brest Iroise science park, Brittany marine cluster, Economic agency of Brittany economic agency, the Cornwall county council and the universities of Exeter and Plymouth.

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Offshore wind turbines off England in the North Sea

DEVELOPING MARINE RENEWABLE ENERGY SOURCES

Ifremer is taking part in four of the Marine renewable energies (MRE) demonstrator projects financed by Ademe in the Investments for the future funding framework.

• The Ademe-Winflo project involves developing a floating offshore wind turbine whose deployment is slated for 2013. It brings together major industrial players from ship-building, oil and wind energy sectors. The demonstrator's concept was tested in test-tank trials conducted by Ifremer beginning in September 2011, subjecting a 1:25 scale model to the effects of waves and wind. The project's funding made it possible to purchase special instrumentation, in particular a system to simulate the turbine and wireless data acquisition, and a strain-gauge balance. A wind tunnel was also developed, with wind velocity exceeding 8 metres per second on the scale of the tank. An optical tracking system (Qualisys), purchased thanks to the Carnot tunding contribution, will be used to monitor a moving body equipped with targets whose sizes are compatible with the presence of wind.

• The Ademe-Orca project aims to test the main real-size components required to produce high power wind turbines using the patented *Clean Current* technology, with the test site envisaged at Paimpol-Bréhat. Technical meetings were organised with Alstom in order to launch an anti-corrosion protection study using the Procor software operated by Ifremer in close collaboration with Cetim (mechanical industry technical centre). Examining how the mock-up used by the École Centrale de Nantes (ECN) could be adapted to the requirements of the Boulogne-sur-Mer testing tank began, in order to conduct trials in the presence of swell and currents.

• The objective of the Ademe S3 project is to develop the highly innovative "S3" wave power system, from concept to demonstration phase, on the Semrev wave energy trials site which will be developed offshore from Le Croisic with the collaboration of Ifremer and ECN. Ifremer is involved for the study and qualification of the materials used for wave power devices in the marine environment.

• The Ademe-Sabella D10 project involves developing a tidal turbine measuring 10 m in diameter, producing from 200 to 500 kW (depending on the site's kinetics), which will be installed off Ushant Island in 2012. Testing tank trials will be performed in the hydrodynamic flume tank at the Ifremer centre in Boulogne-sur-Mer.

> "An active participation in four of the Marine renewable energies (MRE) demonstrator projects"

Chantal Compère

> “Technology enables great scientific breakthroughs”

Interview

What exactly is your job?

I am the head of the Technological Research and Development unit at Ifremer's centre in Brest.

What was your initial training in? And could you describe your career path until now?

In 1984, I earned a PhD in analytical chemistry, majoring in environmental control, at Louis Pasteur university in Strasbourg. My thesis dealt with the "Contribution to studying chromium deposits on rotating carbon electrode and on dispersed type carbon felt electrode". From 1985 to 1987, I focused on "corrosion and study of metallic material degradation" on a post-doc grant from the Natural Sciences and Engineering Research Council of Canada (NSERC). Then, from 1987 to 1989, I held a position of research associate in electro-chemistry and corrosion at IGM, National Research Council Canada (NRC) in Boucherville, Quebec, Canada. From 1990 to 1992, I was a research associate with Professor E. Ghali, the director of the electro-metallurgy and corrosion laboratory at the Department of Mining and Metallurgy of the University of Laval in Quebec. When I returned to France in 1992 I was hired as a research engineer at the Marine materials laboratory and the Materials and Structures service at the Ifremer centre in Brest. I was then put in charge of the Interfaces and Sensors service when it was created in June 2004, and then in 2012 became the head of the Technological research and development unit.

What are the main achievements you've contributed to recently and that you are proudest of?

At Ifremer, the emergence of innovative technologies, like the development of *in situ* biosensors to detect biological species and toxins which associate technology and life sciences (omics, biotechnologies) or associating Raman spectroscopy and nanotechnologies for the *in situ* detection of trace organic compounds is one of the major achievements that I was involved in over the past few years. The tools of the future are the result of multi-disciplinary work within the TRD unit. They bring together numerous types of complementary expertise found in our unit: biology, molecular biology, surface functionalization, optics, chemistry, electronics, mechanics, etc., enabling us to develop innovative collaborative research projects with academic (especially for nanotechnologies and immunology) and industrial partners.
Measuring biological material and trace organic compounds *in situ* in the marine environment is a true technological challenge for the coming years. It is a particularly exciting and fascinating field.

Ifremer has been awarded the Label Carnot: how exactly would you define partnership-based research?

Partnership-based research is collaborative research serving enterprises and local authorities. Carnot institutes mobilise their efforts to support enterprises (big companies, SMEs, very small enterprises) in their approach to innovation. They undertake to develop research and development activities aimed at enterprises. This partnership between Carnot institutes and companies can take various forms, for instance:

- drawing up partnership research contracts: direct contracts or collaborative contracts (in the framework of calls for project proposals by ANR, FUI, FP R&D, etc.),
- creating joint laboratories,
- supervising PhD students.

How does that correspond to Ifremer's objectives?

One of the objectives of the 2009-2012 four-year contract between the State and Ifremer, is to optimise the links between public and private research (objective 4), by strengthening the contractual relations between Ifremer and economic players, by developing and leading strategic partnerships in order to help create innovative activities and support growing of jobs based on research outcomes.
These are the objectives of a Carnot Institute of excellence.

As the new female manager of a research unit, what do you believe you bring to Ifremer? For you, what is the role of a manager at Ifremer? What led you to make this career choice?

First of all, I really like technology. In terms of technological developments, there are challenges awaiting us, whether speaking about technological developments in the field of renewable energies to gain access to new resources or new sensors, especially biological and chemical ones, these are just a few examples.
Technology enables great scientific breakthroughs, and is fed by research, but conversely, applied research can give rise to significant questions in basic research. My original training was in research and I hope to move more closely towards research and technological development, within Ifremer, to give greater visibility to the activities within these disciplines and the rather unique expertise in technological R&D which exists within an Institute like ours and which other research centres envy.
Moreover, I think that women approach management differently, with priority given to collective and participative work, asking for teams' opinions and caring about listening and dialogue. I like team work and scientific facilitation.

“From monitoring network activities to observation systems and oceanographic databases”

Maintaining and developing major facilities serving the needs of oceanography

Take part in bringing a unified monitoring system of global and European scope to the fore

On the national level, Ifremer is engaged in a strategy of global monitoring incorporating both offshore and inshore zones. Accordingly, our Institute is developing efficient, long-term measurement networks.
In the context of progressive implementation of an integrated marine policy and construction of the European marine and maritime research area, Ifremer is also actively involved in bringing a unified monitoring system of global and European scope to the fore. Our Institute is thus taking part in structuring shared facilities and infrastructures and running and coordinating them in Europe.

© Ifremer/Isabelle Nicot

Handling operations for Molit buoy during annual overhaul in 2011.

COASTAL OBSERVATORY NETWORKS

MAREL ARRAY MAINTENANCE CRUISE

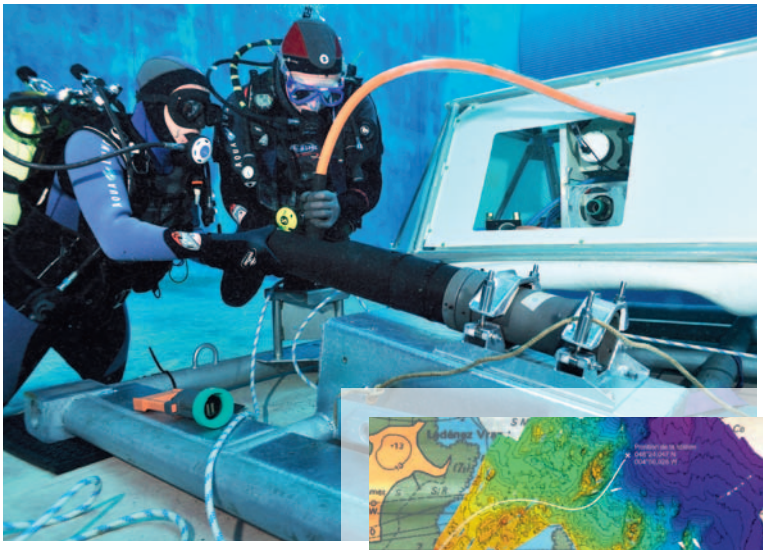
Maintenance work was done on the Molit buoy in the Bay of Vilaine (Marel Vilaine array) during the Carmolit cruise (RV *Thalia*, 22-25 September). This is a standalone measuring station from the range of Marel products developed by Ifremer. It is used to observe and continuously measure hydrological and meteorological parameters and marine water quality. Data (temperature, salinity, dissolved oxygen, etc.) are stored and then transmitted via a satellite link to the Coriolis database. Annual maintenance and cleaning of the buoy, in service for four years, was done on this mission.

© Ifremer

Molit buoy in the bay of Vilaine

PILOT CABLED OBSERVATORY

The Medon project is conducted in partnership with French and English institutes and funded by the Interreg IVA Channel programme. Its aim is to define, test and develop a real-time pilot cabled marine observatory, intended to supplement the range of coastal monitoring systems available. The first survey mission was made aboard the Medon mapping cruise (RV *Haliotis*, 7-11 April 2011) in the Iroise Sea and to the south of Quéménes island, in order to determine the track of the underwater cable before deploying the observatory and choose its landfall (depth reaching 15 m).



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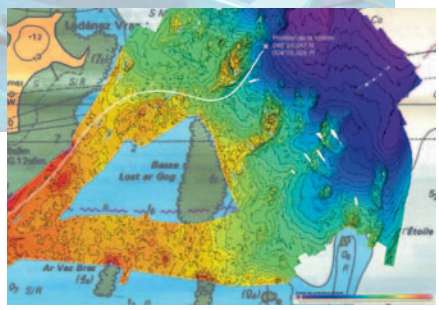
Validation of underwater connection procedures for subsea MeDON module



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Bathymetric survey of zone for MeDON observatory deployment

MRI OBSERVATORY NETWORKS

Cross-cutting projects, such as the Argo monitoring and the EMSO European Multidisciplinary Seafloor Observation programmes, are examples of Major Research Infrastructures (MRI).

FINE-TUNING COASTAL MONITORING

In May 2011, the European Jerico (Joint European research infrastructure for coastal observation) programme was launched, with the ambition to set up, in four years time, a European infrastructure dedicated to coastal monitoring to meet the needs of operational oceanography. It brings together most of the European institutes working in coastal monitoring with the aim of creating a lasting observation network based on three types of systems, i. e., gliders, fixed platforms (buoys, sea pilings, etc.) and ferryboxes. Technical and technological criteria will be determined in order to operate these systems with the lowest cost, over the long term, by standardising procedures and methods.The Jerico project's kick-off meeting was held in May 2011, at the Maison de la recherche, attended by twenty-seven European partners and representatives from the European Science Foundation (ESF) and the EuroGOOS (European global ocean observing system) association.

Observing, understanding and predicting the ocean's role for the climate

Launched in 2000, the Argo programme is the first in situ global array for real-time ocean observations, with approximately 3,000 autonomous floats disseminated all over the globe to measure ocean temperature and salinity, from the surface down to depths of 2,000 m.

The Equipex NAOS project, coordinated by Ifremer, was selected during the first series of calls for projects for facilities of excellence. Its objective is to strengthen the French and European contribution to the Argo network and anticipate its future developments in the coming decade. From ten to fifteen additional floats per year will be deployed by France in the period from 2012 to 2019 (for a total of one-hundred-ten floats).

The research required to develop a new generation of floats will be conducted concurrently, with the aim of deploying seventy profiling floats on three pilot sites in the Mediterranean, the Arctic and the North Atlantic. They will combine technological improvements and innovation (intelligence, reliability, useful life of equipment, sensors, depth, costs and energy savings, etc.).

NAOS is the outcome of a partnership between Ifremer, Pierre & Marie Curie university (co-sponsor), CNRS, the PRES European university cluster of Brittany (UBO/IUEM), SHOM and two private-sector enterprises: CLS for satellite telecommunications aspects and the SME NKE in charge of the industrialisation of Argo floats.

A NEW ORGANISATION FOR THE EUROPEAN MRI EURO ARGO

All French activities associated with the international Argo network are grouped within the Argo France organisation, being the French contribution to the European research infrastructure called Euro Argo. Argo France is one of the components of the interorganisational Coriolis structure (CNES, Ifremer, INSU, IPEV, IRD, Météo-France and SHOM).

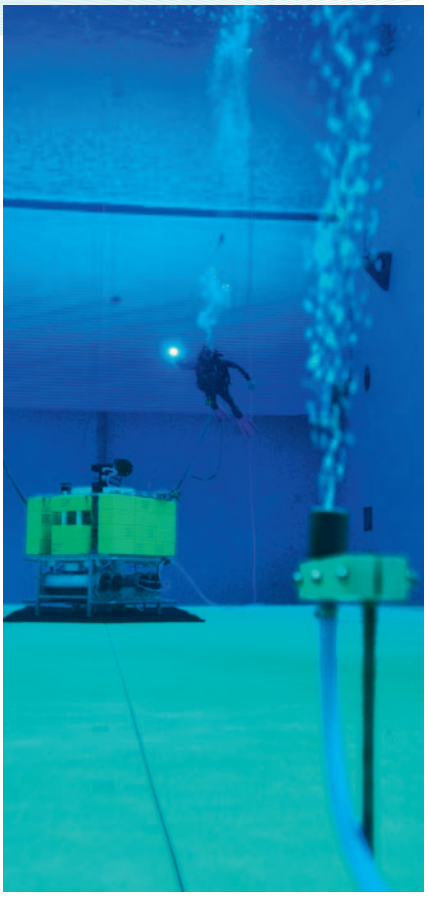
Endorsed in 2006 in the first Esfri (European Strategy Forum on Research Infrastructures) roadmap, Euro Argo is part of the French roadmap for MRIs.

Euro-Argo will evolve into a permanent European legal entity, Euro-Argo ERIC, which will be hosted by France. TO that end, the Euro-Argo system was recently given a positive assessment by the European Commission.

Sponsored by Ifremer, the new Euro-Argo ERIC (European Research Infrastructure Consortium) is devoted to managing Argo floats. The Sideri proposal, whose funding was accepted in 2011, aims to facilitate the integration of our Institute's activities within Argo International. Over the 2012-2013 period, it will enable European positions on the development of the basic mission of Argo to be prepared, as well as that of data processing centres, drawing up the float deployment strategy, and so on. Ifremer is also taking part in the Groom project, which aims to organise an infrastructure of European scope for "gliders" and consolidate a long-term network of legs contributing both to the GMES (Global Monitoring for Environment and Security) programme and to scientific objectives. Our Institute is working to structure the management of data from these gliders along similar lines to that of Euro-Argo.

> "Euro-Argo ERIC, a permanent legal entity devoted to managing Agro floats"

Module BOB



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CONTINUING TO SET UP THE ESONET NOE NETWORK OF EXCELLENCE

The European Esonet NoE (European seafloor observatory network) programme ended on 1 March 2011. This network of excellence, associated with the major EMSO infrastructure, was implemented to prepare and organise the installation of multidisciplinary deep seafloor observatories on eleven sensitive sites in Europe. The Esonet approved status ensures compliance with the recommendations and obligations established at facility level, testing and underwater operations procedures, data management and access to data. Ifremer coordinated this network for four years, with its fifty partners (national institutes and companies), federating a scientific community of nearly three-hundred researchers. A description of the scientific strategy for the network of observatories in the deep sea environment was published in *Progress in Oceanography*. With the launch of EMSO, the European Commission has considered that the Esonet project is a success. A project for a long-term structure called ERIC (European research infrastructure consortium) is being drawn up, under the Esonet Vi (for vision) designation.

EMSO is receiving EU funding in its preparatory phase (until 2012). It is part of the French roadmap for high-priority MRIs and in Esfri's European roadmap, grouping new research infrastructures of pan-European scope.

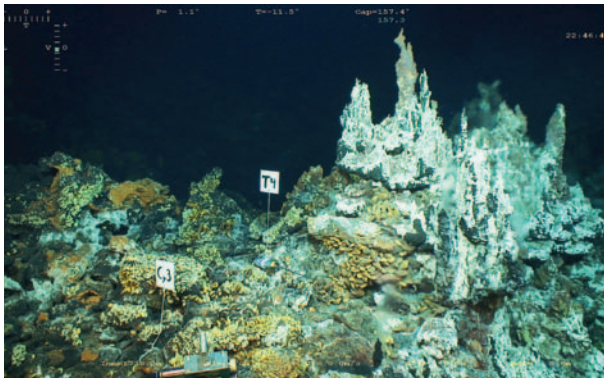
INITIAL RESULTS FOR SEA BOTTOM OBSERVATORIES

Ifremer has engaged work on three high-priority sites: MoMAR (Monitoring the Mid-Atlantic Ridge) to the south of the Azores, in the Marmara Sea and Ligurian Sea. Our Institute also took part in a demonstration mission in Norway.

• Several ocean research cruises in the Marmara Sea were organised in the framework of developing optimised seafloor observatories for seismic monitoring (Marmara DM). Processing of the first data series (OBS, BOB) showed the possibility of detecting precursory signals for quakes from parameters measured on the faults. All of the scientific and technological elements were combined to construct two proposals submitted for funding, in one case, to the Turkish government and in the other complementary proposal, to the European Commission.

• The main objective of the MoMARSat 2011 cruise (RV *Pourquoi pas?* equipped with the remote operated vehicle *Victor 6000*, 28 June-23 July 2011) was to extend the continuous monitoring experiment of the Lucky Strike hydrothermal field off the Azores by one year and perform the maintenance of multidisciplinary observation stations set up in October 2010, linked in almost real-time to shore. Data transmitted from seabed stations are archived and put on line in accordance with the Esonet-EMSO programme recommendations on this website: http://www.ifremer.fr/WC2en/allEulerianNetworks.

• Ifremer is participating in the equipment of excellence project of interest for the fleet of Ligurian instrumentation for the future network. It is sponsored by the Particle physics centre in Marseille and by the University of the Mediterranean. Called Equipex EMSO-Ligure, its goal is to construct and maintain the observatory as well as to develop and promote the utilisation of related instruments.



© Ifremer-Victor/Campagne MoMARSAT 2011

Cypres hydrothermal vent site in the Lucky Strike field at 1,700 m in depth

ONE-OF-ITS-KIND "OCEAN" PORTAL FOR EUROPE

Ifremer is developing and operating large information systems for marine data and oceanographic databases which have truly become strategic resources today, just like the major facilities. Marine and coastal data are collected, validated, processed, databased and disseminated in compliance with national and European directives in effect (MSFD, WFD, Inspire and DCF).

Our Institute is one of two global data centres in the context of the Argo infrastructure. In particular, the SeaDataNet project has asserted its leadership in oceanographic data management in Europe.

SEADATANET 1 AND 2

The SeaDataNet project (FP6-Infrastructures) was completed on 31 March 2011. It enabled several initiatives to be proposed and set up:

• extension of SeaDataNet to geophysical and geological data with the Geo-Seas project;

• actions to prepare the future European marine observation and data network Emodnet -DG-Mare in biology, chemistry, hydrography (with two lots including the Western Mediterranean and the Bay of Biscay) and physical characteristics.

A new "SeaDataNet 2" proposal was submitted and accepted by the European Union in the frame of FP7, to be coordinated by Ifremer and financed to the amount of 6 6 million euros over four years.

Michèle Fichaut / Gilbert Maudire

> “For the user who queries the SeaDataNet portal, there is a single access point which is a “virtual” data centre connected to all project partners. A challenge !”

Interview

Michèle Fichaut is an engineer at Sismer and is involved in data management and European programmes including SeaDataNet. She also set up the data centre for Coastal operational oceanography (CDOCO). Since October 2011, Michèle Fichaut has been coordinator of the SeaDataNet 2 project.

Gilbert Maudire is the head of the “Information systems and marine data” unit and has participated in or coordinated the construction and operation of several scientific information systems in various fields: ocean physics, coastal and deep sea environment, geophysics, fisheries science, etc.

How important are databases for Ifremer?

Ifremer and all French organisations involved in marine research devote significant financial and human resources to collect data in the world’s seas and oceans. These data, if they are not archived and stored on permanent media in the few months or years following an oceanographic cruise, will be lost for the entire scientific community.

A data centre is also responsible for checking the data archived and making them coherent and consistent so that users can recover all of these data, whatever their source, in a single format.

Moreover, the growing needs of operational oceanography in terms of data to input to ocean models require the activity of specialised data centres which are the only one capable of ensuring the on-going dissemination of large volumes.

We also manage data on biology, geosciences, physics and chemistry, as well as from imaging.

What does the SeaDataNet project involve? What did SeaDataNet 1 achieve?

The SeaDataNet project consists in the networking of marine physics and chemistry data from thirty-five countries on European shores. For the user who queries the SeaDataNet portal, there is a single access point which is a “virtual” data centre which in reality is connected to all project partners. To succeed in setting up a virtual data centre of this scope, we had to design common languages for data descriptions and metadata which comply with published international standards, like ISO, OGC for instance), shared software programs which are easy to use in any IT environment, joint catalogues, etc. It was a very interesting challenge for us during the SeaDataNet 1 project, which was completed with the setting up of this virtual data centre. The SeaDataNet 2 project will enable us to consolidate the system by improving it, making it more robust and adding other types of data, such as biological information.

Why is it important to integrate databases on the European level in this way?

On the French scale, we try to provide high-quality, homogeneous data sets which meet international standards. On a broader scale, at the pan-European level, it is just as important to be able to supply data which can respond to societal issues and which can be easily used by both scientists and politicians, decision-makers and all sorts of users.

How is a project of such scope coordinated?

With a great deal of organisation, patience, diplomacy and one’s own time. Working with 35 countries, 55 partners or sub-contractors requires being very vigilant and attentive. You must be capable of complying with deadlines set by the EU and anticipating any problems which can arise throughout the project’s life. Being transparent with respect to all participants is also an important point: it means communicating regularly on the state of progress and on achievements, making presentations and so on.

> “A strong national will for more integrated management of the French ocean research fleet”

Optimising the French oceanographic fleet as a major research infrastructure

Maintaining a high level of quality for ocean-going and coastal fleets, as well as underwater equipment and vehicles

The French ocean research fleet, which is jointly managed by several bodies - IPEV, IRD, INSU and Ifremer - has been part of the French roadmap for major research infrastructures since December 2008.

The fleet serves all marine science disciplines and is also mobilised for public service missions (Exclusive Economic Zone extension claims, fisheries stock assessments, monitoring the marine environment in compliance with France's international commitments, and so on.), cooperation (notably with the French Navy or IEO in Spain) and for industrial utilisations in the framework of public-private partnerships.

Ifremer acts as a resource agency in ensuring the mission of managing and maintaining a high level of quality of a highly significant share of this ocean-going and coastal fleet, as well as underwater equipment and vehicles which all fall within the scope of the MRI.

There were two main milestone events in 2011: the creation and early steps of the joint service unit (UMS French oceanographic fleet), marking the national will for more integrated management of the French oceanographic fleet and the return to ocean-going fleet programming which is more in keeping with the objectives of numbers of days at seas as set out by Ifremer's four-year contract (2009-2012). The target was reached in spite of the strained economic context.

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RV Pourquoi pas?

CREATING AN ENTITY DESIGNED TO OPTIMISE FOF MANAGEMENT

On 2 March 2011, at the Ministry of higher education and research, the four research operators (CNRS, Ifremer, IPEV and IRD) ratified the creation of a unified management entity for the French ocean research fleet. The "French oceanographic fleet" joint service unit was created for an initial four-year period.

Its creation is the outcome of thought and discussion devoted to the national strategy for oceanographic research seagoing resources since 2008. It took form with the results and feedback from the Strategic and technical fleet committee (CSTF), which concluded that there was a need to organise the "fleet" infrastructure in accordance with the MRI concept.

The four fleet operators then created two successive working groups to design this new architecture and draft the text setting up the UMS joint service unit. It is the most appropriate entity due to its flexibility, designed to fulfil the multiple missions of the fleet without interfering with the specificities of the organisations.

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Thalassa

UMS FOF, MISSIONS AND ORGANISATION

The UMS FOF (joint service unit for the French oceanographic fleet) was assigned three missions: to draw up and implement integrated programming of vessels and major facilities; to carry out forward studies, definition and coordination of the fleet's development plan, whilst taking account of the needs of national public operators who are not UMS members (TAAF, French Navy) and to coordinate their investment policies.

Within this new architecture, each of the operators remains the owner of its seagoing resources and assumes legal responsibility for them, and guarantees their "good condition and status", both in terms of safety and efficiency and of the operation of scientific equipment and facilities. However, all decisions depending on these three missions are taken by the four operators, abiding by a principle of consensus. Each organisation will successively chair this UMS. CNRS ensured the first chairmanship. In 2012, Ifremer will take on this responsibility.

In 2001, the UMS held three board meetings. Amongst the numerous decisions made was that to submit two projects for the Equipex 2011 call for projects: the first on natural hazards, with the seismics of the future proposal and the second on knowledge about fluid circulation, ecosystems and metallogenic processes in deep seafloors, with a proposal for high resolution deep sea exploration. Although the projects were not selected, the UMS nevertheless demonstrated its ability to make the four operators and their respective teams work rapidly together to promote a common, shared idea.

UNIFIED GOVERNANCE

The MRI FOF's operation is based on an institutional tripod which was validated by the Ministry of research. It is organised according to a scheme similar to most MRIs, with the UMS and its decision-making body, the management committee (Codir) making up its operational structure; the Strategic and scientific orientation council (COSS) which is the advisory and strategic entity; and the National ocean-going fleet commission (CNFH) and the National coastal fleet commission (CNFC) forming the assessment entity. Construction of this governance was completed with the COSS's installation in early 2012.

STRATEGIC AND SCIENTIFIC ORIENTATION COUNCIL (COSS)

The COSS is the MRI's strategic think tank, taking over from the Strategic and technical ocean-going and coastal fleet committee (CSTF). The specificity of the council, with fewer members than the CSTF, is to include a greater number of qualified personalities. Amongst them is the secretary general for the sea and two scientific figures from outside of the French scientific community (University of Recife, Brazil and Alfred Wegener Institute, Germany). This organisation is in phase with developments in the national scientific context (creation of the Alliance, Marine programme, etc.) and gives the MRI an interministerial dimension. It is the sign of the French fleet's opening to both Europe and emerging countries. This means that the COSS is the main advisory body of the MRI and as such enjoys full independence in the choice of topics studied and in the formulation of its advice. One of the first working groups set up concerns the coastal fleet development plan. Its conclusions are expected for June 2012.

NATIONAL ASSESSMENT COMMISSIONS

Research cruise scheduling is the outcome of a long maturing process which is based on the assessment by an independent national commission of an explicit application file about the research to be carried out at sea. The cruise is then ranked with respect to its level of scientific excellence. Depending on the type of mission, the assessment is made either by the National coastal fleet commission (CNFC), or by the National ocean-going fleet commission (CNFH). The CNFH now devotes its work to cruise assessments and the UMS is in charge of scheduling decisions. The CNFC was established in 2009 at the request of the supervisory authorities asking that the two regional committees (Cirmat, Cirmed) which evaluated requests for access to ships on the two large French seafronts, be merged into a single national commission.

INTEGRATION OF EUROPEAN FLEETS

POSITIVE RESULTS FOR OFEG

A tripartite agreement signed in 1996 between Ifremer, BMBF (German Federal Ministry of Education and Research) and NERC (British Natural Environment Research Council) provided the French scientific community with access to the large facilities and vessels of the fleets of signatories of the protocol, in the form of ship time exchanges. The group was renamed the Ocean Facilities Exchange Group (OFEG) and currently has six member countries with the Netherlands, Spain and Norway. There are eleven vessels in the fleet accessible to all signatories.

After twenty-five years of existence, this agreement has shown positive results, both in bringing major European fleet operators closer and in terms of the relevance of these exchanges and scheduling of scientific cruises. In November 2011, Germany decided to make its large facilities, particularly underwater vehicles, accessible to partners of this agreement.

FIRST SEA MISSIONS FOR THE EUROFLEETS PROJECT

The European project Eurofleets, coordinated by Ifremer, was launched in September 2009 and has twenty-four partners from sixteen countries. Funding is ensured by a European contribution of 7.2 million euros over four years under the 7th Framework Programme for Research and Development (FP7 Research and Development).

The project's general assembly meeting was held in September 2011 in Ostend, Belgium, noting the progress made in terms of transnational access to research vessels. Seventeen cruise proposals were received in the frame of the third and final call for tenders launched in February 2011. By the end of the calls for tender launched in 2010 and 2011, six cruises will be funded aboard five European vessels in the "global" class (i.e. seventy-seven days at sea) and thirteen cruises are scheduled for eleven "regional" class vessels (i.e. ninety-three days at sea).

Eurofleets took concrete form in 2011 with the first scientific missions aboard Ifremer vessels. For instance, the *Haliotis* survey boat (27 June-9 July, La Horta) and RV *L'Atalante* (7-20 September, La Horta) provided a comparative study of geological structures and lava from volcanoes in eruptions in 1891 (Pantelleria, Italy) and 1998-2001 (Terceira, the Azores).

EUROFLEETS2, PURSUING EUROPEAN INTEGRATION

The Eurofleets2 proposal for "new operational progress towards an alliance of European research fleets", which follows on from the current project, was submitted to the European Commission in November 2011.
Eurofleets2 was drawn up, proposing to broaden the consortium towards polar research vessel operators, experiment with new frameworks for research fleet integration, prepare the renewal of "regional" class research fleets which could be incorporated in the roadmap for Esfri research infrastructures and a now compulsory "innovation" strand.
The new project includes thirty-one partners from twenty countries: fifteen European Union Member States, four associated countries and Greenland. Most of the partners are research institutes operating fleets, universities, industrial firms and European organisations (ESF and EurOcean).
Twenty-two vessels will be accessible on the basis of scientific excellence, in the frame of European calls for tender targeted by maritime region, as well as six pieces of mobile equipment, the largest of which is the remote-operated MEBO corer.
The proposal represents a total budget of 11.6 million euros, out of which a European contribution of 9.5 million euros has been requested. Ifremer would continue to coordinate the project. The results of the project evaluation will be known during the first semester of 2012.

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RV Akademik *flying the BIO-OPT project's colours on the research cruise*

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Signing of the GDRE Phoenix research grouping agreement

PHOENIX, A RESEARCH GROUPING ON UNDERWATER SYSTEMS

The European research grouping called Phoenix was officially created in December 2011. It brings together Ifremer, CNRS and the two German institutes Marum and AWI. The objective of this Franco-German alliance is to federate the four research bodies' studies in the field of underwater systems and related technologies (AUV, HROV and system interoperability). The agreement consolidates the already well established cooperation between Ifremer, Marum and AWI: cross development of two HROVs, Marum's purchase of an AUV, installation of the MEBO seafloor drilling system aboard RV *Pourquoi pas?*, etc.

> “Eurofleets puts Ifremer in a pivotal position in terms of integrating and coordinating fleet infrastructures”

Jacques Binot / Valérie Mazauric

Interview

Jacques Binot is a trained naval architect. Amongst other things, he ensured the preparation of the call for tender, then monitored the building of RV *Thalassa*, as well as negotiating and coordinating the partnership between the various stakeholders in the Ministry of Defence for the building of the research vessels *Beautemps-Beaupré* and *Pourquoi pas?*. He is the coordinator of the Eurofleets[1] project and will launch the Eurofleets[2] project.

Valérie Mazauric holds a PhD in underwater acoustics and is specialised in signal processing. Amongst other things, she led the project for the multibeam fisheries echosounder installed aboard RV *Thalassa*. She has been greatly involved in the Eurofleets project since 2008, and is now carrying out increasingly far-ranging tasks. She will be in charge of coordinating Eurofleets2.

Can you tell us about the Eurofleets project?

The Eurofleets project was created in order to integrate the infrastructures and facilities (vessels and vehicles) of the European fleet and open access to it solely on the basis of scientific excellence. Networking and joint technological research complement its range of activities.

Our team was set up progressively, after the project was prepared in 2007 followed by a negotiation phase with the European Union in 2008. This meant presenting the cost structure of eighteen European research vessels in a unified form. The project began on the 1st September 2009 and our team was fully operational for the first intermediate report in 2010.

What assessment can be made for Eurofleets? Why launch its follow-up as of now?

Eurofleets has made it possible to put European fleets “into motion” in a very difficult context of financial crisis and budget cutbacks. In this context of constraints, the project’s impact will grow apace with publications about the cruises financed and with the initial conclusions by working groups for networking.

The Eurofleets label has also enabled some beneficiaries to sign up for their national investment roadmap. Inserting the research fleets in the ESFRI roadmap would be an advance to ensure the visibility of this “small infrastructure” compared to telescopes and particle accelerators.

2013 is going to be an extremely demanding year for us, since the Eurofleets1 project will come to an end, with justification of ship costs from the sixteen cruises financed to be provided and the launching of Eurofleets2 with the beginning of calls for tender for the first sea cruises scheduled in 2014. We feel that this continuity is essential to sustainably establish Eurofleets’ emblematic European calls for tender on the EU science landscape.

Why is Eurofleets important for Ifremer?

Eurofleets is the logical continuation of integration initiatives already launched and successfully completed by Ifremer, either with European partners for the building of RV *L’Europe* or RV *Thalassa*, or with the French Navy and SHOM. It is part of the priorities in the 2009-2012 four-year plan. It puts Ifremer in a pivotal position in terms of integrating and coordinating fleet infrastructures both inside and outside of Europe. Thus, the visibility of our Institute, and of France, in international entente is strengthened by it.

How do other European institutes perceive it?

European institutes are generally highly interested in one or several of the aspects dealt with in the frame of Eurofleets. The project partners have collectively succeeded in proving the feasibility of organising trans-European calls for tender, based on an integrated assessment on the European scale, with transparency in arbitrations and guaranteed scientific quality of the projects selected. This successful integration has motivated the rare adversaries of Eurofleets who worry about losing national control over research fleets and want to maintain selective coordination.

If Europe wants to keep its enviable position on the global oceanographic scene, it must imperatively limit the rise in its infrastructure costs: the Eurofleets initiative is one way to move forward on this path, thanks to the European Union’s confirmed support and significant funding.

Setting up the fleet schedule, particularly that of the ocean-going fleet, is a complex exercise. It involves both satisfying request for scientific cruises that were very well rated, limiting the transit times between each cruise and achieving optimal functioning of the infrastructure. There was an upturn in 2011 shown by 742 days at sea for scientific purposes and this should be confirmed and accentuated in 2012, since almost 791 days have already been scheduled.

2011 CRUISES OF OCEAN-GOING AND COASTAL VESSELS

Setting up the fleet schedule, particularly that of the ocean-going fleet, is a complex exercise. It involves both satisfying requests for scientific cruises that have been very well rated, limiting the transit times between each cruise and achieving optimal functioning of the infrastructure. 2011 showed an upturn, which meant 742 days at sea for science; 2012 should further confirm and amplify this, since 791 days have already been scheduled.

RV Pourquoi pas?

POURQUOI PAS?

• Reprezai-1 (27 December 2010-25 January 2011) was an Ifremer/CNRS mission in the Gulf of Guinea, continuing the studies previously made in the ZaiAngo project, cofinanced by Total-Fina-Elf and Ifremer in the framework of a large-scale effort of subsea exploration (1998-2003). In 2011, the focus was on the internal architecture of the turbidity edifice of the Zaire River and its various channels.

• Wacs (27 January-28 February), was the outcome of cooperation between Ifremer and the Universities of Bremen and Pennsylvania in the Gulf of Guinea. It set out to study the functioning and diversity of ecosystems associated with cold seeps on the margins of the Congo, Angola and Gabon. Twenty dives were made with the ROV *Victor 6000* and core samples were taken at depths ranging from 600-5,000 m to determine the presence of gas hydrates.

• Erato-Fusion (5-23 May) was a SHOM mission designed to experiment the use of an autonomous vehicle (AUV) for bathymetric swath and sedimentology surveys.

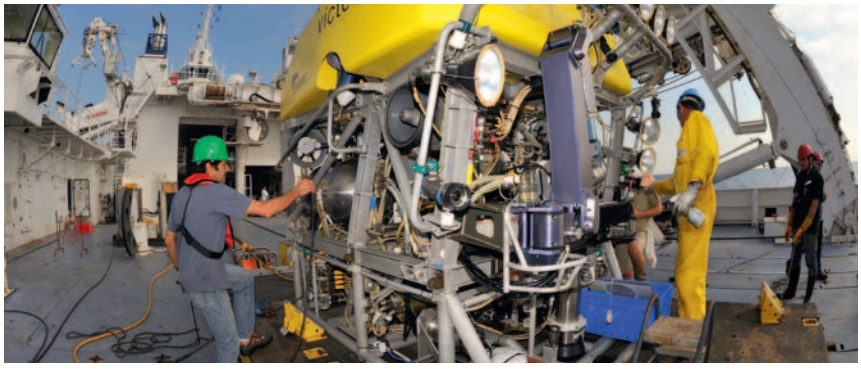
• The Boldmonach cruise (24 May-14 June) enabled the French Navy, in the framework of a NATO exercise, to deploy its large-scale equipment to save a submarine in distress.

• Biobaz/Momarsat (26 June-21 July) was a CNRS-Ifremer mission devoted to maintenance operations on instruments connected to the Esonet observatory put in place in 2010 during the Bathyluck cruise, in the Lucky Strike hydrothermal field.

• Bobeco (9 September-11 October), an Ifremer and University of Ireland mission, proposed to study the communities associated with coral ecosystems and identify deep sea fish species, as well as the impact of fisheries on these communities.

• Guineco mebo (6 November-9 December) was directed by Ifremer and set out to study a pockmark zone in the Gulf of Guinea made up of gas hydrate-rich sediments. Two innovative tools, the MEBO coring system (the University of Bremen's remote-operated corer) and Ifremer's Penfeld penetrometer, were used.

• Congolobe (12 December 2011-10 January 2012) was co-directed by CNRS and Ifremer, and studied the ecosystems of the terminal lobes of the Congo canyon and the fate of river sediments exported by the canyon. This multidisciplinary mission was built upon the Wacs cruise outputs: five sites were studied at depths of 4,700-5,000 m with ROV *Victor 6000*, in order to visualise the biological and geological structures and take samples and various measurements.



Remote Operated Vehicle Victor 6000 aboard RV Pourquoi pas?

L'ATALANTE

• Sanba (14 December 2010-30 January 2011) was a seismics (refraction/reflection) mission conducted in scientific collaboration between Ifremer and the Brazilian Petrobraz oil company, with the purpose of imaging the deep structure of the Santos basin and the Rio Grande plateau.
• The Cascade mission (26 February-20 March) was performed for CNRS, and determined the sedimentary dynamics, transport and mixing of a vein of dense water over the continental towards the continental slope.
• AFFSISM (24 March-21 April) validated the performance of various seismic equipment for the Sercel company in the Mediterranean
• Mirror 1 and 2 (30 May-9 June) were missions by Ifremer and BGR, the German federal institute for geosciences and natural resources. They were devoted to studying the deep structure of the Moroccan margin.
• Demane (12 August-5 September) was a hydrography and physical oceanography mission carried out on behalf of SHOM.
• Futuna-3 (4 November-15 December) will pursue research and studies on new hydrothermal fields, sulphide mineralisations or associated fluids in the context of developing knowledge and promoting the French Exclusive Economic Zone.

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RV L'Atalante*'s bell and forecastle deck*

THALASSA

Each year, RV *Thalassa* performs recurrent cruises (IBTS, Pelacus, Evhoe, Pelgas) for fisheries stock assessments, so that public authorities can determine the common fisheries policy and define catch quotas to be established.

In 2011, RV *Thalassa* proved that it is not only a fisheries science vessel, but can also carry out multidisciplinary scientific missions. Aspex (6-15 August) consisted in recovering an array of twelve current meter moorings on the shelf and slope in the Bay of Biscay.

LE SUROÎT

• Reprezai-2 (13-29 April) was an Ifremer and CNRS mission providing high resolution seismic acquisitions.
• Piratafr21 (1 May-15 June), is a recurrent operational oceanography mission conducted by teams from IRD. In the framework of the international Clivar (Climate Variability and predictability) programme, it studied ocean-atmosphere interactions in the tropical Atlantic and their role in regional climate variability.
• Hydrobs-momar (24 June-4 July) was a University of Brest mission to retrieve hydrophones in the Hydrobs-Momar array used for seismic monitoring of the MoMAR programme.
• SPMPLAC (4-22 July) was an Ifremer mission following up the submission by France to the UN Secretary General, in May 2009, of a preliminary claim document for the extension of the continental shelf off Saint-Pierre-et-Miquelon.
. Apinil (16 September-25 October) was a University of Nice mission on zones of the continental margin off Egypt, where heavy sedimentation occurs and whose accumulation at the top of the continental slope can engender the triggering of devastating tsunamis.

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INSHORE VESSELS

Ifremer's three coastal vessels, RV *L'Europe* in the Mediterranean, RV *Thalia* and RV *Gwen Drez* in the English Channel-Atlantic, as well as the *Haliotis* survey boat clocked up 715 days of activity. They thus made it possible to conduct numerous cruises, essentially devoted to assessing fisheries resources, estimating king scallop stocks, improving gear technology or selectivity and monitoring chemical contaminants and their toxic effects on the marine environment.

RV L'Europe

TRENDS FOR MAJOR FACILITIES IN IFREMER'S FLEET

UPGRADING RV *THALASSA*'S EQUIPMENT AND FACILITIES

The overhaul to reclassify RV *Thalassa* was scheduled for the summer of 2011. Seeing that its scientific equipment had been progressively upgraded since its commissioning in 1997, no large scale modernisation was effected.

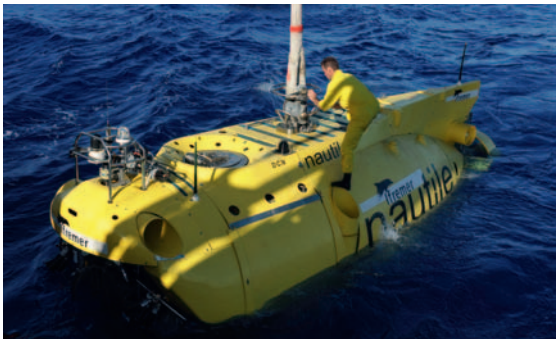
However, improvements were made in terms of the scientific equipment and facilities, by replacing current profilers (ADCP), installing a sounder and replacing the systems for trawl positioning and geometry (Marport solution) and upgrading the software programs. Upgrading of the IT system was also undertaken, replacing the servers and modernising the computers which control the sensors.

OVERHAUL OF *NAUTILE*

Small cracks observed on the main titanium frame of the *Nautile* submersible led to an exceptional overhaul stop lasting six months.

Since its operational start in December 1984, *Nautile* has taken part in 136 scientific, technical or chartered missions on which it made 1,784 dives.

The work to reconstruct and consolidate the frame was undertaken at Ifremer's Mediterranean centre between March and August 2011. On this occasion, major changes were made, with the addition of HD video cameras, installing a new navigation and positioning system and replacing the data management system. After leaving the workshop, *Nautile* performed six test dives during the Essnaut cruise aboard RV *L'Atalante*, from 26 July to 1 August 2011. A deep dive made in the Atlantic at more than 5,700 metres concluded the programme.



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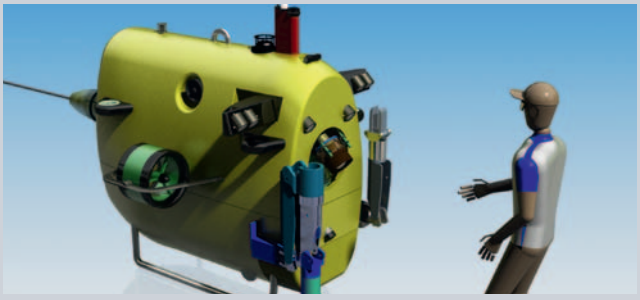
Launching Nautile *submersible*

Developing a hybrid underwater vehicle (HROV)

In the framework of our Institute's four-year contract for 2009-2012 and the CPER project (CETSM European underwater technology centre), Ifremer has engaged in creating a hybrid (HROV), remote-operated (ROV) or autonomous (AUV) underwater vehicle, for coastal and shelf applications. The development takes account of new and emerging requirements related to coastal monitoring, (MSFD, requirements for marine protected areas, WFD, and so on), and coastal or regional programmes, etc. This means providing the scientific community with a means to operate, inspect and perform high resolution (optical and acoustic) mapping, deployed by coastal or regional vessels.



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The project entered its design, development and integration phase in the second semester of 2011, with the choice of an architect-integrator, the ECA company which is specialised in designing and producing automated systems. Technical workshops were set up with the German project partners, Alfred Wegener (AWI) and Marum (University of Bremen) institutes, who are studying the software environment, and with American (WHOI) and British (NOCS) oceanographic institutes working to analyse risks and hazards in deploying underwater drones.

HROV underwater hybrid remote-operated vehicle

> “It is stimulating to be part of strategic developments, anticipating the future and of a vision of evolving technologies and scientific or societal expectations”

Vincent Rigaud

Interview

Based at Ifremer’s Mediterranean Centre, Vincent Rigaud is the head of the Underwater systems (SM) unit.

What developments and partnerships exist in your field and where you are leader?

Developments and partnerships are intimately connected. With the world of industry, we have relationships born of opportunity, complementarity and business developments of our expertise and innovation These include with the Cybernetix company for robotic arms , with the ECA firm in France for the Caliste device to deploy and recover AUVs, with Ixsea for underwater positioning systems, as well as a win-win partnership on AUVs with the Canadian company ISE.

In Europe, we’ve established close relationships with the German Marum and AWI institutions in the framework of the GdRE Phoenix research grouping. European organisations and projects like OFEG and Eurofleets, promote the joint development of instrument modules, including an HD3D video camera with Marum. Globally speaking, our underwater engineering skills are in keeping with those of our two main partners, i.e., Woods Hole Oceanographic Institution (USA) and Jamstec (Japan).

The H-ROV. What is it and what will it provide?

H-ROV is the successor to the remote-operated Victor 6000 vehicle and autonomous vehicles. Its concept is quite novel. It is operated from boats not requiring dynamic positioning, by a small team, which significantly reduces our operating costs.

This ambitious project, which has no successfully completed counterpart worldwide, has significant technological obstacles which are factors for innovation in numerous fields (robotic arms, optics, materials, etc.). It is also a project which is extremely federative within Ifremer. The main innovations, resulting from the Institute’s own research studies, must meet the expectations of the scientific community and correspond to solutions which can be commercially developed by our industrial partners. Ifremer’s H-ROV will be operational for its first scientific mission in 2014.

For Ifremer, what will vehicles of the future be like?

They will be mobile, communicating systems which are connected to each other, with new architectures, new components and greater autonomy. The operational systems will be “smart” systems and we’ll have them navigate in fleets to take advantage of their complementarity, or we’ll configure them to link them up to platforms installed on the seafloor. They will truly be mobile underwater observatories.

These vehicles will be adapted first and foremost to new strategic sectors, such as sustainable exploitation of mineral resources or mapping of biodiversity, for example.

How is Ifremer perceived in this highly specialised business?

The Institute has always been seen as a pioneering organisation of excellence in the field of underwater technologies. Historically speaking, it has been the French scientific community supporting the use of our underwater systems. Broadening these uses to the European scale, as prefigured by the Eurofleets projects and the partnership in new developments in keeping with the CETSM’s ambition, is vital for our development. Pursuing partnership actions with industrial firms or other institutions is also necessary in order to consolidate and created commercial uses for our skills and capacities to reinforce our world-class position.

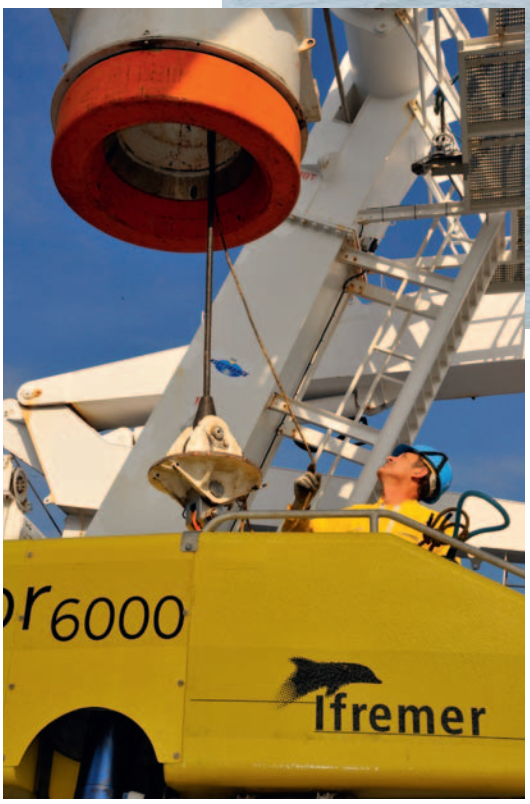
Personally speaking, what does your job bring you?

What I like is the dynamic aspect of the activity. It’s built on a historic foundation of expertise and references and leads to passing on the torch from generation to generation in an evolving environment. It is stimulating to be part of strategic developments, anticipating the future and of a vision of evolving technologies and scientific or societal expectations. However, as an engineer, you also learn a lot from tactical aspects, in setting up projects which contribute to these changes, setting up teams, consolidating knowledge acquired and making skills progress. Finally, on the human level, the biggest motivation truly comes from the collective resource found in these projects: seeing technicians who file patents, engineers who roll up their sleeves and dig in and admin staff who identify with our results, are all part of the joys of my job.

DEVELOPMENT, MAINTENANCE AND PROMOTING COMMERCIAL USE OF SHIPBOARD SOFTWARE

Ifremer maintains and enhances some fifteen products which cover the entire process, from acquisition to databasing.

In the frame of its strategy to develop, maintain and promote the utilisation of shipboard embedded software, our Institute has focused on maintaining a service activity to the user community. Developing commercial use of software is also a crucial orientation. Currently, the software is set up on two-hundred-fifty sites, including a hundred in foreign countries. Nationwide harmonisation of tools, particularly software for acquisition and real-time display, is also an important strand in this policy. On the international level, software programs developed by Ifremer teams are being installed on ocean-going vessels and vehicles of British, Dutch and Australian research institutes (NOCS, NIOZ and Csiro).



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DEVELOPING A NEW COASTAL SUB-BOTTOM PROFILER

Sub-bottom profilers (SBP) are acoustic equipment used to visualise the sedimentary layers buried under the seafloor to depths reaching several tens of metres. A new SBP built into a towfish device is being developed at Ifremer. It is designed for acquisitions in additional zones to those covered by the *Haliotis* survey launch (to depths of 20 metres) and by ocean-going vessels (reaching over 3,000 m in depth).

Trials in test and flume tanks conducted in August and October 2011, led to an initial validation of the electronics in power output and reception and of the hydrodynamic behaviour of the towfish. Sea trials were run on the first prototype of the full system aboard RV *Thalia* in November 2011 with highly positive results, both for the profiler, deployment and hydrodynamics.

TECHNOLOGY TRANSFER WITH NIOT

The DCNS firm joined forces with Ifremer as a major declared subcontractor in order to bid in the Indian NIOT (National Institute of Oceanography Technology) call for tender to supply a deep sea manned submersible, in the framework of a contract paired with a technology transfer. Two bids, including that of DCNS, were selected and the first technical examinations were held at NIOT.

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> “Dynamic performances approximately 20% higher than those of existing systems”

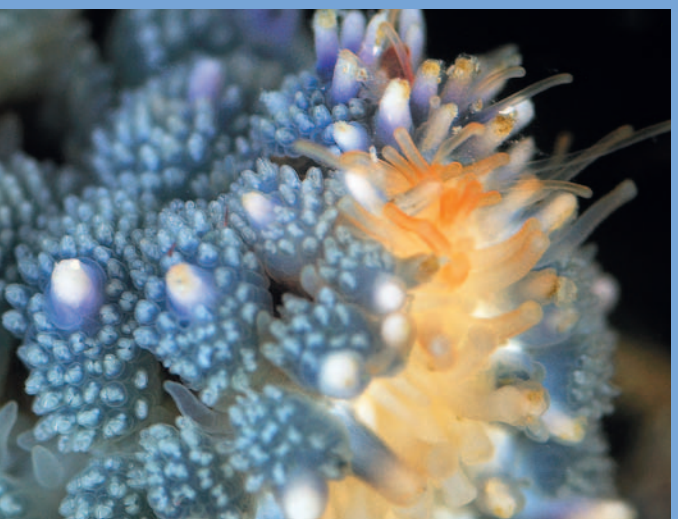
FIRST SEA TRIALS FOR SEAEXPLORER GLIDER

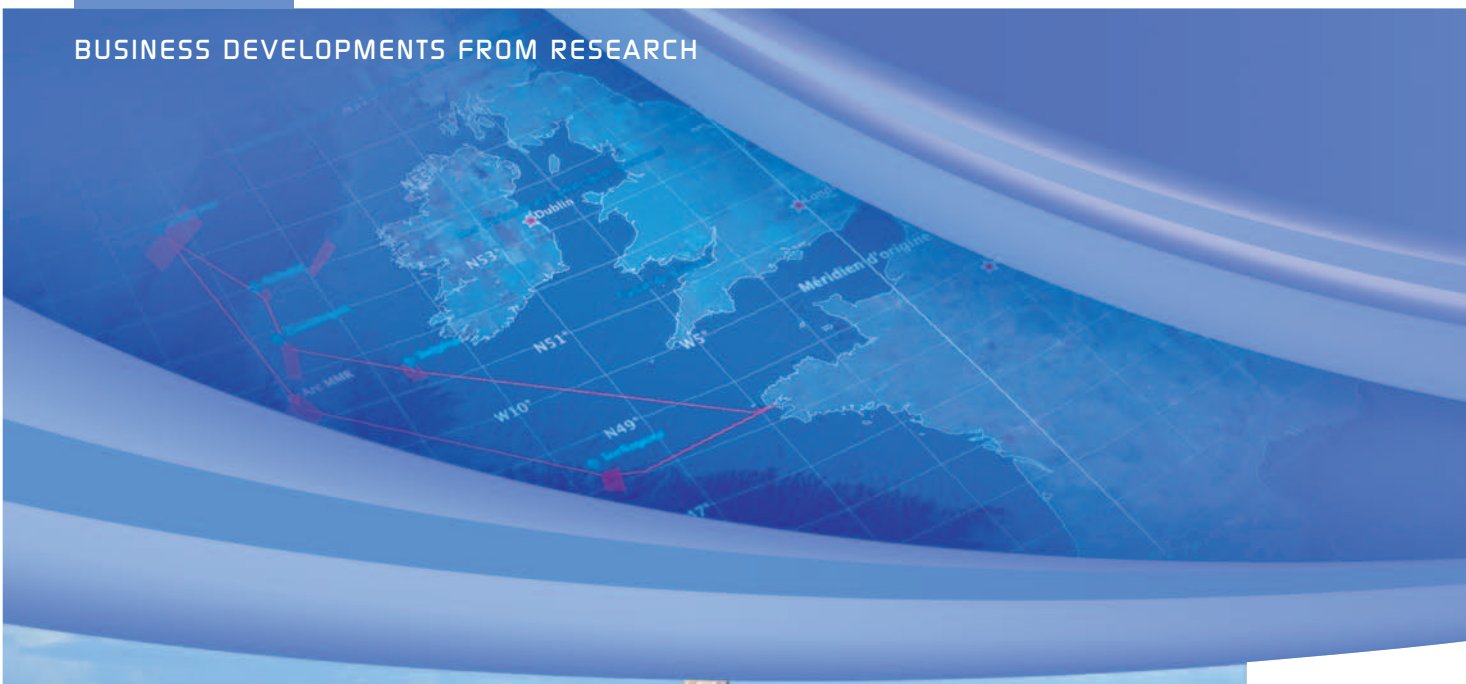
The PACA marine cluster approved SeaExplorer glider is the outcome of collaborative work between the ACSA company (Alcen group), Ifremer and the Acri company for the vector and CNRS oceanology laboratories in Villefranche-sur-Mer (LOV) and Marseille (COM) for utilisations and sensors. The first prototype of the French subsea glider's industrial supply chain performed its trial operational mission off Nice. The vehicle covered 70 kilometres under extreme sea conditions, escorted by RV *L'Europe*. The project's initial expectations were validated, with dynamic performances (velocities, gyration angles, range, etc.) which were approximately 20% higher than those of existing systems, due in great part to the hydraulic driven ballast propulsion developed by Ifremer. Two pre-series prototypes are being manufactured and will join CETSM's fleet of gliders. ACSA launched the commercialisation of its oceanographic glider in an international context dominated by American suppliers.

© ACSA


know-how
innovation
technology
transfer
observation
expertises
regional
partnership
lagoons

BUSINESS DEVELOPMENTS FROM RESEARCH




Dublin
N53°
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Méridien d'origine


DCN
ifremer

Developing regional partnerships with local authorities

© Ifremer/Olivier Dugornay

Ifremer's English Channel-North Sea centre

Reconcile expertise and support for local policies and an active scientific cooperation approach on national, European and international scales

Ifremer is directly involved in the economic activity of coastal regions though research work, monitoring surveys and actions related to ecosystem protection, surveillance and management of coastal risks. Through its regional teams, our institute maintains close links with local authorities and with the marine and maritime professionals and value chains. In accordance with the priorities set out in the four-year contract, Ifremer is pursuing an active approach for regional partnerships with research bodies, PRES research clusters and universities, as well as contributing to numerous European and international projects.

On the local economy scene, Ifremer is one of the main partners in world-class competitiveness clusters like the Brittany and PACA marine clusters, or national clusters such as Aquimer. Numerous certified projects related to our research themes (marine technologies, biotechnologies, biofuels, safety, sustainable development, etc.) are being conducted in cooperation with industrial firms and regional economic players.

ENGLISH CHANNEL-NORTH SEA SEAFRONT

FAVOURABLE OPINION FOR THE TROIS ESTUAIRES MARINE NATURE PARK

The final project for the marine nature park at the opening of three estuaries, i.e., the Somme, Authie and Canche, was submitted for public inquiry. In October 2011, Ifremer's Channel-North Sea centre provided a favourable opinion on the park's environmental and fisheries aspect. Thanks to the active contribution of scientific teams, the Institute supported the largest of the possible perimeters suggested, specifying all the same that this does not cover all of the marine ecosystems (spawning grounds, flat fish habitats, etc.).

CREATING A NEW CLUSTER OF EXCELLENCE

The Campus de la Mer scientific interest grouping (SIG) became official on 2 December 2011. It brings together all of the laboratories, training centres and organisations for business development and research in the University Lille Nord de France PRES cluster concerned by the English Channel-North Sea coastal and shore area. During the day's event, Ifremer presented the activities of its Channel-North Sea centre and co-facilitated a working group on "development and utilisation of scientific data related to the marine environment".

HOST LABORATORY OF THE NORD-PAS DE CALAIS DOCTORAL SCHOOL

Since late 2011, Ifremer's Channel-North Sea centre has joined forces with the doctoral school for Science of matter, radiation and environment (SMRE). The Fisheries resources laboratory in Boulogne has become a host laboratory for the doctoral school, thanks to the HDR accreditation to supervise research held by several scientists on the team there.

"NOUVELLES VAGUES" INNOVATION PLATFORM

Ifremer backed and supported the "Nouvelles Vagues" (new waves) innovation platform project, sponsored by the Aquimer competitiveness cluster, approved in September 2011. This is a limited company so rather than acquiring an equity stake in it, the Ifremer Channel-North Sea centre has thus been able to contribute to the steps to create the entity and to its scientific content. This tool will combine both a technological developments department (the former Haliomer) and an aquaculture pilot station.

Stronger cooperation on the subject of climate change

The aim of the Clarec Airborne laser surveys of coastal environment risks project is to study the consequences of climate change on hazards which could affect the seafront in regions located between Mont Saint-Michel bay and the Belgian border. Being present in the project though participation in the former UMR 100 joint research unit (with the University of Caen Basse Normandie), Ifremer has undertaken steps to pursue this partnership with the scientific interest grouping.

A REGIONAL NETWORK FOR APPLIED ENVIRONMENTAL SCIENCES

Ifremer joined the new federative research body for applied environmental sciences (SFR Scale) following its assessment by Aeres in 2011. In the framework of its new four-year contract, the SFR Scale organisation, made up of the environmental science and socio-economics labs from the Universities of Rouen and Le Havre, broadened its reach by bringing in laboratories from Lower Normandy. Scale federation research is focused on a major study site on the scale of Europe. This is the highly industrialised area covering the lower Seine valley and its estuary, catchment and coastal area. Ifremer teams from the English Channel-North Sea Centre will help strengthen marine expertise and skills for both the environment and resources.

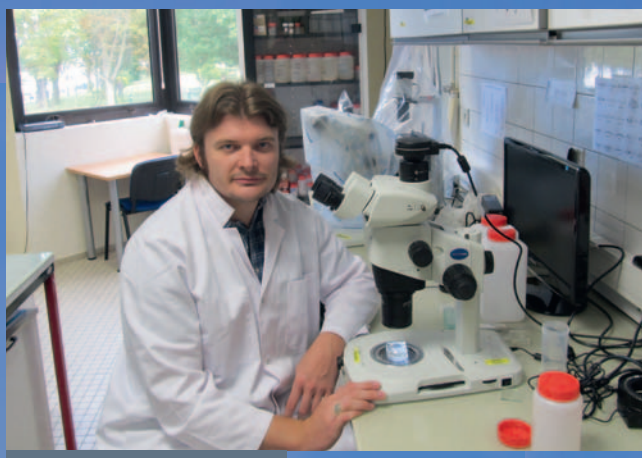
CREATION OF THE OYSTER REFERENCE CENTRE

Ifremer took part, along with the French State and local authorities in the Lower Normandy region and the Calvados and Manche departments (= counties), the joint consortium for coastal amenities (SMEL), the university of Lower Normandy (UBN) and the regional shellfish farming committee of Normandy, in creating the oyster reference centre (CRH).

At the CRH, expertise falls under four major lines of research: summer die-offs, mortality events linked to the presence of pathogens, trends and modelling of shellfish farming ecosystems and ways to improved growing practices, associated with projects for diversification.

This ambitious organisation aims to federate and coordinate the various programmes conducted in the region (research, experimentation and technical support) to the benefit of the oyster farming sector, to facilitate exchanges and communication between the signatories and to provide advice on any project proposed for funding by regional entities and which falls within its realm of expertise, to develop specific or multidisciplinary programmes of investigation and national or international collaboration. It also aims to facilitate access to large-scale facilities and ensure better dissemination of knowledge, especially to stakeholders in the shellfish farming supply chain, and to regularly summarise the studies underway in order to redefine the direction of programmes or define new ones.

> The CHARM project has increased our knowledge on several levels about the functioning of the Channel-North Sea ecosystem



Christophe Loots

Interview

As a researcher in marine habitat ecology at the Fisheries resource laboratory in Boulogne-sur-Mer, Christophe Loots is specialised in the study of ichtyoplankton, i.e. plankton phases (eggs and larvae) in the life cycle of fish. His studies aim to better understand the factors influencing this distribution over time and space and those which have an influence on recruitment, a key phase in the life cycle which ensures the renewal and maintaining of fish stocks.

You are currently working on the multidisciplinary CHARM 3 project. Can you tell us about it?

Yes, we are just winding up this project which brought together seventeen Franco-English partners for a three year period, to work on an ecosystem-based approach to the English Channel-North Sea maritime area. This is a fairly recent approach which consists in addressing all the research themes related to the ecosystem, from biology to legislation and including socio-economic aspects. It is an innovative and essential approach for the future, which aims to better understand the ecosystem as a whole, better manage it and protect it from overexploitation and climate change. The CHARM project has increased our knowledge on several levels about the functioning of the Channel-North Sea ecosystem in the framework of the Channel programme study led by Ifremer. I had previously taken part in the phases 1 and 2 of the project. With the final phase comes the completion of very fine research work and the beginning of new projects more specifically targeting each of the themes addressed in CHARM, and particularly that of ichtyoplankton.

How can we make Ifremer's influence be felt by its various partners?

In the current research system, the best way for an institute to make its influence felt by partners is to participate in major European or international research projects, and to publish papers on its research in the main scientific journals. Ifremer renown also relies on the exactness of its expert advice rendered in the framework of collaborative work or outsourcing with stakeholders in the socio-economic realm like EDF, fisheries committees, DPMA, etc. These public or private sector partners generally turn to Ifremer because they recognise the expertise of its teams and know that the Institute is a reference, particularly in the field of fisheries science.

As a young researcher, what is your perception of science and your job?

When I decided to work in marine ecology, working at Ifremer represented the ultimate outcome of all those years of study. I had, and still have, this image of Ifremer as being the Institute of reference in the marine science field, like other major Institutes in Europe like Cefas (United Kingdom) or Imares (The Netherlands). That's why for me, being part of the Institute is a source of great pride and immense gratitude. My first long-term objective is really to inject new enthusiasm to the topic of ichtyoplankton, because it is a field of capital importance in understanding fish stock dynamics. I'd like to see the discipline recover its rightful place within Ifremer. I am aware that this will be a long-term endeavour, because everything remains to be done: setting up projects, finding collaborative partnerships and financing, and so on. Also, our studies usually extend over several years or even decades. Often when people think of scientists, it is often of their caricature in a white lab coat, working all alone in the laboratory. Today, research work is often done with the help of students on placement, PhD students and post-doc fellows. Being a researcher is not a job like any other. It is above all a job of passion, in which much curiosity, humility and the ability for teamwork are required. It's up to us to make our work better known to the general public.

BUSINESS DEVELOPMENTS FOR MARINE RESOURCES

Ifremer has undertaken discussions with the joint consortium for coastal amenities (SMEL) to renew our partnership. SMEL's mission is to promote the expansion of economic activities related to living marine resources in the Manche county. New potential pathways have been redefined in order to draw up a framework agreement and a technical document describing the actions being considered.

OPEN-HOUSE DAYS AT PORT-EN-BESSIN

For the "science festival" in October 2011, the Ifremer station at Port-en-Bessin held an open house for schoolchildren and the general public. The scientists present gave them the opportunity to discover jobs and research themes, such as shellfish farming resources, fisheries, marine environmental monitoring, metrology, estuarine environment and land and sea-based equipment and facilities.

Displays in the laboratories, mini-lectures on scientists' contribution to fisheries management and on excess mortality of oyster spat, as well as two exhibits ("women and seas" by Ifremer and "where land and sea meet" by the Seine-Normandie water authority), raised the awareness of four-hundred visitors and seventy high school students about Ifremer's work on the coasts of Normandy. Numerous articles published in the local press greatly contributed to making this day-long, public-oriented event a success. Local elected officials and the technical and financial partners of the Ifremer Channel-North Sea centre were also invited for a more specifically tailored tour.

> "400 visitors et 70 high school students aware about Ifremer's work on the coasts of Normandy"

©Thierry Nectoux-Chambre noire

7th Economy of the Sea congress in Dunkirk

IFREMER, PARTNER IN THE ECONOMY OF THE SEA CONGRESS

Being a major player in the marine environment, Ifremer was a partner in the 7th Economy of the Sea congress event which took place in November 2011 in Dunkirk. This annual gathering of economic and political decision makers for the sea and shore attracted over 1,200 stakeholders from the maritime sector. The closing speech was given by the Minister of ecology, sustainable development, transport and housing, Nathalie Kosciusko-Morizet.

Ifremer presented its studies on utilisation of the treasures of the sea and took the opportunity to meet various institutional and industrial partners. Ifremer's President-Managing Director, Jean-Yves Perrot, introduced the session on marine renewable energy sources. Scientists from the Boulogne centre also held discussions with students from the maritime sector in the frame of the "Students of the sea" operation. Finally, congress attendees saw an excerpt of the exhibition called "Women and seas", highlighting Ifremer's visibility and its high-quality photo library.

BRITTANY SEAFRONT

NEW MARINE CLUSTER PROJECTS IN 2011

Since the Brittany Marine Cluster was created in 2005, Ifremer has been a partner in sixty-five certified projects, making it the top-ranking partner in terms of number of projects and resources utilised. 2011 was a better than average year, since fourteen projects involving Ifremer received Cluster certification, with six of them coordinated by our Institute. They deal with subjects like perfecting automated analysers for pollutants in the marine environment, optimising black pearl farming in French Polynesia, using seismic waves to study ocean stratification, small-scale scattering of energy in the ocean or the effects of chemical contaminants on Pacific oyster survival.

A REGIONAL RESEARCH NETWORK

In 2011, Ifremer chaired the Regional conference of representatives major research bodies present in Brittany (Coreb) informally bringing together eleven French research organisations. The Conference was solicited in the work to draw up the *Idex Innovation Campus Ouest* project, and it contributes to the studies of the Regional advisory committee for technological Research and Development of Brittany (CCRRDT), particularly in the framework of awarding regional PhD grants.

IFREMER, PARTNER IN EUROPÔLE MER

Ifremer is one of the main partners, along with the University of western Brittany (UBO), CNRS and Pierre & Marie Curie university, in the Europôle Mer scientific interest grouping. With the objective of increasing the SIG's global visibility, a mission was organised in 2011 at Woods Hole Oceanographic Institution (USA), with which Ifremer had already signed a partnership agreement. This mission aimed to reinforce relations between SIG partners and the institution and to present the future activities of the Labex "Mer".

IFREMER'S EXPERTISE IN REGIONAL INSTITUTIONS

Ifremer takes part in the social economic and environmental council (Ceser) of Brittany, the only of these councils in France to have a section which is specialised in "Sea and shore". In 2011, Brittany's Ceser published two important reports:

- a detailed assessment of coastal ecosystems and their economic and heritage value. Ifremer's Brittany centre supplied the documentation for the section concerning living resources and environmental quality. The report was designed as a decision-making aid and contains recommendations for sustainable management.
- The document on "Green tides in Brittany: for a shared diagnosis to assure efficient actions" formulates a consensus-based approach for the diagnosis and recommendations to reclaim water quality in the environments affected. This report is based in great part on documents and expert appraisals by scientists from the Ifremer Brittany centre, in explaining the environmental conditions which govern the "green tide" phenomenon.

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Ifremer Brittany centre

MARINE SCIENCES AND TECHNIQUES MEETING IN BREST

Carrying on from the Investments for the future - initiatives for excellence submissions, several projects gave rise to thorough preparation involving numerous contributors. Within these dynamics, Ifremer researchers and engineers from the Brittany and Atlantic centres actively contributed to holding the Marine sciences and techniques meeting organised by the Axe Mer Ouest SIG in Brest in May 2011. The meeting gathered contributions from partners in Brittany and the Loire region working in the fields of marine environmental observation, deep seafloors, exploiting marine biodiversity, the ecosystem-based approach and the economy; hydrodynamics, etc. This meeting, intended to lay the foundations for a large "marine" assemblage, reasserted the drive and ambitions for marine research excellence in western France.

STEPPING UP RELATIONS WITH UNIVERSITIES

The French Universities Freedom and Responsibility Act (LRU) has deeply modified the nature of cooperation between Ifremer and universities. Collaborative work has grown with the University of western Brittany (UBO), whose European Institute for marine studies (IUEM) is right next door to Ifremer's campus. Thus, the IUEM began the construction of a building in 2011 which corresponded to the third stage of construction on a plot of land sold by Ifremer to UBO the same year. This geographic proximity will enable the staff from the Amure (Ifremer-UBO) and LPO (Ifremer-UBO-CNRS-IRD) joint research units (UMRs) to be regrouped in 2013. Finally, in 2011 Ifremer joined a fourth UMR joint research unit called Lemar (Ifremer-UBO-CNRS-IRD). These changes show the move towards working more closely, which should continue in future.

Constituting a regional spatial observatory

The Brittany Remote Sensing scientific interest grouping (GIS Bretel) has existed since 2009. Télécom Bretagne, Ifremer, Universities of Rennes 1 and 2, CNRS, UBO, INRIA and Agrocampus-Ouest have joined forces to develop research, studies and training in the field of remote sensing and remote environmental monitoring. The regional council of Brittany, which considers satellite observation as one of the major stakes for research, launched the project in consultation with organisations in the territory. This SIG in Brittany has a global calling. Tools promoted by the SIG supply invaluable data for the analysis of the ocean's surface state (swell, pollution, shipping, etc.) as well as for the hydric status of zones on land. Ifremer's Brittany centre makes its contribution via the spatial oceanography laboratory (LOS).

AN ASSESSMENT OF INVESTMENTS FOR THE FUTURE IN BRITTANY

In the first series of calls for proposals under the investments for the future programme, Ifremer teams in Brittany were selected in five projects chosen by the General commissariat for investment (CGI). This included the NAOS project for "Observation of the global ocean for study and forecasting of the ocean and climate: preparing the next Argo decade" and the France Énergies marines IEED institute of excellence in low-carbon energy.

• On 25 March 2011, the French State announced that the laboratory of excellence named "Ocean in change" was one of the 100 laboratories of excellence selected under the national investment loan scheme. It is built along seven lines of research, bringing together eleven university labs and research bodies, making two-hundred-ninety researchers and engineers and one-hundred-seventy PhD students and post-doc fellows in all. This Labex was launched on 3 November 2011 at the IUEM institute of the UBO, university of western Brittany, which sponsored the project. One third of the Labex researchers belong to Ifremer's Brittany centre. The main objectives sought by the Labex are international excellence in research and teaching of marine sciences, transfer of research results to professionals and the general public, assistance for public policy decision-making and the sustainable management of oceans.

• Another project also selected on 25 March 2011, called Idealg "Biotechnologies for exploitation of macroalgae", aims to make the supply chains utilising large seaweed in France more competitive and to respond to societal challenges for sustainable production and quality of algal resources. It is sponsored by the biological station of Roscoff (UPMC-CNRS). Two research scientists from Ifremer are contributing to the project, in which Ifremer is a partner.

• Sponsored by the Carnot institutes of Cemagref, BRGM and Ifremer-Edrome, the project called Sensors and data for environmental quality of water and soils (Captiven) aims to increase the efficiency of metrological equipment and means used to monitor risks and reduce the impacts of global change while utilising the resources of the environment. Ifremer will contribute to the project through its array of Marel buoys and seafloor observatories.

©Ifremer/Jérôme Huet

Macroalgae

CREATION OF THE MARITIME COUNCIL FOR THE SEAFRONT

Ifremer is a major player in the implementation of the Marine Strategy Framework Directive (MSFD). Under the aegis of the MEDDTL and in partnership with the Marine protected areas agency, expertise was mobilised in Brest and Trinité sur Mer to work on the initial assessment of ecosystem baselines and on defining good environmental status. The implementation of this framework directive will rely on a new organisation provided for under the Code of environmental law and called the seafront council (CMF). It will be in charge of drawing up an action plan for the marine environment (PAMM). The North-Atlantic-Western Channel (NAMO) CMF was created in November 2011 and Ifremer is a participant.

MAJOR RESEARCH INFRASTRUCTURES (MRI)

In relation to the European Commission's research infrastructures approach (Esfri), France has determined which large research infrastructures will receive adequate funding support from the Ministry of Higher education and research (MESR). For Ifremer, three large infrastructures, all located in the Brittany centre, were selected. They are the scientific fleet grouped within the French oceanographic fleet UMS research unit, the ARGO floats array in the open ocean and the seafloor observatories. The first two were audited by the MESR in 2011 in order to accurately determine the full real costs of access to these infrastructures and the perimeter of potential users.

MAPPING OF KELP FORESTS

Ifremer has taken part in the activity and missions of the Iroise marine nature park since its creation in 2007. In 2011, the Brittany centre conducted a mapping study of forests of Laminaria seaweed exploited by fishermen, including sustainability criteria in compliance with the park's objectives. An experiment in regulated fishing areas for spiny lobster in the isle of Sein causeway was also set up in 2011.

© Ifremer/Michel Gouillou

Speech by Ifremer's President-Managing Director at inauguration of the "Commandant René Chauvin" building

INAUGURATION OF THE "COMMANDANT RENÉ CHAUVIN" BUILDING AT THE BRITTANY CENTRE.

Entirely financed by the government's reflation plan, the building named for Commandant René Chauvin (the first director of the Brittany oceanological centre at the Cnexo from 1969 to 1973) was inaugurated on 6 December 2011 on the Ifremer centre's site in Brest. Technical teams from Genavir (eighty employees) will work there.

The building has 650 m² of workshops and 1,500 m² of storage platforms and office space, financed to the amount of 2 million euros. This had become a necessity, seeing the changing fleet and the generalisation of large, sophisticated equipment and facilities, part of which is moveable (containers). The building now provides the different areas and means required to prepare research cruises in a single place.

The building was constructed in an eco-responsible, sustainable approach, aiming in particular to limit water and power consumption. For instance, an underground tank will collect rain water to be used rinsing and washing containers returning from missions. The multi-cell cladding of the building insulates while letting light through, meaning that less artificial lighting is needed.

CREATING A TOOL TO MANAGE BUILDINGS AND PROPERTY

In keeping with a national mandate, Ifremer's Brittany centre ensured the implementation of the computerised management tool for the Institute's buildings and property (GIPI) based in Brest. Its objective is to have comprehensive knowledge about the buildings available and to monitor on a daily basis the floor space in use, to put all the sites into a functional scheme and to control budgets. In 2011, this software tool made it possible, working in collaboration with the legal department, to approval from the France Domaine authority for Ifremer's multi-annual real estate strategy plan (SPSI).

"ARCHIVES AND HISTORY" DAY

On the 150th anniversary of the maritime fisheries technical service, a forerunner of Ifremer, a day devoted to Archives and History was organised by Ifremer's "Archives and intellectual heritage service" based in Brittany, in October 2011. Over one hundred participants took part in the events, which included a meeting of archive correspondents and guided tours of the service, a conference on "Victor Coste, fisheries inspectors and the maritime fisheries technical service" and an exhibition, followed by a cocktail party. A history booklet was also circulated for this anniversary. Articles appearing in the press and an interview *France Bleu* radio drew the public's attention to our Institute's activities.

© Ifremer/Michel Gouillou

RV L'Haliotis *and its trailer-truck in the buildings of the Genavir storage platform at the Brest centre*

REGIONAL PARTNERSHIP

In the framework of close ties between Ifremer and institutional authorities, Isabelle Thomas, who is the vice-chairwoman of the Brittany Regional Council in charge of the sea and coastal protection, visited the Ifremer centre in Brest in January 2011. Topics related to shared issues, like marine energy sources, Ifremer's Sextant cartographic data server, fisheries resources and the benthic monitoring network (Rebent) were focused on. She was accompanied by the Head of the Fisheries and aquaculture service and by the manager of the Coast and integrated coastal zone management (ICZM) cluster.

ATLANTIC SEAFRONT

© Ifremer/Jean-Pierre Baud

General view of Ifremer station at Bouin and the new buildings of the regional innovation platform

REGIONAL RESEARCH PROJECT ON TOXIC MICROALGAE

Inshore waters of the Pays de la Loire region are regularly affected by *Dinophysis* microalgal blooms, responsible for food poisoning in bivalve mollusc consumers. Since 2010, the Pays de la Loire region has financed the Dinophag research programme aiming to find ways to optimise monitoring and limit the impact of these toxic microalgae on the coasts there. In order to develop, *Dinophysis* needs two other species of plankton, whose culturing is a prerequisite to studying its development and toxicity in the lab. Dinophag researchers have already begun cultivating the first species. Presentation of the results is slated for June 2012.

Biotechnologies for sustainable aquaculture

An international scientific workshop was organised by Ifremer at La Rochelle in October 2011, in the context of the Aquagenet project This project is funded by the EU Interreg IVB programme on the theme of "Genomic approaches for aquatic species. How next generation sequencing can help to improve breeding and sustainability of farmed aquatic resources.".

Supported by two biotech firms - Roche and Illumina - the scientific workshop was attended by a hundred participants, scientists and stakeholders from French and foreign fishfarming and shellfish farming supply chains. The focus was on the relevance of using new generation sequencing (NGS) technologies and their applications for fish, molluscs and their pathogenic agents (bacteria, parasites and viruses).

These innovative tools open up new possibilities in the field of aquaculture or of biodiversity, particularly in selecting populations (wild or farmed) able to resist a pathogen. "Marker assisted selection" also enables farmed populations whose features are interesting for aquaculture (for instance, rapid growth) to be selected before the characteristics are even expressed or can be spotted using classic selection methods.

INVESTMENTS FOR THE FUTURE: THE "COTE" LABEX

Ifremer is one of the five entities supervising the laboratory of excellence called "COTE" along with the University of Bordeaux, INRA, CNRS and the National Research Institute of Science and Technology for Environment and Agriculture or Irstea (formerly called Cemagref). This Labex, selected in the first series of investment for the future projects, studies three types of regional ecosystems (agrosystems, forests and coasts) from the angle of their evolution, adaptability and governance. Ifremer is present through the Biogeochemistry and ecotoxicology research unit in Nantes and the Environment Resources laboratory in Arcachon. The COTE Labex involves approximately three-hundred-fifty people belonging to ten partner research units.

ANNUAL MEETING OF THE NATIONAL REFERENCE LABORATORIES

Organised by Ifremer's Genetics and pathology laboratory at La Tremblade, as a European Union Reference Laboratory (EURL) for mollusc diseases, the annual meeting of National Reference Laboratories (NRL) was held in March 2011 in La Rochelle.

Thirty-eight participants from fifteen countries attended the meeting, as well as a guest scientist from the United States and a representative from the European Commission's Directorate General for Health and Consumer Protection (DG-Sanco). Various subjects were addressed during the day: an overview of the epidemiological situation in each country, abnormal mortality or die-offs of Pacific oysters and the virus *OsHV-1 uvar*, the animal health situation of natural populations of cupped *Crassostrea Gigas* oysters, the EURL's activities such as organising inter-laboratory trials and setting up a system to observe scanned histological slides.

The gathering was followed by a day of practical sessions organised within the lab on detecting and quantifying *OsHV-1* using real-time PCR (polymerase chain reaction) and detecting the parasite *Perkinsus marinus* in histology studies.

DEVOTING CONSIDERATION TO THE VULNERABILITY OF COASTAL ECOSYSTEMS

© Ifremer/Sophie Pilven

Round table at Biarritz Symposium: from left to right, Philippe Bertrand (CNRS/INSU), Patrick Prouzet (Ifremer/DS), Paul Holthus (DG/WOC), Prof. Louis Legendre (UPMC) and Michel Porcher (Ifrecor).

The international symposium on the "vulnerability of coastal ecosystems to global change and extreme events. At the crossroads of knowledge to the benefit of coastal and marine ecosystem services" was jointly organised by Ifremer, CNRS and the Centre de la Mer in Biarritz. It was held in Biarritz in October 2011. More than one-hundred-fifty papers and posters from some fifteen countries provided a focus on scientific knowledge about the observation of coastal ecosystems, their evolution and capacities to adapt to the impacts of climate change and human actions. The symposium, combined with the Oceanovation forum, attracted managers, enterprises and users from the fields of observation, forecasting and reducing the natural and anthropogenic impacts on marine ecosystems. A conference and exhibitions on the the wide range of fauna and landscapes, diversity and restoration of maritime heritage, were also programmed for the general public.

RENOVATING IFREMER'S BOUIN STATION

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General view of Ifremer station at Bouin and the new buildings of the regional innovation platform

In 2011, extensive renovations were made at Ifremer's station at Bouin with the aim of creating an appropriate site for the missions of general interest performed for the shellfish farming sector. This includes controlled maturing of tetraploid *Crassostrea gigas* oysters, seeking procedures to protect molluscs from toxic microalgae, controlled introduction of *C. gigas* strains from European and third countries while ensuring mastery of effluents, and so on. The work was also carried out so that researchers from other institutions can be hosted, thus promoting exchanges and development of research on shellfish farming conducted at the station. This operation received significant funding from the Pays de la Loire region in the framework of its policy to support Regional innovation platforms (PRI). The PRI at Bouin will thus act as a demonstrator with nationwide or even European influence. It will be operational as of spring 2012 for the deployment of the project called Score, dealing with "collective selection of Pacific oysters for purposes of guided capture" and hosting two staff members from the National shellfish farming committee (CNC) for a three-year period.

AQUAREF DAYS DEVOTED TO PASSIVE SAMPLERS

In the framework of the Aquaref National reference laboratory's activities for aquatic environmental monitoring, in November 2011 Ifremer organised a two day event on the Nantes site, with financial support from the French national agency for water and aquatic environments (Onema). It was devoted to passive samplers: a workshop presenting the results of the intercomparison exercise organised nationally, followed by the Aquaref seminar on "passive samplers and alternative sampling techniques".

This intercomparison exercise was performed in 2010 to monitor three families of contaminants (polycyclic aromatic hydrocarbons, pesticides and metallic contaminants) in surface waters. It was coordinated by Irstea in collaboration with BRGM, Ineris, the National metrology and testing laboratory (LNE) and Ifremer, and brought together twenty-four French and European expert laboratories.

There were seventy-five participants at the seminar, including scientists and representatives from the water authorities, Onema and the MEDDTL ministry, and the two industrial partners Veolia and Suez-Environnement. Three themes were addressed: use of passive samplers in a regulatory context; their application to different types of water bodies and the assessment of intercomparison trials These two days of discussion were an opportunity to focus on the potential of these tools to contribute to assessments of chemical status of water bodies in regulatory contexts like those of the Water Framework Directive (WFD) and the Marine Strategy Framework Directive (MSFD).

THE NEW SKILLS CLUSTER FOR WESTERN FRANCE

Western France's cluster of expertise in food and agrifood system sciences and technologies (Pôle Ouest ASAA) is a scientific interest grouping started up by institutions of higher education and research of the Ministry of Agriculture present in the Brittany and Pays de la Loire regions (Agrocampus Ouest, Oniris, INRA, Ifremer, Irstea and Anses). The grouping, which notably covers the fisheries processing supply chain, has replaced the Ministry of Agriculture's previous skills-based SIG for western France, which ended in March 2011. It plans to incorporate the universities of both regions, Brittany and Pays de la Loire, in order to unite all partners concerned by these new challenges.

SETTING UP THE SEA AND COASTAL RESEARCH FEDERATION

The Aeres evaluation was positive for the creation of the marine and coastal university institute research federation (IUML) bringing together research teams from the University of Nantes, Ifremer and Ecole Centrale, i.e. some four-hundred individuals. The scientific project for the period from 2012-2015 is based on five orientations. They are biodiversity and coastal environment; exploration and utilisation of marine resources marines; marine systems; civil engineering and geomaterials; changes, conflicts and governance of maritime areas.
IUML bases its work on the monitoring network activities of Ifremer's Atlantic centre, the Nantes Observatory of earth and planetary sciences (Osuna), the University of Nantes, and Ifremer's "Expertise-knowledge transfer" unit targeting quality, processing, development and utilisation of marine products and by-products.
This multidisciplinary platform of expertise and decision-making assistance thus complements the system to develop research and higher education. A project has already been submitted in the framework of the call for projects launched by the Pays de la Loire region on the strand called "Development of structured themes and scientific specialities".

> "A multidisciplinary platform of expertise and decision-making assistance"

BIOMARINE 2011 BUSINESS CONVENTION

Ifremer was a scientific partner of the second BioMarine business convention organised in September 2011 in Nantes. Devoted to developing commercial uses for the marine biomass, this international business convention aimed to promote encounters between laboratories, industrial firms and biotech companies. Ifremer was actively involved in organising the convention alongside the Atlanpole Blue Cluster and Biomarine teams. Scientists and experts from our Institute took part in the plenary opening session, conferences and a round-table discussion open to the general public on the question "Is the sea man's future?" which attracted 1,200 participants. On *Discovery day*, Ifremer received some fifty guests (opinion leaders, scientists, institutional representatives and journalists) visiting the three laboratories of the Biotechnology and marine resources unit in the Ifremer Atlantic centre in Nantes.

© Ifremer/Sophie Pilven

Ifremer's stand at the Biomarine trade show

© Ifremer/Michel Gouillou

Ifremer Mediterranean centre

> “Observing and monitoring of lagoons”

MEDITERRANEAN SEAFRONT

IFREMER'S ACTIONS RECEIVE SUPPORT FROM LANGUEDOC-ROUSSILLON LOCAL AUTHORITIES

In 2011, the Languedoc-Roussillon regional council showed its interest and provided financial support for several actions led by Ifremer. These include:

- continued co-funding for a PhD thesis on the "Study of multi time-scale hydrodynamic and sediment dynamics processes in a coastal lagoon ecosystem: application on étangs palavasiens – étang de l'Or – canal du Rhône à Sète ecosystem";
- financing for the 2011 action programme of the lagoon monitoring network (2007-2013), and the Adecom (2009-2011) programme whose objective is to study the morality of Pacific oyster spat in the Mediterranean, in partnership with the Hérault county council and the Regional shellfish farming committee for the Mediterranean. The studies were continued in 2011 in the framework of the ICES "Impact of farming conditions on Pacific oyster survival in the Thau lagoon" project co-funded by France Agrimer, Ifremer, the Hérault county council and the Languedoc-Roussillon regional council.

© Ifremer/Olivier Barbaroux

Sardines and anchovies, fisheries species studied in the Pelmed cruise framework

MARINE EXPERTISE IN THE REGION

Ifremer conducted fisheries research cruises with the aim of using acoustics (Pelmed) to observe small pelagic fish like anchovies and sardines and using conventional trawling (Medits) for demersal (hake) and benthic (red mullet, angler) species.

Our Institute is taking part in the regional scientific council for natural heritage set up by the Languedoc-Roussillon region's Prefecture.

Ifremer's Mediterranean centre is also engaged in the pilot project for geolocation of small-scale fisheries activity, involving vessels less than 12 metres LOA, in Languedoc-Roussillon and PACA regions, by using the Recopesca technology developed by Ifremer. The objective is to have access to automated flows of accurate data on the fishing grounds. This characterisation is not only important in terms of fisheries management, but also for managers of protected areas and for planning projects like those for offshore wind farms.

Ifremer issued expert advice at the administration's request on the status of fish stocks, particularly for large pelagic (bluefin tuna, swordfish), demersal (hake, red mullet) and small pelagic (sardine, anchovy) species.

An activity linked to the regional economy

The partnership between Ifremer and the Mediterranean association of producer organisations (AMOP), which falls under the Bleu contracts (Barnier plan) framework continued in 2011, for sampling of anchovies and sardines in the Gulf of Lion by professional fishing vessels following a scientific protocol. The data acquired will enable detailed monitoring of these populations, supplementing the scientific cruises which have been conducted for these species for over fifteen years.
Ifremer is taking part in the Vasco (Valorisation and storage of CO_2) project. This is a collaborative project between industrial firms and research centres, aiming to study several solutions to reduce industrial discharges of CO_2 into the atmosphere. The Mediterranean centre is in charge of the CO_2 bioremediation strand using the production of microalgae in open fields. The first phase of the project, lasting ten months, should identify the avenues of research to develop in the second phase, by identifying the key parameters in the different value chains for remediation or sequestration.

Open-field production of microalgae in the Vasco project framework

© Ifremer/Cyrille Przybyla

REGIONAL AND INTERNATIONAL SCIENTIFIC COOPERATION

Cooperation with the world of academic research took many forms in 2011. Amongst them, Ifremer contributed to drawing up the application for the Institute of excellence in low-carbon energy (IEED) called Greenstars, which aims to federate and accelerate work on research and commercial utilisation of microalgae.

greenstars
ALGUES ET CO-PRODUITS

MARINE EXPERTISE IN PACA REGION

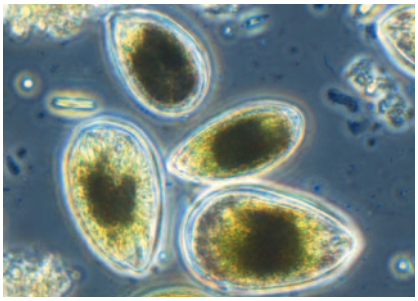
Ifremer's opinion was sought on numerous issues related to the implementation of Bay contract plans (Toulon, Iles d'Or, Azur bay) or marine nature parks (Calanques), marine aspects of the territorial cohesion plan (SCOT) and the reconversion of military sites on the coast. In partnership with the Rhone Mediterranean Corsica water authority, the Oscreen project was the first to make it possible to sample over eighty stations for the planktonic algae *Ostreopsis* through three sampling cruises in June, July and August 2011. The first mapping of this toxic species over the entire French Mediterranean seafront was achieved in this way.

Our Institute contribute to studies by the working group set up by the interregional directorate for the Sea, under the aegis of the PACA region's prefecture State authority, in order to draw up a methodology guide on establishing and monitoring of artificial reefs.

Ifremer's Mediterranean centre organised open house days at La Seyne-sur-Mer to present our Institute's activities to the general public and to raise awareness about the stakes for the sea. 3,600 visitors were able to talk with scientists and learn about the Institute's research outcomes.

An expert from Ifremer was appointed to the regional advisory committee on research (Andromède collective) by the PACA regional council. In that capacity, he takes part in assessing projects and analysing the orientations of the regional council's policy to support research.

European cooperation in underwater technologies was further strengthened and structured by the setting up of a research grouping (GdRE) associating the German Alfred Wegener Institute for polar and marine research, the University of Bremen, CNRS-INSU and Ifremer. Joint studies were identified in order to pool the development of tools and promote the interoperability of equipment and facilities.



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Phytoplanktonic microalgae
Ostreopsis *spp*

Ifremer is participating in the working group set up by the Regional centre for the Mediterranean (CeReM) with the aim of defining the themes for its first exhibition on the Mediterranean Sea which will be open to the public in 2013. As a member of the Mediterranean seafront maritime council, Ifremer contributed to the drafting of the initial assessment document by coordinating the studies of the "environmental status" strand. This document is the first step in the action plan for the marine environment which will be the instrument for MSFD implementation.

THE EUROPEAN UNDERWATER TECHNOLOGY CENTRE

The European underwater technology centre (CETSM) project at La Seyne-sur-Mer was pursued in 2011. The project is supported by the Provence-Alps-Côte d'Azur regional council, the Var county council and the Toulon Provence Mediterranean urban community as well as European ERDF funding. The building's construction was completed and it will be put into use in early 2012. New equipment and facilities to be shared by marine research laboratories were purchased, including a radar for fine-scale measurement of the physical parameters of the sea surface. Studies for the construction of a "hybrid" underwater vehicle which can be deployed in either remotely-operated or autonomous modes were launched in cooperation with the ECA industrial firm.

The PACA regional council also allocated financial support for Ifremer for a PhD thesis on statistical techniques for quantitative optical imaging of underwater systems.

© Ifremer/Annabel Merrien

MESURHO: REGIONAL SCIENTIFIC COOPERATION

The Mesurho instrument bearing station located at the mouth of the Rhone (East Roustan buoy) enables river inputs to the sea to be monitored. Since 2011, the data measured is transmitted in almost real time. Its operation is the outcome of collaborative work between the University of the Mediterranean and several research bodies including Ifremer, the maritime and river technical studies centre (Cetmef), the European Centre for Research and Education in Environmental Geoscience (Cerege), the Institute of radiation protection and nuclear safety (IRSN) and the Laboratory for Climate and Environmental Science (LSCE). In 2011, there were many related projects (Mermex, Moose, Jerico, CETSM, Extreme/IRSN).

International scientific cooperation

The Climcares project, for "Climate impacts on Mediterranean coastal areas", with two-year funding from the Total foundation, began in May 2011. The Institute of marine sciences of Barcelona (ICM/CSIC), Ifremer and the Ipso-Facto company in Marseille have joined forces in the project. It aims to assess the impact of climate change on the preservation of biodiversity in Mediterranean benthic coastal ecosystems. An approach combining modelling and field monitoring will make it possible to evaluate the potential risk of massive mortality episodes. It will be based on warming scenarios for the end of the century and current knowledge on biological response to variations in water temperature.

The scientific advisory committee of the General fisheries commission for the Mediterranean (CGPM) met in Marseille in January 2011. Ifremer, as chair of the scientific advisory committee, organised the meeting which received funding from the Directorate of maritime fisheries and aquaculture (DPMA), the PACA regional council and the City of Marseille. Twenty-one of the twenty-four CGPM member states were present to take stock of the status of fisheries resources in the Mediterranean.

MARINE EXPERTISE IN CORSICA

Activity at the Bastia laboratory in 2011 was greatly marked by its involvement in MSFD-related processes. Studies dealt with the coordination of a European group to support Member States for the Good Environmental Status descriptor on "marine litter" and drawing up of eight reports related to the initial status assessment for the "marine litter" and "micro-debris" indicators in the four marine subregions. Concurrently, experimental studies made it possible to specify the quantities of micro-plastics in the Mediterranean. These activities were significantly highlighted through scientific publications, presentations at international scientific conferences (5th IMBC Hawaii, Yeosu/IMC in South Korea) and trade conventions (EUPC European Plastic Converters symposium).

A study on contamination in commercial species (fish and crustaceans) by discharges from the Canari asbestos mine was conducted on the scale of Saint-Florent gulf at the request of the Corsican environment office. The study was finalised in 2011 and showed the absence of significant chemical contamination in commercial fish species and spiny lobster. Known contamination of invertebrates (urchins) remains confined to the immediate surroundings of the Canari mine.

Marine litter macrowaste trawled aboard the inshore catamaran RV L'Europe

© Ifremer/Michel Gouillou

AN ACTIVITY LINKED TO THE REGIONAL ECONOMY

Once again, in 2011 the year was marked by high mortality of oyster spat, beginning in Corsica. Corsican teams from our Institute monitored the phenomenon and relayed information produced by national research programmes.

In 2011, Ifremer's centre in Corsica, working in partnership with the Corsican environmental office, completed the monitoring of lagoon fisheries, mainly developed due to the current situation of the *Anguilla anguilla* population worldwide. The study's objective was to improve knowledge about eels in Corsican lagoons, draw up a diagnosis of fisheries practices in the island waters with respect to new European regulations and obtain the first figures concerning fisheries in lagoons in Corsica. Four-hundred-ninety-two fisheries surveys were conducted on the Palo, Urbino and Diana lagoons (Upper Corsica).

This study falls under the fisheries information system (FIS) framework. All of the data has been fed into the Harmonie database. It gives an accurate reproduction of lagoon fishermen's periods of activity and an estimation of catches by species, by season and by lagoon.

REGIONAL SCIENTIFIC COOPERATION

On the initiative of the regional delegation for research and technology (DRRT), the University of Corsica and Ifremer finalised a joint research project which creates synergy between the teams while respecting each partner's strategic orientations. The application was successfully submitted to the programming commission in 2011 for funding in the frame of the CPER 2007-2013 State-regional contract plan. Two strands are planned: the first will study relationships between anthropogenic pressures on catchments and phytoplankton communities in lagooons and the second will involve developing a platform to model complex natural systems (larvae, algae, pollutants, etc.) in the Corsican trough.

Developing partnerships with local authorities overseas

Closer scientific cooperation with Ifremer teams in metropolitan France, research bodies present overseas and in neighbouring countries in the area

For fisheries, aquaculture, biodiversity, mineral and energy resources: overseas France territories represent significant stakes in terms of current and future resources.

France ranks second worldwide as a maritime nation, with over eleven million square kilometers of exclusive economic zones (EEZ), 97% of that area being accounted for by marine waters of overseas France.

Ifremer has been traditionally present there with 10% of staff posted in locations in the Indian Ocean, French West Indies, French Guiana and Saint-Pierre-et-Miquelon and in the Pacific.

Our activities are based on three major priorities, which are: research action to support the sustainable development of local production supply chains; observation and monitoring activities to underpin public planning policies; and research to better exploit and utilise the scientific added value of overseas environments, particularly in the fields of biodiversity and marine renewable energies.

They are organised along three strategic orientations, with the setting up of stronger scientific cooperation between Ifremer teams in metropolitan France and those in overseas France in an inter-DOM-ROM approach, building local expertise based on an active partnership-based policy with local research bodies and universities, as well as developing scientific cooperation with neighbouring countries in the area to promote the regional integration of French ROM-COM.

In 2011, Ifremer took part in studies which fell under the Ifrecor French initiative for coral reefs national action plan, on the theme of "Marine protected areas", in preparing and starting up a new theme on "Mechanisms of governance and strategic planning".

Ifremer's overseas teams were actively involved, working alongside teams from metropolitan France, in national events which were held in the framework of "2011, overseas year".

FRENCH GUIANA

The biggest development in 2011 was the discovery of oil in the Guiana Exclusive Economic Zone, following exploratory drilling by the Tullow-Shell group. Although the results must still be confirmed, exploiting the resource could be foreseen in eight to ten years from now. The issue has already been raised of the environmental impact, especially on the ecosystem and its resources, and Ifremer will most likely be involved in the short and medium term.
The shrimp crisis is continuing, with a marked reduction of the fleet and a shipowner company which has closed. The drop in catches, which is not linked to overfishing, may be explained by warming of the water and changes in the wave and wind conditions which directly influence shrimp recruitment dynamics.

© Ifremer Guyane

Ifremer station in French Guiana

ADVICE AND EXPERT ASSESSMENT MISSIONS

For the environment, Ifremer has favoured actions conducted to promote the implementation of the Water Framework Directive (WFD), by providing assistance to the DEAL contracting authority. The WFD will enter its permanent monitoring phase in 2012.

In the field of aquaculture, in 2011 upon request from the Guyane-Technopôle science park, our Institute carried out an expert assessment on the possibilities of developing an aquaculture value chain locally.

LOCAL AND NATIONAL PARTNERSHIPS

Ifremer's main partner in Guiana is Ceregmia, the economics laboratory of the University of the Antilles and Guyana. Above and beyond, the existing Irista SIG, which Ifremer is a member of, discussions are being pursued locally with the prospect of creating the marine cluster which the Regional Council wants, as well as a research grouping (GdR) with CNRS, on the theme of "coastal ecosystems under the influence of Amazonian waters". CNRS and the University of Bordeaux IV perform annual missions in Guiana, particularly in the framework of the Adhoc and Biomer programmes (financed by FRB).

ECOSYSTEM-BASED APPROACH TO FISHERIES

The Geco (sustainable management of inshore fisheries in French Guiana) report was handed in to the State secretariat for overseas France. It showed that the current limitations for the supply chain's development are more economic than biological. The actions called Dispatch on the development of inshore fisheries in French Guiana (financed by ERDF) and Adhoc (ANR) on modelling the ecological and economic viability of fisheries are on-going. A bioeconomic simulation model was set up, with the – currently unmet - objective of finding the ways of exploiting the stock which could offer a compromise between protecting the food web and economic viability. These actions are based on data from the fisheries information system (FIS). They were promoted by Ifremer's participation in international conferences and were published in an A-ranked journal. The fisheries observatory covers the three Guianese fisheries, and by extrapolation, can be used to produce monthly and annual information about the production effort. The information is disseminated both locally and nationwide.

WEST INDIES

The activities of the Ifremer delegation for the West Indies (UR-Antilles) are conducted in an ecosystem-based approach, through a comprehensive and integrated approach to the "marine catchment basins" approach surrounding the island territories in the French West Indies.

The environmental preoccupations mainly concern the impact of chlordecone on marine species. In the fisheries field, public authorities have undertaken the modernisation of the fisheries fleet to exploit offshore resources. The deployment of fisheries towards deep sea pelagic species, thanks to the development of fish aggregating devices (FAD), must be stabilised today in order to avoid any return of the activity to the island shelf, which is a hot spot for biodiversity. This approach to fisheries planning relies on knowledge about the status of shared fisheries resources.

© Ifremer/Olivier Dugornay

Ifremer site in Martinique at the tip of Pointe Fort, in Le Robert bay

In marine finfish farming, two new farms equipped with submerged offshore cages were installed to test this technology against the risk of cyclones. Moreover, new prerogatives granted to the Regional maritime fisheries and mariculture committees, the revival of the Martinique aquaculture cooperative in 2011 and the setting up of a Research and Development tool in Mayotte to be used within the DOM-ROM territorial entities by 2013, should help boost the production supply chain.

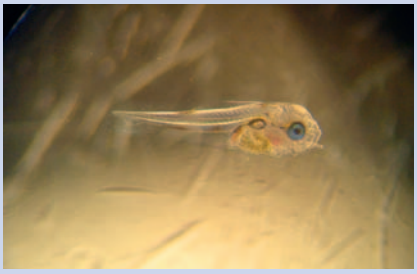
In 2011, Ifremer took part in numerous events, including the ICCAT's marlin meeting (Madrid), the scientific meeting for the Regional mechanism for Caribbean fisheries (CRFM), the Bodlanme forum for sustainable management of West Indies coasts, the international conference on marine mammal sanctuaries (Martinique), and the symposium on FADs (Tahiti).

© Ifremer Martinique-SIH/ Louise Simonnet-Touchain

Work by our field investigators with fishermen landing their catches (Grand Rivière)

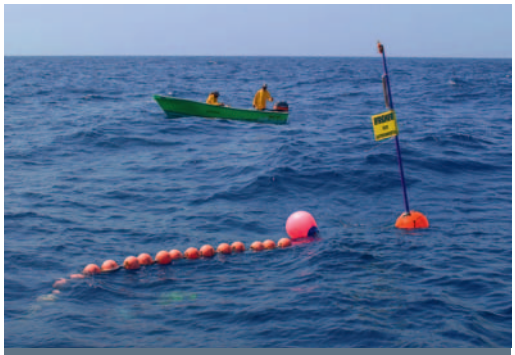
RED DRUM FARMING

The inter-DOM-ROM Genodom programme for "management of the red drum gene pool in the DOM-ROM" ended in November 2011. Its studies led to a proposal for a working basis to manage the genetic resources of red drum. An intrafamily selection process was developed and implemented on an experimental scale in Martinique and on a pilot scale in Mayotte.
Key results obtained on the different test sites and at the level of each link in the biological cycle made it possible to set out the scope of a zootechnics scheme and the means needed to apply it. Genetic management of the species was entrusted to the Union of French overseas fish farmers (UAOM), in the frame of the programme for the future Research and Development centre in Mayotte. The other regions concerned could benefit from the spin-offs of this programme, by regularly receiving biological material incorporating the genetic improvements obtained.
In addition to this programme, studies related to mastering artificial reproduction of red drum (FAO project) are continuing. A further step was taken in 2011 with fertilisation rates ranging from 40 to 60% on spawns obtained by hormonal stimulation. To date, this is the best result on record for this species. The final objective is to optimise reproduction protocols and make the tool part of red drum genetic management. Working with the fishfarming value chain, a technical-economic analysis of the small-scale production system for red drum, based on the accountancy figures of a partner firm, made it possible to determine its strengths and weaknesses. A study was conducted in partnership with the regional agrifood cluster of Martinique (PARM) on the biochemical and sensorial characterisation of the quality of flesh of red drum farmed by producers in Martinique. Avenues for the commercial development of this product were highlighted (nutritional advantages, etc.).
UR-Antilles pursued its contribution to support production by supplying nearly a million larvae to five privately owned hatcheries in the West Indies in 2011. Transfer (sperm cryopreservation) and expertise (growing live prey) actions were conducted to benefit structures for overseas aquaculture development, particularly in Mayotte.
In the framework of the Overseas France year, the unit published a book on red drum at Editions Quae. Its intention is to disseminate all of the knowledge acquired on this species, by Ifremer teams in particular, to the broadest possible professional and institutional readership.



© Ifremer Martinique

Eight-day old red drum larvae



Fishing with FAD (Fish Aggregating Device) in Martinique

Sustainable development of fisheries

The first data produced by the fisheries observatory pilot study (FIS) in the West Indies were presented locally. In Martinique, they highlight a drop in fisheries landings since the first assessment made in 1987. A quarter of Martinique skippers who own their boats and have reached retirement age continue to fish near the coast where working conditions are easier. They account for half of the fish trap catches. Deep sea pelagic fisheries seem to be the activity which has best resisted the decline affecting the sector. FIS data and Customs statistics suggest the imports are one of the main causes for the sector's drop in production. Overfishing of demersal resources on the shelf also seems to be a major factor of difficulty.
During 2011, the European Interreg project Magdelesa was launched in cooperation with the Western Central Atlantic Fishery Commission (FAO/WECAFC) and several countries in the Lesser Antilles. This multidisciplinary project on sustainable development of fisheries using moored fish aggregating devices (FAD) enables the French West Indies to be better integrated in their regional context. It aims to supply new knowledge which is essential for assessing potential resources like blackfin tuna and provides an opportunity to experiment on a systemic approach to emerging FAD fisheries.

CONTAMINATION BY CHLORDECONE

Acting as scientific expert, Ifremer has provided assistance to State services and maritime professionals for overall project management.

In the framework of the first national chlordecone plan (2008-2010) in 2011 our Institute finalised two specific studies which brought new knowledge about chlordecone's mode of transfer in the marine environment, both in sediment (Chlosed) and in living organisms (Chloretro).

The Chlosed study demonstrated the role played by sediment type and dynamics in the contamination of the marine environment. It particularly highlighted the importance of the relation with the catchment basin with respect to its hydrogeological features. The Chloretro study shed light on the levels of contamination in fish fauna which develop either by bioamplification along food chains or by bioaccumulation.

A study on the contamination status of spiny lobsters (Caribbean and spotted) in zones at risk was carried out at the request of State services in 2011. These studies showed the influence of various factors such as spatial distribution (North, South, inshore, offshore), size, sex and organs (cephalothorax and tail).

Preparations were made for the second coordinated national action plan (PNAC-2, 2011-2013) based on an assessment of knowledge acquired in the previous plan. In this capacity, Ifremer took part in numerous national level (GOSS studies) and local level (Grephy, Grepp) meetings.

MONITORING MARINE ENVIRONMENTAL QUALITY AND IMPLEMENTING THE WFD

Ifremer is acting to provide contract management assistance in the frame of the Ifremer-Onema agreement, in relation with the DEAL authorities in Martinique and Guadeloupe. In 2011, this assistance took the form of significant support given to local resources by teams from metropolitan France. Several missions were conducted in the two DOM-ROM entities for outreach information and training actions (databasing, passive samplers) and to take part in meetings with targeted themes.

An exceptional bloom of pelagic sargassum algae in 2011 mobilised all of the State services and stakeholders involved in the coastal and marine environment. Ifremer was solicited for its expertise to assess the impact of the phenomenon.

The back of Le Robert bay invaded with sargassum

“ Ifremer: a research organisation which is essential for developing the local economy ”

© Stéphane Poirier-Cusick (Patron du M.A.2)

Herlé Goraguer

Interview

Herlé Goraguer has represented Ifremer at Saint-Pierre-et-Miquelon since early 2010. He is both the head and the only agent of his delegation, reporting to the Biological and Environment resources department (RBE). In this capacity, he responds to various requests related to Ifremer's fields of expertise, ensures the monitoring of fishery landings and takes part in regional fisheries organisation meetings (Franco-Canadian advisory committee, OPANO).

What led you to choose Saint-Pierre-et-Miquelon?

I'd been returning to the archipelago since 1990 on a regular basis for my holidays, and I've always been interested by Saint-Pierre-et-Miquelon's development. Located as it is at the confluent of the Labrador, Saint-Laurent and Gulf Stream currents, the archipelago holds a huge number of subjects to be studied. Paradoxically, in the past, research work mostly focused on fisheries. That means that the coastal environment is still poorly known. It thus offers many opportunities for studies: type of seabeds, determining benthic habitats, characterization and locating marine aggregates, currentology, etc.

How does the Institute work in the archipelago?

Ifremer is the only research body established in the archipelago, so the agent posted there must be as versatile and "multi-skilled" as possible! In contacts with fishermen, the administration and the public, I'm the Institute's local contact. When the questions raised go beyond my expertise, I relay them within the Institute. Ifremer missions take place regularly in the archipelago in order to continue the studies underway. I ensure the logistics while taking an active part in the research.

One of the milestones of the year 2011 was the initial results of developments conducted in scallop farming. What are the implications on a local level?

In 2011, 60 tonnes of king scallops seeded on the sea floor in Miquelon Bay were re-harvested for the first time. This made it possible to show the reality and feasibility of this experiment which Ifremer has been associated with since 2006. This innovative project for Saint-Pierre-et Miquelon has raised high hopes in terms of the impact on the local economy, maintaining as of 2011 an activity to supplement the work in fish processing and which puts a top value product on the market.

What are Ifremer's image and economic impact, locally speaking?

Since the 1970s, Ifremer has been an important job provider on the local scale, having established a laboratory and a research vessel RV *Cryos* there. Today, people still have the image of a research body which is greatly involved in local life. Participating in developing scallop farming at Miquelon with the first tangible results in terms of economic exploitation, the prospecting cruise by RV Suroît in July 2011 in the Extraplac programme framework and the on-going scientific support for fisheries make Ifremer a research organisation which is essential for developing the local economy.

How can you feel part of Ifremer when you're on an isolated assignment in the back of beyond?

Luckily, the means of communication now available make contacts with the Institute considerably easier and keep the link strong: there is always someone in-house who can provide an answer. Sometimes the time difference and the availability of contacts in-house, requires positioning in emergency situations, and that highlights the lack of local decision-making support.

© Ifremer/Herlé Goraguer

Le Suroît *in the bay of Saint-Pierre-et-Miquelon*

Ifremer is the only research organisation present in the Saint-Pierre-et Miquelon archipelago.

Since the collapse of cod stocks, followed by the moratorium in 1994 (a 90% drop in landings), local stakeholders have tried to diversity the activities and have turned towards aquaculture, especially scallop farming (Atlantic deep-sea scallops) and to a lesser extent, mussel farming for the local market.

Concurrently, in May 2009, France submitted a letter of intent to the UN Commission on the Limits of the continental shelf to prepare a claim to extend its sovereignty beyond the 200-nautical-mile Exclusive Economic Zone. The SPMPLAC data acquisition cruise conducted in July 2011 by Ifremer covered the outer part of the Canadian EEZ and the south of the French EEZ off Saint-Pierre-et-Miquelon.

ASSESSING FISHERIES RESOURCES

Each year, Ifremer compiles the biological data needed to assess stock status and determine the total allowable catches (TAC) and regional fisheries quotas for cod, snow crab, sea cucumbers, swordfish and whelk.

Since the Franco-Canadian agreement was signed in 1994, Ifremer has taken part, in cooperation with Canada, in the scientific assessments of fisheries resources on the southern coast of Newfoundland around the Saint-Pierre-et-Miquelon archipelago.

A cruise to assess pectinid stocks (Iceland scallops and Atlantic deep-sea scallops) financed by MAPA was performed in September 2011, in the cross-border zone off Saint-Pierre-et-Miquelon, in order to acquire recent data for the renewal of fisheries agreements with Canada.

In the the North Atlantic Salmon Conservation Organisation (Nasco framework, Ifremer resumed studies for genetic identification to determine the origins of salmon caught by professional and recreational fisheries, with the sclerochronology laboratory contributing to reading of fish scales. The data were summed up by the delegation and sent to Onema, which is taking part in the ICES working group on North Atlantic salmon.

DEVELOPMENT OF SCALLOP FARMING

Ifremer is providing scientific support for the scallop farming project at Miquelon, which uses hanging ropes for rearing and seeding of juveniles in deep water. Our Institute participated in the steering committee's various technical meetings and provided its advice to local mariculture commissions.

The main actions carried out in 2011, included seabed mapping, hydrodynamic modelling, technological developments for monitoring and acquiring environmental data. Integrating this information and monitoring of farms and production conditions led to recommendations for aquaculture development issued by Ifremer.

An assessment of scallop biomass on the first zone seeded in 2006 was made in April 2011 by a professional seafarer from the Local maritime fisheries committee (CLPM) of Brest. Once exploited, this seeding enabled the harvesting of sixty tons of scallops which supplied the Miquelon processing plant.

© Aurore MICHEL/Journal L'Horizon/ Mairie de Miquelon-Langlade

First re-harvest of seeded Placopecten scallops *(60T) using a Saint-Brieuc dredge by a professional vessel from Miquelon*

In September 2011, a cruise for fine-scale mapping of seabeds was cofinanced by the Odeadom fund, the Territorial council and Ifremer, in order to identify the best sectors for seeding of queen scallops and acquire knowledge about the marine habitats surrounding the archipelago.

In the environmental realm, the delegation, working with the Environment resources laboratory of Concarneau (LER/CC), is taking part in setting up phytoplankton monitoring though an agreement signed with MAAP.

INDIAN OCEAN, REUNION AND MAYOTTE

© Ifremer DOI / Jérôme Bourjea

RV Europa, *east drop-off*

French Exclusive Economic Zones in the Indian Ocean cover a surface area of 2.8 million square kilometres, including Reunion Island, Mayotte and the TAAF French Southern and Antarctic territories and the Scattered Islands.

In 2011, the *South Indian Ocean blue paper* was published by the Prefect of Reunion Island. It was cosigned by the Ministers of the Environment and of Overseas France, as well as by the prefects of Mayotte and the TAAF. Ifremer's teams were greatly involved in this work, especially for the research aspect. This *South Indian Ocean blue paper* - a variant on the 2010 *Grenelle de la Mer blue paper* from the French marine environment summit - defines the French maritime policy in the Indian Ocean for coming years. In particular, it proposes:

• the creation of a Southern Indian Ocean basin committee (CBSOI), which will bring together some forty members from Reunion Island, Mayotte and TAFF, coming from State, elected and professional bodies, representatives of the civil society and scientists. The CBSOI's mission will be to identify the programmes to be given priority in all fields related to the sea and to launch their implementation with the appropriate funding.

• creation of the Indian Ocean marine scientific cluster (PSMOI), which with gather all the organisations involved in marine sciences in the Indian Ocean (without necessarily having establishments there). The PSMOI will have the mission to set up a large observatory for the Indian Ocean (like the GOPS in the Pacific). As the CBSOI's scientific advisory, it will produce all the data, knowledge and summaries of use in the sustainable management of activities, uses and natural resources in the Indian Ocean.

The Reunion (PMR) marine cluster and the Mayotte (PEMM) cluster of maritime excellence, are currently being created. They will have researchers based in the Indian Ocean, including Ifremer teams, and will contribute to PSMOI.

Scientists from Ifremer took part in numerous conferences in 2011. Particular mention can be made of the South West Indian Ocean fisheries project (SWIOFP) in South Africa, the WIOMSA symposium in Kenya, and that on FADs in Tahiti.

MONITORING COASTAL WATER QUALITY

Working closely with DEAL and Onema, Ifremer is in charge of coordinating the WFD implementation: determining which indicators are adapted to the specificity of Reunion Island coastal ecosystems and defining the permanent monitoring networks which should be started before 2013. Studies conducted in 2011 with all the specialists based in Reunion Island, led to the definition of four water quality indicators and to developing inspection networks for monitoring in four fields (chemistry, macrozoobenthos, soft substrates and hydrology). Significant efforts were made for databasing of information in the Quadrige² data bank.

In 2011, the delegation also continued to develop the Hydrorun hydrodynamic modelling platform, designed to anticipate the impacts of discharges from sewage treatment plants and industrial sites to the sea, depending on the wind conditions, duration of the discharge, flow rate, concentration, etc. The objective, whose deadline is late 2012, is to create a general Indian Ocean model, a regional Reunion Island model and six local models. All project partners, as well as the scientific community, State services and territorial authorities, will have access to the data in the form of maps. Hydrorun, the GIS platform and the genetic analysis laboratory will thus be the basic tools for the future regional marine scientific cluster.

ASSESSING FISHERIES RESOURCES

In addition to drawing up summaries, based on data in the fisheries information system (FIS), to be used by State services and various international organisations (e.g., IOTC) for the management of fisheries and stocks exploited, Ifremer is involved in the sustainable development of small scale coastal fisheries in Reunion Island (Ancre).

© Ifremer DOI / Pierre Gildas Fleury

Snapper fisherman

The project began in February 2011, cofinanced by the European Fisheries Fund (EFF), the French State, the Regional Council and Ifremer, working in collaboration with CRPMEM. The project is broken down into several actions, such as analysing data on seashore fishing in the reserve and the Démersaux project to assess the bottom fish stocks ((comet groupers, tropical red snapper, mochong pomfrets, etc.) caught in small-scale inshore fisheries. The first results (a drop of over 90% in yields and smaller sizes of fish caught) emphasize how fragile the demersal stocks are and the need to launch moored fish aggregating devices, or FAD, in order to open up access by the coastal fleet to pelagic fish which are less vulnerable and more abundant.

MAPPING BY REMOTE SENSING

The Litto3D® project was launched by SHOM and IGN in 2009, consisting in 3D modelling of French coastal zones in the Indian Ocean. Data are acquired using an airborne laser scanner (Lidar). In order to develop, then verify the effectiveness of a new method using remote sensing to map coastal habitats, TAAF authority, AAMP and Ifremer fitted Litto3D® flights with a hyperspectral imager. Reunion Island was chosen as pilot site for the Spectrhabent project. Mapping of coral sectors should be completed by mid-2012.

© DEAL/DOI-Ifremer/Pascal Mouquet-AAMP

Hyperspectral image (corrected for water column effects) highlighting the characteristics of outer reef slopes to depths reaching 30 metres in the bay of Saint-Leu/Reunion Island

Marine protected areas management

The indicators for monitoring and assessing MPA performance, drawn up in the framework of the Pampa project, were completed in 2011. Their development was financed by Ifremer, Ifrecor, AAMP and the Reunion marine nature reserve public interest grouping (GIP RNMR), in order to monitor the efficiency of the latter's management plan.

The CAMP (connectivity of marine protected areas) project is using a population genetics tool to determine the paths of exchanges between the various coastal zones in the South West Indian Ocean (SWIO). The study, funded by the European Union, the Reunion Island Regional council, Diren, Ifremer and Wiomsa, is taking part in setting up a more or less dense network of MPAs currently being created. Ifremer's delegation will submit its recommendations to the Indian Ocean Commission (IOC) at the end of 2012.

Also based on the populations genetics tools, the Indian Ocean Swordfish Stock Structure (IOSSS) project aims to determine whether there are one or several stocks of swordfish in the Indian Ocean in order to improve their management. Financed by the European Union, the Reunion Island Regional Council, the French State and Ifremer, this project has eight international partners (Australia, South Africa, Thailand, the Seychelles, India, etc.). 2011 was devoted to studying the results of analyses performed on the 3,000 samples taken. In July 2011, Ifremer chaired the IOTC working party on Billfish.

© Ifremer-DOI / Jérôme Bourjea

Shoal of Lutjanus kasmira

DYNAMICS OF MARINE TURTLE MIGRATION

In cooperation with the Reunion sea turtle observatory called *Kélonia*, Ifremer is continuing to study the migratory paths of turtles between their nesting and feeding grounds by deploying one-hundred-twenty Argos beacons. The Dymitile project includes the member countries of the IOC and of the East African coast, as well as gendarmes posted on the Scattered Islands. The studies aim to supplement our Institute's data and knowledge, in order to draw up recommendations and proposals which will be used as of 2012 by DEAL and TAAF, to draw up the French action plan accompanying the Indian Ocean and South East Asian Memorandum of Understanding (IOSEA MoU) on the conservation and management of marine turtles and their habitats.

AQUACULTURE PROJECTS

Being specialised in tropical aquaculture, the Ifremer laboratories of Palavas-les-Flots, Polynesia and Martinique contribute to Research and Development projects in the Indian Ocean, working in collaboration with associations for the development of aquaculture in Reunion (ARDA) and Mayotte (Aquamay). In 2011, studies mainly focused on consolidating the farming protocols and improving red drum genetics (Ombrigen and Génodom programmes).

To promote inter-DOM-ROM cooperation in the field of marine finfish farming, Ifremer co-organised and took part in facilitating a workshop designed for the agents of ARDA and Aquamay, in order to better coordinate the actions of these two associations.

IFREMER ESTABLISHED IN MAYOTTE

To support the development of marine finfish farming, the project to create the Mayotte aquaculture research centre was launched in 2009 by the French State, public authorities of Mayotte and the Aquamay association. In 2011, Ifremer assisted Aquamay with project contracting for the engineering studies for the future centre (2010-2012). Ifremer research scientists and technicians will be hosted there once the installations have been commissioned for operational service, to provide scientific support for the Aquamay teams.

Ifremer has also been solicited by DEAL, the South Indian Ocean marine department (DMSOI), the General Council and the Marine park, to provide scientific support in fisheries science and environmental fields (FIS, fisheries studies, WFD, and so on). A multidisciplinary mission was set up in September 2011 in order to define the appropriate organisation.

© Ifremer/Olivier Dugornay

Ifremer Pacific centre

PACIFIC

Ifremer's Pacific centre includes the establishments in French Polynesia (Tahiti) and New Caledonia (Noumea and Saint-Vincent). Its activity is strongly focused on research to support the sustainable development of aquaculture value chains, as well as on studying the marine environment and resources. In 2011, new research orientations came clearly to the fore, particularly in the fields of marine renewable energy sources and biotechnology. Developing these activities relies on increased synergy between the two Pacific delegations, backed up by scientific teams from metropolitan France.

FRENCH POLYNESIA

In spite of a political context of uncertainty, 2011 was a year rich in initiatives. Some concerned creating a contractual basis for relations between Ifremer and our Polynesian institutional partners and others aimed to federate research between scientific partners in French Polynesia or over the Pacific area (GOPS, the LabEx on coral and the UMR EIO project). Our Institute also successfully bid in calls for tender on projects which are important for the future.

The terms of the future 2012-2015 framework agreement were negotiated by Ifremer and French Polynesia authorities. The agreement will govern all of the research actions to be conducted by our Institute in Polynesia in the top priority fields: pearl farming, shrimp and finfish farming, marine biodiversity, deep sea mineral resources, marine renewable energy sources and blue biotechnologies.

The French Polynesian president, Oscar Temaru, the president of the Polynesian Assembly, Jacqui Drollet, and four ministers in the government visited the Ifremer centre and the installations of the new aquaculture technical centre of Vaia in May 2011.

SUSTAINABLE DEVELOPMENT OF LOCAL SUPPLY CHAINS

GdR Adequa (2008-2012) research grouping studies on improving the quality of French Polynesian pearls continued in 2011 with three PhD theses defended, fourteen scientific articles published in international journals and the international extension of two patents filed in 2010 for nucleus coatings. Two new projects were launched: Polyperl (ANR) for integrated management of pearl farming and Bioperl (State-Region project contract) to preserve the biodiversity of pearl oyster stocks. The special agreement between Polynesia and Ifremer on "support for local lagoon fish and shrimp farming supply chains and aquaculture health" was negotiated and its signing slated for early 2012. It will fall under the 2012-2015 framework agreement.

In marine finfish farming, the partnership between Ifremer and the French Polynesian fisheries service (SPE) to master the breeding of the Paraha peue batfish (*Platax orbicularis)* under experimental conditions was further reinforced with the inauguration of the Vaia aquaculture technical centre in on Ifremer's Vairao site in 2011. Our Institute provided significant support in terms of designing facilities and equipment and training the scientific and technical staff.

© Ifremer/Olivier Dugornay

Shrimp ponds in Ifremer's Pacific centre

In shrimp farming, transfer activities continued with the setting up of the Polyfloc project (State-region project contract) for a hyper-intensive shrimp farming system and the Sadec project (SEOM) for a sustainable shrimp farming supply chain.

MARINE RENEWABLE ENERGY SOURCES

The Ifremer project to study the marine tidal current potential of the Hao atoll in the Tuamotu Islands came to a close in 2011, with the handing in of the report entitled "Final summary on an annual cycle of current data" to the Ministry of marine resources. It should guide the choice of tidal turbine prototypes to be set up in the channel.

The Polynesian authorities confirmed their interest in marine renewable energies, by pursuing the assessment of tidal current potential in other atolls in the Tuamotu Islands. Priority is given to the sites meeting the criteria defined in the 2010-2011 pilot study conducted on the Hao atoll. The second line of work will consist in supporting pilot projects for setting up the first tidal turbine prototypes in these atolls.

INTERNATIONAL SYMPOSIUM ON "TUNA FISHERIES AND FAD"

In the framework of the "2011 Overseas France year", this conference was coordinated by Ifremer, in partnership with the Polynesian marine resources directorate (DRM), the secretariat of the Pacific Community (SPC) and IRD. Held in Tahiti in November 2011, it attracted one-hundred-fifty participants from forty countries. Discussions focused on Research and Developments related to exploiting pelagic resources using fish aggregation devices (FAD), drawing up a comprehensive assessment of the use of these devices worldwide.

© Ifremer/Yannick Gueguen

Huîtres perlières

Monitoring lagoon water quality

Studies undertaken in the framework of the partnership with the IRSN's environmental studies and monitoring laboratory (LESE) aiming to perfect a method for measuring and monitoring chemical contamination in Polynesian lagoons based on the use of the pearl oyster (*Pinctada margaritifera*) as a sentinel species.

MAIN SCIENTIFIC PARTNERSHIPS

Over the year, numerous forms of collaboration were conducted with local (UPF, DRM, Criobe, Pacific Biotech, Gauguin's Pearl, etc.), national (IRD, EPHE, IRSN, UMR Lameta, UMR Amure, Skuldtech, etc.) and international (Dalhousie University, Canada; Jeju National University, South Korea; Cibnor in Mexico, etc.) partners.

The South Pacific integrated observatory for environment and biodiversity (GOPS), now has seventeen French partners, from universities and national and regional research institutions; Ifremer is a member of LabEx Corail, selected in 2011 under Investments for the future funding. This consortium is coordinated and managed by Criobe, the Moorea environmental centre and includes the main French research teams specialised in the field of coral.

The project to create the Ocean island environment UMR joint research unit, which brings together the University of French Polynesia, IRD, Louis Malardé Institute and Ifremer, underwent its first assessment by Aeres. Adjustments are being made to this high-priority project.

NEW CALEDONIA

The gearing up of the multidisciplinary "lagoons of New Caledonia" programme continued in 2011 with stronger scientific partnerships and achieving concrete work on halophytes and mangroves, methodology guides, MPA management, blue biotechnologies, and so on.

The 2007-2010 framework agreement covering the research work on sustainable shrimp farming (Déduction project) was extended until the end of 2011. Defining new programmes related to the lagoons programme and diversification of activities was explored. This thought and discussion should lead to the signing of a new framework agreement for 2012-2015 between Ifremer, the State, the government and the three provinces of New Caledonia.

© Ifremer-Projet AMP/Micado/Gilles Hervé

New Caledonia lagoon (Cinq-îles, Kuaré islet)

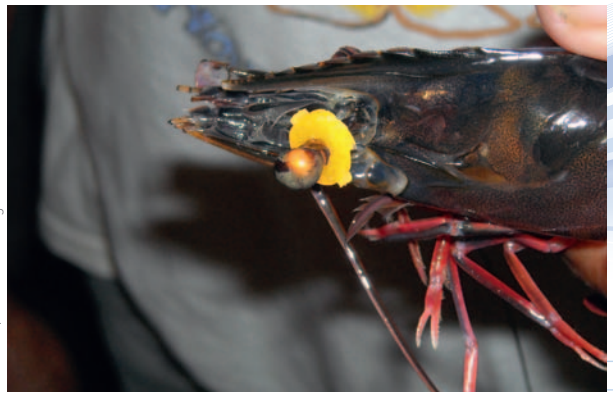
An audit of the entire shrimp supply chain, conducted by independent experts in 2011, made it possible to define priorities for the governance and functioning of the value chain and formulate recommendations for research. It was decided to create a technical centre for aquaculture (CTA), to be directed and managed by local stakeholders. Its activities will be positioned downstream from the research activities carried out by Ifremer teams

SHRIMP FARMING, SCIENTIFIC AND TECHNICAL SUPPORT

2011 was a year of transition, with the preparation of the next four-year research programme related to scientific and technical objectives.

Ifremer contributed to developing the shrimp farming supply chain with the project called Déduction, for the "sustainable development of shrimp farming, processing of information and systemic observatory of New Caledonia". Numerous results were logged up in 2011, including a PhD thesis defended; the perfecting of a method to identify two pathogenic Vibrios in shrimp (PCR multiplex analysis); genome sequencing of fifteen Vibrio strains highlight the presence of a reservoir in the environment; selecting, characterising and evaluating a bacterial strain for use as a probiotic in rearing larvae; developing controlled experimental structures (mesocosms) in order to reproduce the pond environment, and putting them into operation. Ifremer is also taking part in experiments conducted by the Aquaculture farm grouping (GFA).

All these studies were carried out with French and foreign partners: IPNC, University of Caen, University of Montpellier-CNRS, Pierre & Marie Curie University-OOBS and the Medical School of Boston.



© Ifremer/Jean-Marie Peignon

Shrimp eye tag

Prospecting for mineral resources

Projects to map the Exclusive Economic Zone and the national Extraplac programme for the extension of the continental shelf are mainly conducted by Ifremer teams from metropolitan France. A partnership was forged between Ifremer and the Dimenc department of Industry, Mines and Energy (with some staff trained by Ifremer), to implement a programme to assess mineral resources and the potential of exploitable offshore oil. The interest raised by this programme on the part of New Caledonia's direct neighbours led to the pooling of scientific data acquired during French, Australian and New Zealand oceanographic cruises and by applying jointly for projects (Tecta, Vespa, etc.) aiming to implement large-scale oceanographic facilities.

"LAGOONS OF NEW CALEDONIA" SITE STUDIES

The principal studies conducted by Ifremer in 2011 in the framework of this multidisciplinary programme fulfil two theme-based objectives: enhancing the utilisation of biodiversity and natural resources and designing tools for integrated management of lagoon environments.

• **bioprospection and commercial utilisation of biological resources (bacteria adapted to extreme environments other than hydrothermal):** the project is supported by the Ministry of overseas France and is the subject of a PhD thesis. Over seven-hundred-forty bacterial isolates were collected during the cruises performed in April 2010 and 2011. They are kept in two strain collections, one of them at Ifremer and the other at the Pasteur Institute. Significant initial results have been obtained: 5% of the isolates produce EPS and PHA polymers and 12% of these isolates produce antibacterial substances. Relations were established with the Caledonian science park and industrial partners are now being sought for transfers of methodology and technology.

• **studies to develop feeds to be used in developing Indo-Pacific swamp crab farming.** The studies (UNC-Ifremer thesis) were launched in July 2011 under the impetus of the South Province in partnership with Vietnam (*Research Institute for Aquaculture n°3*, Nha Trang). The project's first phase consists in specifying whether one or several exploitable species exist in New Caledonia and to produce spawning in a controlled environment.

• **managing and utilising environmental data:** the project on "KNS demonstrators & Entrecasteaux reef-Promoting Quadrige² and Surval tools" contributes to drawing up the specifications for a marine portal which could be used by the future Natural areas conservatory. Ifremer (leader), the Department of information technologies and services (DTSI) of New Caledonia and the KNS company (staff provision) are the project partners.

• **assessing MPA performance:** the Pampa project (Liteau programme) receives additional funding from Ifrecor, the Agence of Marine Protected Areas and the South Province. Currently in an enhancement and development phase, it is being continued by Ifrecor (TIT-AMP) and through a project led by Ifremer, in partnership with the three provinces and the Natural areas conservatory.

• **perfecting an observation system using underwater video:** a patent was filed jointly by IRD, the Adecal economic development agency and Ifremer for this project. Its methodology has been widely tested and will be progressively transferred to services managing MPAs.

• **methodology guides for monitoring the impact of mining and marine environmental quality (financed by CNRT, entitled "Nickel and its environment").** The Gimini project involves drawing up specifications for one or several monitoring networks which are adapted to local requirements, with the transfer of know-how and tools to Caledonian technical services. The project was led by Ifremer, in partnership with IRD, UNC

© Ifremer/Michel Gouillou

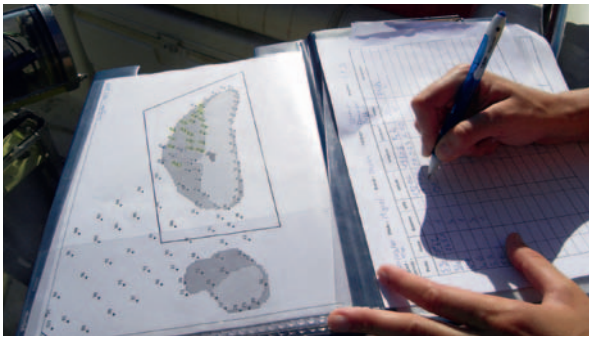
Closing meeting of Pampa project, Aquarium de la Porte Dorée, 30-31 March 2011

and Mine professionals. The final report was handed in July 2011.

• **development of mine-related impact and pressure indicators (CNRT, "Nickel and its environment"):** the ADIIP project, led by IRD, brings together Ifremer, AEL, Cerege and Aquabiotech. Ifremer is working on three of the project's components, including the deployment of passive samplers. In July 2011, a trials cruise was conducted in the Noumea region in order to validate the relevance of using the passive sampling technique (DGT) to monitor water contamination.

• **development of a numerical hydrodynamic modelling platform:** this project, led by Ifremer and conducted in partnership with IRD, with the objective of supplying local and regional authorities with outreach and demonstration tools created by numerical modelling of the behaviour and dynamics of lagoon water bodies.

• **co-management of coral reefs and lagoon areas:** the Cogeron project (Liteau programme) is led by IRD, in partnership with UNC, IAC and Ifremer. Ifremer is involved in perfecting a demonstrator for the possibilities offered by Quadrige and a web portal prototype based on our Envlit tool.



© Ifremer/Jérémie Drelon

Note-taking in order to position the Staviro station in the large Noumea lagoon New Caledonia

> "From valorisation of biodiversity and natural resources to designing tools for integrated management of lagoon environment"

SCIENTIFIC COOPERATION AND PARTNERSHIPS

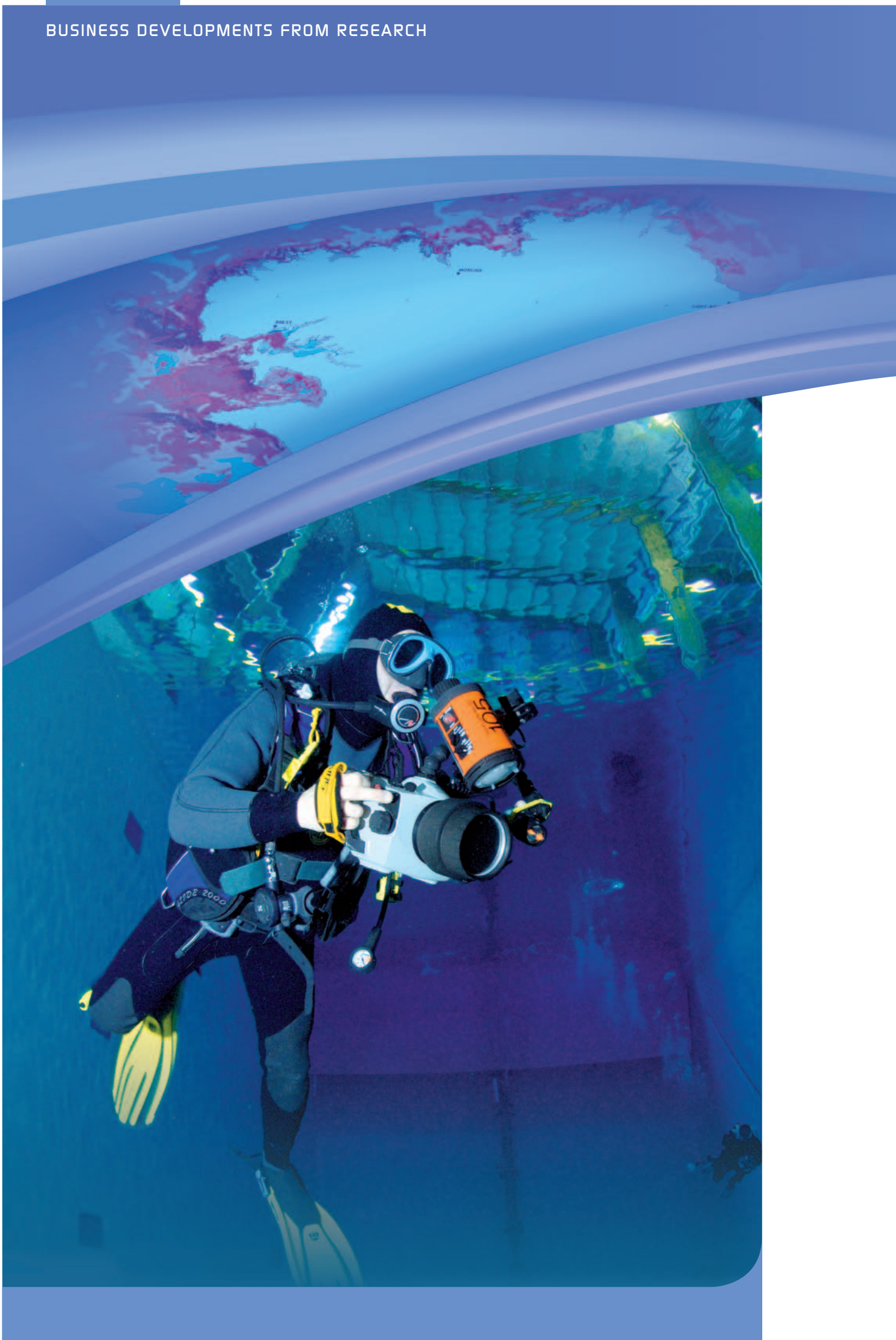
Ifremer conducts its research in cooperation with the services of the New Caledonian government and the three provinces. In scientific terms, our Institute works in collaboration with the University of New Caledonia and the main research bodies with local presence (BRGM, IAC, Pasteur Institute, IRD). Discussions were pursued in 2011 to strengthen cooperation and identify the prospects for pooling of resources. An interim association (Presica) was formalised. Its aim is to define the scientific programme and the conditions of governance for a Caledonian PRES cluster.

Our Institute is a member of the National technological research centre (CNRT) on "Nickel and its environment", and takes part in the scientific councils of the Zoneco programme, the Œil observatory, the Natural areas conservatory and the Ifrecor's New Caledonian section. We actively contribute to several other groupings such as GOPS and Pace-Net (European Union-South Pacific network for science and technology).

Ifremer is a partner in the recently established MPA agency's field office in Noumea and is setting up scientific cooperation with Australia (Csiro, AIMS, University of Tasmania, James Cook University, University of Queensland and Geoscience Australia), New Zealand (NIWA, GNS Science), the secretariat of the South Pacific Community (SPC) and the University of the South Pacific (USP) in Fiji.

MAIN EVENTS IN 2011

Ifremer took part in the first of three seminars organised by the Pacific Economic Cooperation Council (PEEC) on the sustainable management of marine resources (Noumea, November), the first coordination committee meeting organised by France, New Caledonia and Australia for integrated management of the coral sea (Noumea, December) and the seminar on "energy management in the Pacific" organised by the government of New Caledonia and Ademe on the topic of "Marine renewable energy sources" (Noumea, December).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Cultivate an ambition for European and international scientific cooperation

EUROPEAN RESEARCH POLICY ORIENTATIONS

Contribute to collectively defining the ambitions of the marine science and technology community, both European and global

A NATIONAL-LEVEL COORDINATION MISSION

Ifremer, as Europe's number one marine science institute by its size and the range of its thematic and geographic coverage, contributes to the collective development of the marine science and technologies community - both in Europe and worldwide. The contribution is made in coordination with national theme-based groups created by the European Affairs mission of the ministry responsible for research, which brings together representatives of public and private sector research and the technical ministries concerned. Their objective is to ensure that rapid, direct information reaches research teams working in the various fields of the European Framework Programme for Research and Development (FP R&D).

FULL INVOLVEMENT IN EUROPEAN STRATEGIC NETWORKS

To be at the heart of decision making and ensure that our strategic objectives remain a benchmark in Europe, Ifremer is present in numerous European networks. Since the European Science Foundation (ESF) came into existence, our Institute, though its contribution to Marine the Board's analyses, has highlighted the specificities of marine sciences and their importance in the European scientific community.

In 2011, Ifremer decided to join Science Europe, which will progressively take over a large part of ESF's actions and EuroHORCS (European heads of research councils) activities. As the association of research funding organisations (RFO) and research performing organisations (RPO) based in Brussels, Science Europe's mission is to promote their collective interests with the objective of strengthening the European research area.

Since May 2011, Ifremer has assumed the two-year chairmanship of the Efaro European Fisheries and Aquaculture Research Organisation.

Ifremer contributes to the EurOcean platform, rising to the challenge for information to serve the needs of institutions and scientists. Our Institute's participation in the POGO and EuroGOOS networks keep it fully abreast of developments in international projects for ocean observation, both in the field of data (Ifremer being the operator of the Coriolis centre) and that of sensors or systems (Argo, OceanSites).

JOINT PROGRAMMING

At the Competitiveness Council meeting in December 2011, the European Ministers of Research formally adopted the Joint programming initiative JPI Oceans. The initiative gathers seventeen Member States and Associated Countries, thus covering all European maritime basins. Ifremer, having promoted this initiative as of 2008 in agreement with the Ministry of research and in the framework of preparing the "Marine Science" ERA-Net (SEAS-ERA), was a driving force in its implementation in 2011. Our Institute contributed in particular in responding to an FP7 call for projects: CSA Oceans coordination and support action for research activities and policies (work package leader, research infrastructure), aiming to define the strategic agenda for JPI Oceans research and innovation, tools and resources for its implementation and launching a joint programming pilot action.

PREPARING THE EUROPEAN "HORIZON 2020" FRAMEWORK PROGRAMME

The main instrument for the European Union's research policy, the seventh framework programme for research and technological development (FP7 RTD), began in 2007 and will end in 2013. The future European programme for research and innovation Horizon 2020 (2014-2020) will replace the current FP7 research framework programme, the CIP competitiveness and innovation framework programme and the European Institute of Technology (EIT), as of 1 January 2014. During the two years of negotiations for this programme, Ifremer's European and international affairs department (DAEI) will provide support for its scientific community, in order to present the orientations and objectives of Horizon 2020, the rules of participation and the positions taken by the stakeholders (States and research actors), etc.

For the preparation of this new framework programme, Ifremer responded to the public consultation launched by the Commission in February 2011; our Institute is taking part in several national working groups (including the Ministry of higher education and research's European cross-cutting consultation group), thus contributing to establishing the French position. A strategic document, entitled "Marine Sciences: from Challenges to opportunities", which was jointly drafted by G3 partners (NOCS, Geomar, Ifremer), was widely disseminated to various European Commission services as well as to national bodies, with the aim of highlighted the specific needs of the marine science community. Ifremer also took part in drafting position documents presented at the Blue Growth conference held in December 2011 at the European Parliament, and elsewhere.

This future framework programme will be based on three priorities: scientific excellence, industrial leadership and societal challenges (with six major themes).

In 2012, Ifremer will deliver its comments and recommendations in response to the Commission communications distributed in November 2011, to the European Parliament and Council, the European economic and social committee and the Committee of regions. Ifremer plans to rely on its participation in JPI Oceans "Healthy and productive seas and oceans" initiative, the Marine Board and ERA-Nets to make our position known.

AN ACTIVE ROLE WITHIN MARINE ERA-NETS

The MariFish ERA-Net presented its final report in the first semester 2011. This gave a complete inventory of all of the consortium's major achievements (2006-2011) for the drawing up of a sustainable ecosystem-based management strategy for fisheries.

Six joint programmes were begun in Work Package 7, coordinated by Ifremer, to test and develop the ways that Member States can cooperate on the basis of various existing national programmes. The experience acquired was positively taken into account in the SEAS ERA-Net (2010-2014), where Ifremer, in partnership with ANR, worked as of 2011 to build collaborative programmes in the framework of regional approaches (Atlantic and Mediterranean). JPI Oceans' implementation will benefit from the reflections and results of the MariFish and SEAS-ERA networks.

The MariFish ERA-Net fostered contacts between financial backers, managers and scientists in order to find solutions to future fisheries management challenges. The cooperation established sound foundations, enabling new and fuller cooperation to be built in response to a proposal for an ERA-Net in the fields of fisheries, aquaculture and seafood processing. In September 2011, Ifremer, through the European fisheries and aquaculture research organisation Efaro, organised the first meeting, thus beginning the process of developing a project bringing together twenty-five partners. Within the project, Ifremer is positioned *inter alia* in the strategy actions for fisheries research.

Florence Coroner

> “Give Ifremer the means to incorporate its scientific priorities and methodologies in European research programmes and policies in general”

Interview

Florence Coroner is specialised in Political Science, European Union law and functioning of European institutions, lobbying techniques and European project management. She joined Ifremer in March 2010 as its permanent representative to the Club of associated research organisations called Clora. In 2012, she was appointed to the Secretariat of the Joint Programming Initiative “Healthy and Productive Seas and Oceans” (JPI Oceans) in Brussels.

What main achievements have you contributed to recently?

First as a representative to Clora and then as member of the JPI Oceans secretariat, through my work, I’ve contributed to positioning Ifremer as a major player in European policy for marine science. The relationships which I have maintained with European bodies, as well as my work on European policy and legislation intelligence and information, have led to quite tangible results for the Institute, such as the coordination of large-scale projects which highlight Ifremer’s expertise on the European scale (e.g. Eurofleets), the Institute’s increased presence in all European programmes and its recognition as an essential stakeholder in the framework of European marine science policy. Obtaining this recognition, like the renown of our Institute on the EU and international levels, is of course, related to the scientific studies, but also to the transmission of this expertise within European mechanisms - for instance, by setting up a European Union-level marine data portal. This work is more political than scientific in nature and it is a long-term endeavour. I’m proud to contribute to it through my activities in Brussels.

What is JPI Oceans? Why is it important for Ifremer?

JPI Oceans is a coordinating and integrating platform open to all EU Member States and Associated Countries. Its management board is made up of representatives from Ministries and from Agencies funding research.

National research budgets represent up to 85% of the research funding within Europe, so joint programming aims to improve the efficiency, effectiveness and impact of national public research funding in strategic fields such as marine and maritime research. Joint programming is a turning point in European cooperation in terms of research. It could become a mechanism which is at least as important as the Framework Programmes on the European research scene. It could also truly change the way Europeans think about research.

Ifremer has been a driving force in setting up joint programming since 2008. To pursue this objective, which is part of the Institute’s will to act as a driver of marine science policy in Europe and to maintain its leadership role in this field, it seemed essential for Ifremer to constitute the means for strong involvement in the implementation of JPI Oceans. This commitment is most clearly shown by my work at the JPI Secretariat.

What impact does your work with European institutions have for Ifremer? And for French research in general?

My work within the JPI Oceans secretariat enables Ifremer to play an active role in setting up this new process for cooperation. More specifically, my mission is to relay the expertise of Ifremer and our French partners, for instance in terms of managing large research infrastructures, starting with the scientific fleet, or monitoring methods for environmental or product quality and for implementing joint programming.

JPI Oceans is also greatly involved in preparing the upcoming “Horizon 2020” Framework Programme for research, and more broadly speaking, in implementing the Integrated Maritime Policy. My involvement in these significant projects should give Ifremer the means to incorporate its scientific priorities and methodologies in European research programmes and policies in general.

IFREMER REPRESENTED IN CLORA

Within the Club of associated research organisations (Clora), in 2011 Ifremer was especially involved in monitoring the Commission's preparation of the future Horizon 2020 framework programme (consultations, schedule, compiling of advice). The conference on Blue Growth, co-organised in Brussels with CPMR, the German consortium for marine research KDM and the European Parliament intergroup on "seas and coastal areas", aimed to highlight research's contribution to the development of the maritime sector. Several experts from our Institute spoke at this conference (contribution of marine sciences, economic data on maritime activities).

On Clora's twentieth anniversary, the Minister of Higher education and research and the heads of French research alliances held a breakfast-debate in December in Brussels. This meeting was an opportunity to increase the visibility of French research and its representation in Brussels. The Minister reiterated his support to Clora members just before the intense lobbying action to finalise the EU programmes and tools for the 2014-2020 period. Clora will be chaired by Ifremer in 2012.

Fourth Franco-German forum on scientific cooperation

Ministers and directors of the main research organisations of both countries gathered in October in Berlin for the event. It is held every three years and represents an important step in closer scientific cooperation between France and Germany.
Ifremer was represented in four of the twelve thematic working groups which brought together the best experts from both countries. They dealt with green and white biotechnologies (workshop 3), non-energy raw materials (workshop 4), climate-energy (workshop 5) and large-scale instruments (workshop 10).
At the outcome of the forum, a joint statement by the two ministers as well as a roadmap were published on 6 February 2012, officially endorsing the closer work, above and beyond already existing cooperation, in the fields of medical research and green and white biotechnologies, in close collaboration with the world of research and industry. Furthermore, France and Germany will closely coordinate their actions in the field of the strategic importance of non-energy raw materials, a subject on which joint studies will be conducted by BGR and Ifremer on the nodules zone of the Pacific. Both countries wish to establish cooperation in the field of extraction and processing technologies, like biomining and deep sea technologies.

STRONGER BILATERAL COLLABORATION IN EUROPE

SPAIN

In February 2011, Ifremer and the Spanish oceanography institute (IEO) redefined the terms of their cooperation. Both institutes stated their will to reinforce the traditional fields of their cooperation though the shared use of infrastructures (RV *Thalassa)* and developing programmes on the ecosystem-based approach to fisheries i the context of the new Common Fisheries Policy (CFP). Ifremer and IEO want to extend their cooperation to new fields, such as coordinated application of the Marine Strategy Framework Directive in adjacent seas and developing aquaculture projects (tuna, etc.) and are envisaging concerted proposals and actions in the European framework (JPI Oceans, ERA-Net, major research infrastructure policy). They plan to develop tools to promote and exchange scientific and technological excellence between the research laboratories of our two countries.

ROMANIA

A new cooperation agreement between French and Romanian research institutions was signed in October 2011, on the premises of the GeoEcoMar Institute in Bucharest, with the Romanian Secretary of State for Research, the president of the National research authority and the French Ambassador to Romania in attendance.

The Ifremer-GeoEcoMar agreement provides an institutional framework for the Franco-Romanian scientific exchanges in marine geology which have existed since 1991. It will enable new opportunities to develop for collaboration, with training and hosting of Romanian studies, a stronger partnership in European projects with the preparation of the next FP Horizon 2020 and growing awareness about the themes specific to the Black Sea.

SPECIAL PARTNERSHIP WITH COUNTRIES ON THE SOUTHERN SHORES OF THE MEDITERRANEAN

In order to better understand the stakes for the Mediterranean, Ifremer has established a partnership with the sustainable development observatory in the Mediterranean called the Blue Plan, taking on the functions of a Regional Activity Centre under the Mediterranean Action Plan (United Nations environment programme, UNEP/MAP). This renewable agreement provides the availability for three years (2009-2012), of an expert in charge of developing the Blue Plan's marine programme on the sustainability of maritime economic activities in the Mediterranean related to marine ecosystems. In 2011, Ifremer's studies focused on the socio-economic analysis of the fisheries and aquaculture sectors in the Mediterranean. The Blue Plan and Ifremer are also partners in the European FP7 Perseus (Policy oriented marine environmental research for the Southern European seas) programme, launched in 2011 following the Ocean 2011-3 call for proposals. The programme aims to promote the application of the Marine Strategy Framework Directive principles in the Mediterranean and the Black Sea.

ASSOCIATIVE AGREEMENT WITH ALGERIA

Algeria and the European Union signed an "Association agreement" establishing the frame of their bilateral relations in the realm of economic, commercial, social and cultural policies.

The first phase of its implementation (2009-2011) gave rise to five twinning projects, including the redeployment of the Algerian national fisheries and aquaculture Research and Development centre (CNRDPA) to foster restructuring of the sector and making it part of the country's economic activity.

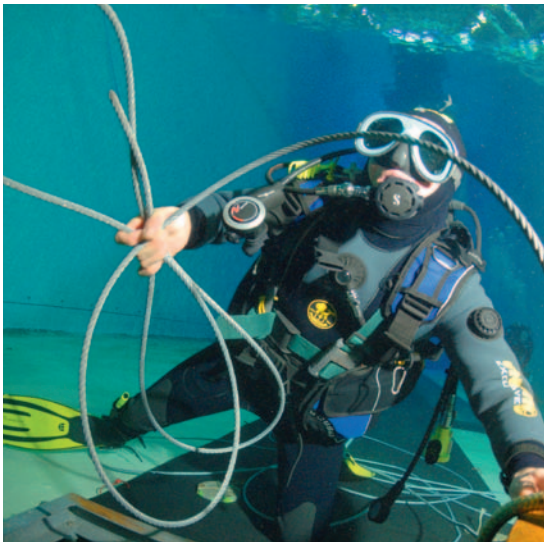
An association between French and Italian partners was selected by a call for tenders. The twinning is coordinated by DPMA at the French Ministry of agriculture and fisheries, and also involves MEEDTL and the General council for food, agriculture and rural areas (CGAAER). Numerous experts from Ifremer will be called on for the implementation of this contract (slated for mid-2012).

Discussions between CNRDPA researchers and managers and experts from Ifremer will be a fulcrum for future cooperation in terms of fisheries and aquaculture research, including the fields of managing and organising research cruises and scientist exchanges.

At the outcome of this twinning experience, CNRDPA will be able to consolidate its scientific research strategy, reposition its action for developing commercial utilisations and for relations with the business world, and finally modernise its research fleet's equipment and use.

MOROCCO, TOWARDS A MORE SCIENTIFIC PARTNERSHIP

The 2010 joint committee meeting of the Moroccan national fisheries research institute (INRH) and Ifremer was held in Casablanca in March 2011, attended by the deputy advisor for cooperation and cultural action of the French embassy in Morocco. This French-Moroccan cooperation has been qualified as exemplary, particularly in terms of the wide range of themes covered and its regular joint committee meetings. It should evolve towards a more scientific partnership (publications, articles and co-supervised PhD theses), with greater focus on exchanges on data, on themes giving preference to fields such as operational oceanography and ship building. Support for carrying out these projects may be found through the Hubert Curien (PHC) Volubilis programme set up by the French embassy in Morocco.



TUNISIA, A CO-SUPERVISED PHD THESIS

A thesis on the optimisation of methods in order to reduce the risk linked to shellfish contaminated by fast-acting neurotoxins was co-supervised by Ifremer's Phycotoxins laboratory and the Tunisian national institute of marine sciences and technologies (INSTM). The oral examination for this PhD thesis in 2011 was the subject of numerous exchanges between our two Institutes.

> "Better understanding of the stakes for the Mediterranean"

STRATEGIC INTERNATIONAL COOPERATION

FRANCO-RUSSIAN OCEANOLOGY COMMITTEE

The fourteenth Franco-Russian committee for oceanology meeting held in Saint-Petersburg in April 2011, aimed to assess the cooperation underway between Ifremer and Russian institutes and collect request for cooperation in fields not yet covered, particularly concerning the Arctic Ocean. On this occasion, an encounter was organised with the French Embassy's advisor and attaché pour Science and Technology in Moscow in order to present Ifremer's cooperation with our Russian partners in the various fields of marine geoscience (deep sea mineral resources), physical and spatial oceanography, oceanographic data management and aquaculture techniques.

COOPERATION WITH JAPAN

Two representatives from Jamstec (Japan Agency for Marine-Earth Science and Technology) were received at Ifremer headquarters in Issy-les-Moulineaux and in Brest in order to discuss the collaborative work underway and to come in fields of shared interest (physical oceanography, underwater technology, exploration and observation of deep sea ecosystems, etc.). Putting a Jamstec agent on secondment at Ifremer was considered, in order to strengthen the ties linking our two institutes. Sharing of ship time on our respective vessels was mentioned and will be given a thorough examination.

A proposal for an agreement between Ifremer and the Japanese Fisheries Research Agency is being studied, with the aim creating a framework of scientific cooperation which would span several fields related to managing and protecting biological resources (fisheries and aquaculture) and integrated coastal management.

GREATER COLLABORATION WITH BRAZIL

2011 was a pivotal year for marine science in Brazil, with on one hand the Brazil "Science without borders" mobility programme of CNPq (funding for 75,000 geoscience student grants abroad between now and 2014), and on the other, the creating of four INCT marine science regional LabEx coordinated by the Marine institute in Rio and by the federal Universities of Bahia, São Paulo and Rio Grande.

In keeping with the priorities set out in the four-year contract, Ifremer has continued to further its collaboration with Brazil in the fields of geoscience (preparing the Magic cruise off Brazil) and operational oceanography, with a new project devoted to observation of the South Atlantic in 2011. The latter is financed by ANR and the Foundation to support science of the State of São Paulo (Fapesp) whose funding resources are sufficient to independently develop cooperation with France.

The scientific director of Fapesp, accompanied by the attaché for science and technology at the French consulate in São Paulo, was received at Ifremer's headquarters in March 2011. A meeting with the directors of the other main Brazilian foundations supporting research (FAP) was organised in October. Two framework agreements, mainly concerning geoscience, the deep sea environment and organising joint cruises, were signed for a period of five years with the University of Brasilia and with the Brazilian geological service (CPRM), which reports to the Ministry of energy and mines.

The Franco-Brazilian marine science symposium was held in September 2011 in Roscoff and Brest under the aegis of the AllEnvi alliance's marine group. The event, where the four Brazilian LabEx entities were represented, made it possible to identify possible strategic partnerships.

An Ifremer mission was commissioned in November 2011 in order to attend the various working meetings organised in relation with Brazilian institutional stakeholders and partners. They included a joint committee meeting with CPRM in Brasilia, preparing the authorisation procedure for the Magic cruise with the French embassy scientific attaché present, a meeting with the ICF consultant, then with the Petrobras Research and Developmentcentre (Cenpes) in Rio de Janeiro, with the National council for scientific and technological development (CNPq) and a presentation of Ifremer's scientific cooperation at the Ministry of the Environment in Brasilia.

COOPERATION WITH CANADA

The eleventh joint committee meeting of Ifremer and the Department of Fisheries and Oceans Canada (DFO), part of the framework agreement signed in 1990, was held as a videoconference in November 2011. Its objective was to review and assess the priority levels of the actions conducted in the framework of Ifremer-DFO cooperation. Seeing the interest of its cross-cutting theme, the integrated project on "Ecosystem-based approach" will be supported by the creation of an international research grouping.

COOPERATION WITH THE UNITED STATES

Cooperation with NOAA is continuing, though the funding begun in 2010 by Ifremer, of three post-doc fellows working on the strategic themes of the environment and deep sea coral, toxic algae blooms and observation of the South Atlantic.

International Seabed Authority

During the last meeting of the Inter-ministerial committee for the sea in June 2011, Prime Minister François Fillon announced that an application file for a permit to explore sulphide deposits in the international zone which corresponds to seafloors "beyond zones of national jurisdiction" was being prepared. Ifremer was put in charge of drawing up the application file, which should be submitted to the International Seabed Authority (ISA) to be examined during the eighteenth session. The seventeenth session of AIS was held in Kingston in July 2011. The French delegation was led by representatives of the Ministry of foreign and European affairs which have ex officio the right to sit at the ISA Council and Assembly. The latest session was a turning point, from the Authority's creation in 1994, asserting its enduring role as guardian of the international zone. This was the last year of the elected terms of the two French representatives to the Legal and technical commission and the Finance committee of the ISA. Elie Jarmache was elected as representative to the Legal and technical commission for the period from 1 January 2012 to 31 December 2016.

scientific ethics

dissemination of scientific results

vulgarization

education

SUPPORT AND PROMOTION OF RESEARCH

Cultivate the marine science network

INTELLIGENCE AND FORESIGHT

Intelligence, foresight and research strategy for marine sciences: respond to the challenges of the future in a national and European context

OVERVIEW OF THE EUROPEAN "GLOBAL EUROPE 2050" FORWARD-LOOKING STUDY

This foresight study, entitled "The World and Europe up to 2050: EU policies and research priorities" brought together 25 European experts focusing on the major challenges for EU27 - population, climate change, availability of natural resources and geopolitical context, research and innovation, etc. - with a long-term outlook. Based on three scenarios, called "nobody cares", "EU under threat" and "EU renaissance", the European experts defend the "renaissance" scenario which brings breakthroughs and progress, i. e., cooperation within Europe and with the rest of the world. The study gave rise to three key messages.

Firstly, decision-makers must abandon business as usual and small context-related adjustments and rather make strong structural choices.
The second point involves the need for the European Union to invest in knowledge. If the European Union wants to play a role, it must remain united. The experts specify that the field of excellence for maintaining Europe's influence lies in science, in order to preserve its ability to invent and master the future.
The final point is on political and cultural integration, pooling all forces and resources to meet global challenges (climate, agriculture, urbanisation, etc.), and build a "Union of European Nations" showing more solidarity, being more reactive and mobilising young people with confidence in the future.

Think tank on ocean acidification

Scientists from Ifremer took part in a symposium on ocean acidification organised in October 2011 by the Total foundation. Three days of thought and discussion focused on research's state of progress, current issues, and the forces at work on both national and international levels. These elements will be used directly to draw up an Ifremer position paper on the issue of ocean acidification in the framework of the strategic approach.

RAISING AWARENESS ABOUT SCIENTIFIC ETHICS

A day to raise awareness about ethics was organised at Ifremer's headquarters in November 2011. It launched thought and discussion about the issues raised by the manipulation of living matter in terms of ethics, particularly those related to a PhD thesis on developing isogenic lines of seabass conducted within our Institute.

DRAWING UP OUR STRATEGY

BILATERAL PARTNERSHIPS: RENEWED FRAMEWORK AGREEMENTS WITH BRGM AND MNHN

Ifremer and BRGM, a public institution which is a reference in earth sciences, held meetings in late 2011 in order to prepare the signing of an up-coming framework agreement slated for June 2012.

Both organisations plan to share their respective strategic approaches in order to coordinate their objectives with respect to their supervisory authorities. Their future cooperation should be further strengthened through a dossier presented to CIMer on knowledge about the marine environment in territories surrounding French zones (areas with stakes for the continental shelf). It also lies in the field of mineral resources and in coordination for coastal activity on the Atlantic seafront, with the organisation of a joint scientific coastal conference. This new agreement provides for the creation of an operational monitoring committee to supplement the current strategic steering committee.

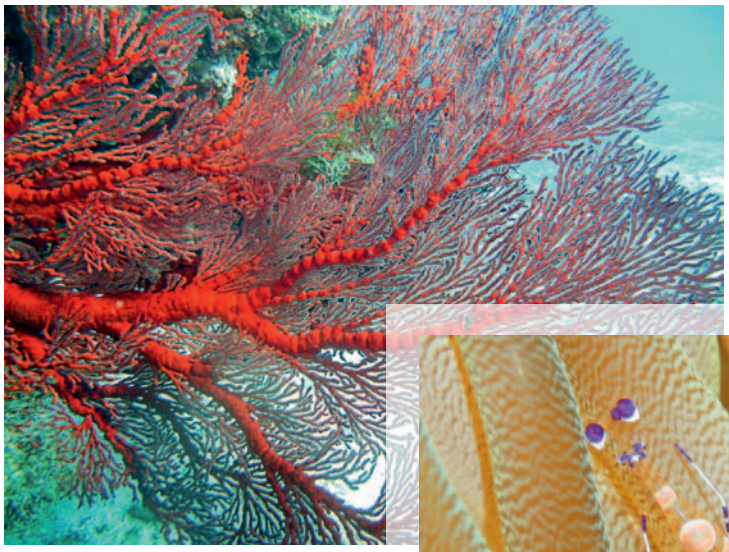
The framework agreement for scientific cooperation between Ifremer and the National museum of natural history (MNHN) reached its term in late 2010. Their respective scientific departments met during the last quarter of 2011 to assess the current arrangement and propose new priorities for scientific cooperation. The need to optimise scientific expert assessment approaches, notably by performing collective appraisals, has been identified in fields like fisheries resources, to back up public policies (Cites, MSFD, fauna-flora habitat directives).

ACTIVE PARTICIPATION IN NATIONAL ALLIANCES

Ifremer is participating in the Prospective foresight group of AllEnvi, the national environmental research alliance, as well as in the Marine group. In this capacity, our Institute made a major contribution to the drafting of the "Programme for the sea" document presented to the Department of the Commissioner-General for Sustainable Development (CGDD) in November 2011.

A MORE EFFICIENT PHD POLICY

Competition is rife to find excellent candidates for PhD and post-doc grants, as well as finding matched funding. The schedule for Ifremer grant calls for proposals was revised in 2011 to make it compatible with the offers of other research bodies. The goal is to move the selection of PhD and post-doc subjects forward in order to launch calls for applications and consolidate co-funding as of early March. All of the 2011-2012 PhD grants have been awarded and recruiting of post-doc fellows for 2011-2012 will continue until April 2012.



Support for public policies

Ifremer took part in drawing up a project presented in the FP7/ENV call for proposals on the theme of the environment. Planned to last for two years (starting in September 2012), the project called Stages for "Science and technology advancing governance on good environmental status" aims to improve the foundations of scientific knowledge needed for the implementation of the Marine Strategy Framework Directive (MSFD). The project is coordinated by Cetmar (Spain). Its objective is to make three tools available: a database of research projects producing knowledge of use in implementing the MSFD; a report for decision makers on research projects to be encouraged; proposals for a structured science / policy interface platform including the different stakeholders. It has been suggested that Ifremer coordinate the latter strand.

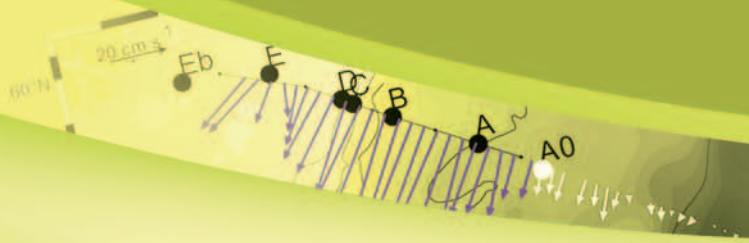
Onema and Ifremer have set their 2012 schedule, with twenty actions selected. They involve methodological support related to the implementation of the Water Framework Directive (WFD), bio-indication and chemical contaminants, as well as Ifremer's contribution to the water information system called SI Eau. The 2012 agreement also covers four research actions on contamination of the food chain, emerging contaminants and assessing environmental damage. In order to weigh Ifremer's contribution to the WFD for the drawing up of the next framework agreement, a macro-analysis of our Institute's activities in the coastal environment was conducted in 2011, based on analytical data from the previous year.

STRATEGIC METALS

Ifremer was entrusted with examining the submission to the International Seabed Authority (ISA) for licensing to explore for sulphide deposits. A preliminary version of the "application for approval of a plan of work for exploration to obtain a contract for polymetallic sulphides" from the ISA was sent to the Secretariat general of the Sea as well as to the Strategic metals committees (Comes) for their opinion on the terms and conditions and scope.

SCIENTIFIC OUTREACH

Ifremer was greatly involved in organising, alongside CNRS, the international symposium on "Vulnerability of coastal ecosystems to global change and extreme events: at the crossroads of knowledge to the benefit of coastal and marine ecosystem services" which was held in Biarritz in October 2011. This international symposium particularly highlights the type of themes for which Ifremer can mobilise skills and expertise and provide concrete responses to society. In a novel approach, organised in conjunction with the Océanovation technical forum, it associated the socio-economic sector for a joint perspective on how to transfer scientific tools, also emblematic of our Institute's model. The lively interest raised by this initiative provided the proof that questions about vulnerability, adaptation and resilience of ecosystems subjected to numerous pressures, are at the centre of both current and future scientific reflection. Concepts and tools being developed for the coastal zone are also awaited for deep water ecosystems, for ecosystems in overseas territories and so on.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Promoting and sharing Ifremer's innovative offer

High stakes and a strong commitment: economic developments and transfers of the Institute's technology and know-how to industrial firms

For Ifremer, generating economic value from its research is an essential stake. In 2011, several types of action drew the strong involvement of all our Institute's teams, in promoting technologies at trade shows, contracts for service provision, cooperation and licenses with industrial firms, managing patent portfolios and pursuing collaborative research. Other examples include the participation in the Ifremer 2011 Trophies by presenting six candidates in the "innovation" category.

PROMOTING TECHNOLOGIES

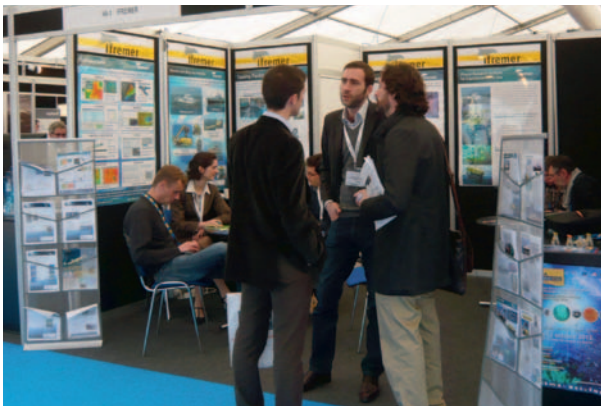
PARTICIPATION IN TRADE SHOWS

In 2011, Ifremer promoted its products, services, facilities and know-how at five major trade shows.

• *Halieutis* trade show (Agadir): promoting studies, presenting proposals for studies and expert assessments, fisheries-related test equipment and facilities and the fisheries research vessels *Thalassa* and *L'Europe*. Ifremer shared a stand with the Cofrepêche consultancy firm, in the French pavilion organised by UbiFrance. International cooperation, including that with the National fisheries research institute of Morocco (INRH), was showcased.

• *Ocean Business* trade event (Southampton): presenting vessels and autonomous underwater vehicles (AUV), embedded software and our Institute's testing facilities. Ifremer shared a stand with the Brest Métropole Océane urban council.

• *Oceanovation* European forum (Biarritz): with the exclusive presentation of the Hybrid ROV project, the autonomous sailing boat with embedded instrumentation Vaimos, technological and biological solutions to protect the marine environment and the mock-up of the *SeaExplorer* glider (developed by ACSA-Ifremer in collaboration) on show.



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Ifremer's stand at the Ocean Business trade show

• *Itech'mer* trade show for fisheries professionals (Lorient): presenting the new test tank for fishing gear, projects like Barconnect (seabass tagging cruise) and Obsmer (scientific observers aboard volunteer fishing vessels) and Ifremer's studies on fuel savings and reducing the impact of fishing gear on benthic habitats.
• Pollutec trade fair (Paris): presenting technological and biological solutions to protect the marine environment, patented technologies like a marine optical transducer and a new process to extract chitin, exhibiting the mock-up of the Molit water quality measuring station.

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Sailing robot Vaimos *- Autonomous sailing boat with embedded instrumentation - using wind power and solar energy for measurement and observation missions at sea*

> "13 agreements signed in 2011 for consortia and cooperation"

COOPERATION WITH INDUSTRIAL FIRMS AND TECHNOLOGY TRANSFERS

PROVIDING SERVICES AND PARTNERSHIPS WITH INDUSTRY

Working with the Legal affairs department, the department of development, business development and economic partnerships (DDVPE) negotiated thirteen agreements signed in 2011 for consortia and cooperation. They were all highly structuring for Ifremer industrial partnership activity.

Major chartering agreements were signed in 2011. Ifremer took part in assessing and setting up a new public-private partnership involving Areva, Technip and Eramet in the Futuna 2011 cruise. Negotiations with Petrobras continued to perform exploratory cruises off Brazil. The Sanba cruise took place in January 2011. Ifremer also ensured the preparation and negotiation cruises for Total.

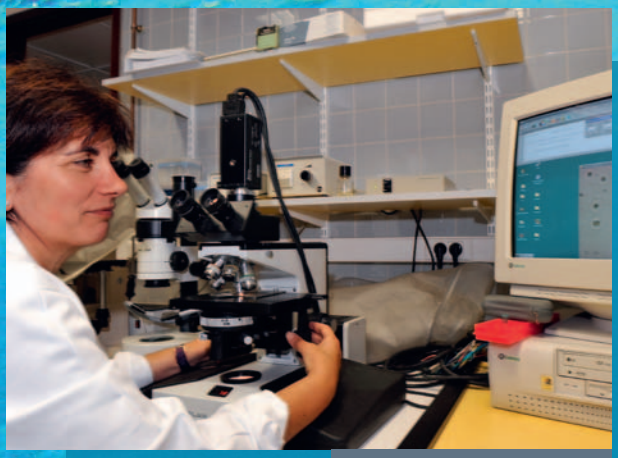
A contract was negotiated with the Sercel firm for twenty-eight days of sea trials for innovative equipment aboard RV *L'Atalante*. The trials were preceded by several developments on Sercel's behalf, such as creating a mooring line.

Ten-day cruises were organised aboard RV *L'Atalante* for BGR, the German geoscience and mineral resources institute (multichannel seismics research) and aboard RV *Le Suroît* for escort missions. Several coastal bathymetry and imagery cruises were performed on behalf of public bodies such as the Iroise marine park.

© Ifremer/Stéphane Lesbats

Monitoring a rock dredging operation from the bridge of RV L'Atalante *(Futuna cruise)*

> “Obtaining a strain of microalgae twice as rich in neutral lipids led to new projects: filing the patent was one of the steps”



Catherine Rouxel

Interview

Catherine Rouxel is a scientific and technical attachée within the Algal physiology and biotechnology laboratory (PBA). The PBA laboratory is connected to the Marine research and biotechnologies department (BRM) at Ifremer and has two teams, one of them specialised in microalgae ecophysiology and the other working in a post-genomic approach.

What is your field of research? What are the main projects you have worked on?

My fields of research fields have changed over time. In 1981, I started working at the ISTPM's planktonology laboratory in the context of marine environmental monitoring studies near nuclear power plants, which were financed by EDF. I then conducted a new programme on determinism in Solea vulgaris sole recruitment; then joined the Algoculture laboratory at Ifremer to work in two fields: recruitment determinism of the macroalgae Himanthalia elongata and food quality of macroalgae which had been approved for human consumption (“Aliment Demain” project).

You went to the Pacific, where you worked on other themes.

Yes it was a both a geographical and thematic change! I joined the Genetics laboratory at Ifremer's Pacific centre to develop a technique to conserve sperm in order to introduce genetic variability in shrimp farmed on site. After transferring the activity to New Caledonia, I was entrusted with a study on cryoconservation of *Pinctada margaritifera* oyster sperm within the Nacre unit. These studies led to the first viable fertilizations in small volumes. They made it possible to measure the required sperm quality needed to obtain the survival of male gametes after freezing. They resulted in the first agreement signed with the pearl farming service.

Upon returning to metropolitan France, I was put in charge of creating a research grouping on cryoconservation of mollusc and fish gametes which did not come into being due to a lack of funding. So I joined the Algal physiology and biotechnology laboratory in 2006.

You recently filed a patent in the framework of your research work.

Yes, in the framework of an ANR project designed to improve the biofuel potential of some microalgae, with the help of temporary staff contributors, I obtained a strain of microalgae which is twice as rich in neutral lipids. This was a first in terms of varietal selection in the field of microalgae. These results led to new projects coming to the fore, putting complementary techniques in transcriptomics and proteomics into play to characterise the metabolic pathways responsible for this improvement. Filing the patent was one of the steps.

Why file a patent? What makes that a logical next step in your work as a research scientist?

Within Ifremer the first path to business developments begins with publication. The fact that we work on living organisms may be an obstacle for increasing the patent approach. Nevertheless, I thought it was advisable to bring the obtaining of this improved and stable strain to a conclusion, just as is done in the terrestrial plant world. There were two factors behind the choice to patent it: a comprehensive search on the possibilities of protecting and developing the strain obtained for commercial use, along with the positive opinion of the patent office consulted.

What impact does your patent have for Ifremer? And for society in general?

For Ifremer, I hope it will be a return on investment. For the moment, it is hard to determine the patent's impact, since it will be open to the community during the first quarter of 2013. The additional studies we are performing aim to consolidate and fuel this strain's potential, whether for energy-related uses or aquaculture.

Business developments for know-how

In 2011, Ifremer continued to develop commercial utilisations of our know-how through tool development and software sales, technical testing of industrial equipment and facilities, sale of data to French and foreign consultancy firms, impact studies and other expert assessments in the fields of aquaculture and fisheries technology.

Each year, testing means and facilities are made available to a wide range of sectors of activity. They have included testing video and sonar acquisition systems in a seawater test tank, taking acoustic measurements on Ifremer's Mediterranean site, experiments, culturing of algae and ultrafiltration test in the installations of the Palavas station, etc.

Ifremer also carried out in 2011, advice and assistance missions, for instance, an expert assessment in metrology for NKE, assistance for contracting authorities, state of the art, etc. A contract was signed with the European research centre for algae (CEVA) comprising two projects to control the green tide phenomena at Noirmoutier and in the Bay of Lannion.

Five DynamiT software licenses were granted, along with relevant training, to CSAR (Centre for Sustainable Aquatic Resources, Canada); licenses were sold to the Ilvo company (Belgium), to the School of fisheries (Canada) and to Scapêche (France).

A contract was signed IRD Legos-OMP for the design and production of a tool to calibrate sounders. Equipment, like current meters, was also made available on several occasions.

MANAGING THE PATENT PORTFOLIO

INVENTIONS, PATENTS AND LICENSING CONTRACTS

DDVPE filed seven invention disclosure forms and three patents during the year 2011. Our Institute's patent portfolio was brought up to data, with nine patents being abandoned. Ifremer's technology transfer activity is taking on tangible form through the negotiation of eighteen license contracts (for patents and know-how), eight of which were signed in 2011. Three biological material transfer agreements (MTA) were signed this year.

• In the field of the environment and the agrifood industry, two invention disclosure forms were studied and a patent on chitin extraction was filed. Two license contracts are currently being negotiated with major industrial players in the marine instrumentation sector, and a third contract for Arvor-Provor floats was signed with NKE. Two MTAs with licensing options were established, one on bacterial strains was signed with Cryolog and another with the Bioprox firm.

• In the marine technologies field, an invention disclosure form was accepted and three Soleau envelopes (sealed envelope serving as proof of anteriority for inventions valid in France) were filed. They were for a broadband wireless connector that can operate under water to recover and transmit subsea data from sensors; a standalone, low energy, measuring apparatus used in cathodic protection; a bubble curtain system aiming to mitigate undesirable acoustic fields and developed for the deployment of remote operated AUVs from ships of opportunity.

Four license contracts were negotiated, two of which were signed in 2011 with Sercel (hydrophone and MicrOBS ocean bottom seismometer)

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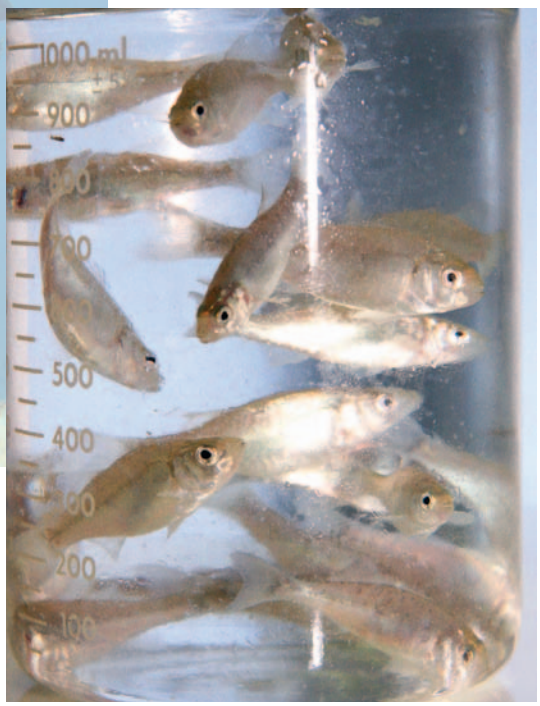
Arvor and Provor ocean profiling floats manufactured by the NKE company

• In the field of marine biotechnologies, four invention disclosure forms were accepted and two patents filed. They concerned the use of an EPS (exopolysaccharide) secretedd by a marine bacteria with applications in the medical field; use of a microalgae which was selected and improved for its lipid yield, with applications in the realm of cosmetics and nutrition.

Eleven license contracts were negotiated, with five of them signed in 2011.



SUPPORT FOR CREATING BUSINESSES

Ifremer's technology transfer activity also includes providing active support to projects of our Institute's scientists to create enterprises. Three projects, both in-house (organising a spin-off committee) and with outside partners (incubators, potential sources of financing) were supported.

The Coldep company, created in August 2011, supplies specialised equipment for producing and concentrating biomass from marine microalgae and for treating aqueous effluents at a low cost. It uses two patents for which our Institute is co-owner with INSA in Lyon. For a budget of nearly Đ100,000, the DDVPE supported twelve research projects which are promising in terms of the potential for industrial and commercial exploitation, requiring technological or commercial maturation. The innovative potential of some of these projects was also highlighted in the Ifremer Trophies event.

CONTRIBUTION TO PUBLIC/PRIVATE SECTOR RESEARCH

PARTNERSHIP-BASED RESEARCH AND "INVESTMENTS FOR THE FUTURE"

In 2011, Ifremer participated in negotiating projects of national and international scope, particularly in the field of renewable energy sources and technological transfer to the industrial sector. Our Institute made a major contribution in bringing new research projects to the fore, in the frame of five competitiveness clusters - Brittany marine, PACA marine, Aquimer (Nord-Pas de Calais), Atlantic Biotherapies and Valorial (Brittany) - thus aiming to promote partnership-based research.

DDVPE contributed to developing the economic value of projects bidding for the "Investments for the future" funded calls for projects. In 2011, the department invested special effort in three projects for facilities of excellence (called Equipex) as well as a LabEx project. It also took part in setting up projects for institutes of excellence in low-carbon energy (IEED), as coordinator for France Energies Marines and as partner in GreenStars. These efforts were crowned with success for the NAOS Equipex and the LabEx Mer in 2011.

The European Prottec project (Ifremer, UBO-Bretagne Valorisation, Universities of Plymouth and Exeter, Marine South East) launched in March 2009 came to a close in June 2011. Its objective was to improve transfer of technology produced by public research organisations to industrial firms and to compensate for some weak links in the innovation chain.

Disseminating knowledge towards society

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Respond to Ifremer's will to integrate the entire scientific process in the overall communications policy

The Department of scientific information, communications, mediation and institutional relations is now structured into three divisions (scientific and technical information; outreach and mediation; actions and production), which corresponds to our Institute's will to integrate the entire scientific process into the communications policy.

It therefore relies on the communications teams along the seafront in order to meet the two main objectives set, i. e., to reassert Ifremer's ambitions and positioning on regional, national and international scales and to enable as many people as possible to understand and buy into the work done by our Institute.

In 2011, Ifremer continued the approach to broaden communications begun in 2010, which is based on four high priority orientations. They are raising the public's awareness about marine science stakes; increasing our Institute's visibility and influence; contributing to business developments for research results and disseminating them both in-house and externally; and optimising partnerships with regional stakeholders (universities and research bodies, professionals, institutional entities, industrial firms, etc.). The main vectors are exhibitions, educational action, media and outreach, trade shows and scientific conferences, the Ifremer trophies, in-house lecture series and tours, as well as developing in-line communication and creating thematic websites.

Ifremer also took part in national events organised on the "2011, Overseas France year" theme, in the Science festival held nationwide and the Sea Days event.

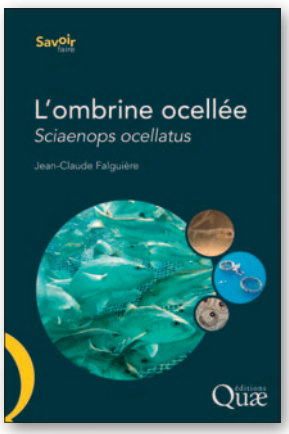
THE PRESS AND PUBLISHING, A DRIVE SERVING SCIENCE

> “66 new books published in 2011 by editions Quae”

With a pick-up rate of nearly 13%, once again this year, press releases and press kits (forty-nine in 2011) greatly contributed to growing Ifremer's visibility for the general public. Amongst the subjects which were particularly well relayed by the media are: feedback from the IBTS cruise and the Pelmed cruise to tag seabass working with the Iroise marine nature park, the Open house days at La Seyne-sur-Mer, the upcoming creation of the France Énergies marines IEED (finally announced in 2012), the NAOS Equipex project with a greater contribution from France and Europe to the international Argo network, the Ploops cruise focusing on small crustaceans called haploops which are colonising southern Brittany and the BoBeco and Momarsat cruises.

Once again this year, the partnership with the weekly *Le Marin* was renewed with two pages each month with greater emphasis on making science more accessible. The press partnership with the *Télégramme de Brest* daily paper is continuing, with the publication of two photos per month on the “Overseas France year” theme in its “Nature” page.

Les éditions Quae published seven new books in 2011, including *Mieux combattre les marées noires* by Michel Girin and Emina Mamaca and *Les pêches méditerranéennes. Voyage dans les traditions*, by Jean Monot. Over 3,250 books were sold over the year. They were promoted to the media, at the Agriculture trade show and the Book show in Paris, through outreach actions, conferences and signing sessions organised at regional events such as the “Livres et Mer” festival in Concarneau, “Sciences métisses” festival in Brest, “Courants d'Ère” festival in Saint-Jean Cap Ferrat, the Open house days at the Mediterranean centre, and so on. These actions were complemented by the regular distribution of the *Esciences* newsletter, as well as by the new Quae website opened in the third quarter of 2011.



"2011, Overseas France year"

A special page devoted to news and events was developed on Ifremer's portal site. The schedule of accredited events was kept up to date with regular posting of shorts or news in brief on various themes.

Presented from the 9 April to 8 May 2011, at the Jardin d'acclimatation in Paris, the exhibition called "An overseas garden"' let visitors discover the treasures of France's overseas territories. Alongside the members of the Alliance for the environment, AllEnvi (INRA, Cirad and IRD) and with the help of the Planète sciences association, Ifremer spotlighted its research work in a fun and entertaining approach. A conference moderated by a scientist from our Institute was also a high point of the event, considered to be one of the outstanding operations during "Overseas France year".

There were portraits of scientists and technicians at work, the technologies used, marine species, and more at the exhibition on "Blue sciences, overseas colours" held from 25 May to 12 September 2011, at the French Naval museum. Display panels and videos, along with some thirty photographs, raised visitors' awareness about the environmental issues for overseas territories, while emphasizing the commitment of men and women who serve marine sciences. The exhibit was also presented at the International boat show in Paris in December.

© Ifremer/MA

Ifremer took part in the third "sea, lake and river days" event instituted by the Ministry of sustainable development in the framework of the Grenelle marine environmental summit. This nationwide event aimed to let everyone discover the treasures and the fragile nature of the sea, its biodiversity, the jobs it provides and its resources for the future, focusing this year on overseas territories and their potential.

Supported by research bodies, including Ifremer, the exhibition on "Overseas nature" was a sign of the National museum of natural history's will to create a bridge between the cultural and natural world of these overseas communities. Each one was presented through the eyes of photographers who live there. A photograph for each overseas community was on display in the lobby of the auditorium of the large gallery from October 2011 to January 2012, with the complete exhibit presented on the http://outremer.mnhn.fr/le-programme-culturel/exposition website.

SCIENTIFIC OUTCOMES, THE CORNERSTONE OF IFREMER'S IN-HOUSE AND PUBLIC COMMUNICATIONS

Disseminating scientific results requires, first and foremost, the regular presence of various Ifremer teams and researchers at conferences and professional or trade events. To this end, in 2011, Ifremer was a partner in organising the BioMarine event (7-9 September 2011, Nantes), symposia like that on "Abyssal plains, voyage in a little known world" (13 October 2011, Paris), "Vulnerability of coastal ecosystems" (18-21 October, Nantes) and the sixth Maritime and coastal economics meetings organised by *Le Marin* and *Les Échos* magazines. Lastly, our Institute also took part in numerous trade fairs, like those for oyster farming at La Tremblade (21-23 May) and Vannes (20-21 September).

Ifremer also hugely mobilised its forces for the twentieth Fête de la science festival event, held all over France from the 12 to 16 October 2011. For the 2011 event, linked to the International year of chemistry and the Overseas France year, Ifremer hosted the general public and schoolchildren at our different sites, by organising open house days, workshops, facilitated demonstrations and mini-conferences.

On the occasion of the University of western Brittany's fortieth anniversary, the Brittany centre joined in the scientific discovery activities proposed for all ages on the Sciences and Techniques faculty campus. Working in collaboration with Ensta Bretagne and Brest's Océanopolis aquarium, Ifremer took part in presented the new cabled coastal observatory concept in the Iroise marine nature park. Our Institute was also present at the science villages set up in Caen, Brest, Nantes and Lorient, etc.

Ifremer's Mediterranean centre presented a stand devoted in great part to its activities overseas at the science village set up in the Var county area.

In Paris, Ifremer received over eight-hundred visitors in the Science quarter organised for the first time at ESPCI ParisTech, higher school of industrial chemistry and physics. An exhibition, workshops and a quiz, all based on the theme of the main physical-chemical principles which influence the oceans and on discovering the ecosystems of the deep sea, were presented there.

Our institute also provided support for the temporary exhibit on "Oceans, the climate and us" inaugurated on 7 April 2011 at Cité des Sciences de La Villette, with Ifremer's researchers participation in the series of Conferences and meetings on the theme of "Ocean and climate seen from space", hosting school groups, facilitating an activity on the Ovide expedition, providing images and films, and helping monitor a setup to answer visitors' questions via the exhibition's website.

And finally, on 20 December 2011, for the third consecutive year the Ifremer Trophies were awarded in Paris.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The winners of the 2011 Trophies

Scientists, members of our supervisory ministries and partners from every background were invited to the ceremony presided by Jean-Yves Perrot, the president-managing director of Ifremer. These awards provide the opportunity to honour the scientific excellence, spirit of innovation and strong personal involvement of our Institute's staff and to make the achievements of Ifremer teams better known and better shared both within and outside of our Institute.

EDUCATIONAL OUTREACH FROM PRIMARY SCHOOL TO HIGH SCHOOL

As well as making resources and educational material designed for teachers available, Ifremer supported numerous projects in 2011 that were set up for all categories of pupils and students. They included: "Passport for the sea" for schoolchildren, "From space for the sea" for middle school and high school students organised in collaboration with CNES and IRD, etc. Concurrently, Ifremer worked in partnership with schools to organise presentations of activities, lectures and scientific workshops geared to a young public, and took part in numerous, large-scale events such as "Science month" (June 2011, Brest) or the "Science quarters" festival.

The European transnational educational project with Germany called "InterNat" started in 2009 and took concrete form with the hosting of four French and German high school students during the first quarter of 2011, at the Algal physiology and biotechnology laboratory in Nantes. This week-long introduction course to science ended with the visit to an aquaculture farm in Guérande.

Our Institute was also present in numerous student fairs, like the Trades and jobs show organised by the Oceanographic institute in Paris (10 December 2011) or the Azimut fair (20-21 January, Brest), which organises information days each year on higher education and jobs; nearly twenty researchers, engineers and technicians took turns manning Ifremer's stand to present our activities, different jobs and the educational paths leading to them, etc.

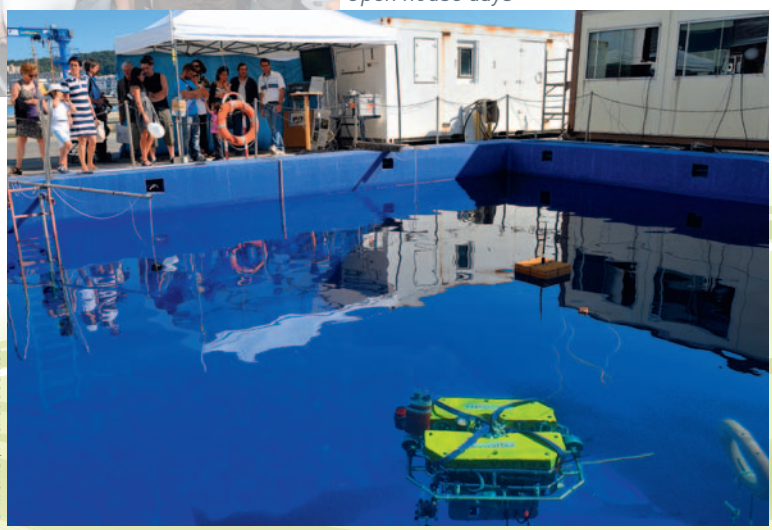
Organised by the Marine world discovery centre (CDMM), through its European-Mediterranean network (associations, schools, scientific organisations, etc.), the twelfth "Young people and the Mediterranean" meetings were held in September in Villefranche-sur-Mer. Ifremer took part in the event, with a presentation to an audience of eighty teenagers from ten countries around Mediterranean shores, on the theme of managing pollution in the Mediterranean Sea. Ifremer continued the partnership with the World festival of underwater pictures (FMISM), which took place in Marseille in October, the Aquarium de la Porte Dorée in Paris and the Océanopolis aquarium in Brest with the "Young audience jury" operation launched in March 2011. The results of their selection were announced regionally in Paris and Brest, on World Oceans Day. Our Institute also took part in co-producing a film for children (aged seven to eleven), called "Lucie raconte la mer" by supplying our expertise, documentation and technical resources.

MEETING THE PUBLIC...

Ifremer's Mediterranean centre at La Seyne-sur-Mer opened its doors to the public from Friday the 20th to Sunday the 22nd May 2011. Over 3,500 people attended this second event and could discover the research activities conducted by our Institute in the Mediterranean basin. On this occasion, visitors were also lucky enough to see several of the underwater vehicles (including *Victor 6000* and *Nautile*) used to explore the deep seas. In an open-air area entirely reserved for the general public, visitors could enjoy an interactive visit with varied displays presenting the major stakes for marine sciences in the Mediterranean.

Likewise, as is the case each year, numerous delegations were received at the various Ifremer centres and stations. In 2011, amongst the numerous visits, were those by Jamstec (Japanese marine research institute), the vice-minister for the Environment from Vietnam (March 2011), delegations from Mexico and Argentina, the Chief North Atlantic Coast Guards, with the Secretary General for the Sea, Mr. Jean-François Tallec present, and that by Ms. Susanna Gota-Goldmann, the head of the Major research infrastructure unit at the Ministry of Research (October 2011).

Welcoming the public during Open house days



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quality

approach

sustainable development

eco-responsibility

management auditing

skills development

manpower planning and skills management

TOOLS TO AID RESEARCH

Human resources

Improve speed and efficiency in processing of dossiers, make communications low more easily and establish close relations with Ifremer employees

STREAMLINING THE ORGANISATION AND PROCESSES

Already underway for over two years, modernising the human resource department continued in 2011, with a new organisation put in place:

- The HRD team at headquarters is in charge of defining the human resource policies and adjusting existing practices and procedures. It ensures that salaried employees are treated fairly and equitably.
- Teams in the centres assist the directors in administrative management of teams and in social dialogue at a local level.
- HR correspondents (locally in charge of human resources) attentively ensure that within the scientific departments, skills, training, mobility, promotion, etc. are developed.

The goal of this new breakdown of missions and responsibilities is to ensure greater clarity in the roles of human resource department actors, improve reactivity in processing files, make communications more fluid with all in-house clients and establish a dialogue at local level, so that all employees can rapidly obtain the information they need, both in administrative terms and for their professional careers.

Additionally, the HRD Intranet, which was entirely revised and enriched in 2011, makes career tracking available to each employee, along with access to documents used on a daily basis (forms, training, mobility, agreements, and so on). It also meets the requirements of the Quality approach for documentary aspects.

STRATEGIC WORKFORCE AND SKILLS PLANNING

The approach of manpower planning and skills management (GPEC), whose objective is to anticipate Ifremer's needs for skills with respect to its strategy for the future, was actively pursued in 2011.

As of October the Strategic jobs and careers committee (CSEC), whose vocation is to create a place where thought and discussion are devoted to qualitative aspects in terms of human resources (detecting potential, a breeding ground for experts, mentors, rare skills, etc.), where decisions taken with respect to opening positions are the object of arbitration and equity, and to steer the gearing up of an enterprise project on "skills".

Studies carried out in synergy by management and teams in the field made it possible to map, for the 450 jobs and 1,350 salaried staff, the typical employment covering the three main fields of our Institute's activity: science and techniques, support for research and support operations.

Combined with the analysis of staff departures and work to develop Ifremer's strategy for the future, this mapping will provide the basis for the foresight planning work to be performed in 2012.

SOCIAL DIALOGUE MARKED BY TWO AGREEMENTS

Continuing on from the union/management discussions held with staff representatives, two agreements were signed in 2011.

Agreement on prevention of stress and psychosocial risks and improved well-being at work in UES Ifremer-Genavir

This agreement aims to improve working conditions, to adapt work stations, techniques and working pace constraints to human physiology, protect employees against risks from discomfort or nuisances, to achieve a clear drop in stress levels and reduce the risks identified. This will be seen through:

• reinforcing the role and missions of the CHSCT, acting as the body of rights and referral where all collective issues related to prevention and mitigation of psychosocial risks will be dealt with;

• establishing an annual assessment sent to the CHST, which will include manpower trends, the principle usual indicators of social climate, any outstanding events of the previous year and the actions undertaken;

• the commitment by each department to seek, in cooperation with the staff representative bodies, the reasons for work-related malaise and to identify the sources which could cause stress. The impact of organisational modifications on working conditions will also be taken into consideration;

• setting up training courses for managers, to make them aware of situations which may engender psychosocial risks and learn to better anticipate them;

• creating a crisis management unit for situations related to external constraints, ready to intervene when necessary;

• setting up an observatory for quality of life at work, whose mission will be to identify and assess psychosocial risks, choose and monitor the relevant indicators, propose measures to be part of the action plan and monitor their application;

Committee members will be the delegated managing director of Ifremer and the director of Genavir, the human resource directors of Ifremer and the Genavir EIG, a member from the CHSCT of each establishment, one representative from each trade union represented, one representative from the seafarers' section, an occupational health doctor and a doctor for seafarers.

AGREEMENT FOR PROFESSIONAL EQUAL OPPORTUNITIES FOR MEN AND WOMEN

In 2011, a new agreement on equal opportunity regardless of gender within UES Ifremer-Genavir was signed by department directors and the CFDT, CFE-CGC, CFTC and CGT unions. The agreement, which carries on from that of 28 February 2008, marks the will of the general management to continue to promote professional equality and gender mix in jobs and professional categories. For Ifremer, the main measures in the agreement covered:

• hiring and career management: to promote staff gender mix, the human resources department is careful to ensure a balance in gender representation, that no discrimination is made in hiring, recruitment, mobility, promotion or career management;

• the way work-life balance and parenthood are structured: arrangements to organise working time, like individualising work hours and working part time by choice, aim to reconcile professional life and family life. Parenthood should not hinder career progression. Also, while on leave for the birth, adoption or raising of children, all salaried employees, male or female, benefit from the same general rises and measures related to their category as those granted to other staff.

Financial aid for child care and remedial courses (until over sixteen years of age), in the form of a service voucher, has also been set up.

“Ifremer responds to the pressing societal challenges of our time, but with that extra aspect that makes us dream”

Interview

Alain Lagrange

What exactly is your job today?

On the recommendation of Jean-Yves Perrot, Ifremer's President-Managing Director, since the 1st of September 2011, I've been on secondment at the General directorate for research and innovation (DGRI) of the Ministry of higher education and research (MESR). For 80% of my working time and for a two-year renewable period, I have become a project officer for "Marine engineering and development" within this Ministry, where my role is that of an interface between the latter and Ifremer on all topics concerning the development of marine science research.

What main achievements make you the proudest?

My contribution, aiming to promote greater visibility for marine science, is by nature just that, a contribution, and is only one element of a more general scientific policy. So more than pride, I'd say rather usefulness in speaking about my contribution to the outcome of some actions I have furthered. For instance, when my context notes supplied to the Minister's cabinet were used in a speech or in drawing up a ministerial decision, or when my arguments to promote a project with a strong impact on marine sciences were heard.

What does being on secondment involve? What benefits are there for both parties?

Within the Ministry of research, marine sciences are a scientific field which needs to be bolstered, so that the various components (fisheries science, geoscience, coastal environment) are better taken into account within the major national priorities which are food, energy, environment, health, etc. I see my job as being a relay for information and knowledge so that in the Ministry, marine sciences are a more integral part of strategic orientations.

How have you found that enriching?

I've had the possibility, as much by will as by inclination, to change jobs and even geographical locations frequently throughout my career. I think that everyone now recognises the advantages of mobility in both personal and professional spheres. Beyond the open-mindedness that mobility can bring, it makes it possible to understand how a research institution like ours functions, both in operational and staff-related dimensions.

At MESR we encourage the mobility of researchers and technical and administrative staff members within their organisations but also outside of them, so that comparing outlooks and experiences is a source of improving knowledge and the way we work. But we must ensure that the conditions for these forms of mobility are encouraged and facilitated.

What image do you have of Ifremer, after spending the first part of your career in this institute?

Looking at Ifremer with hindsight, as during this secondment for instance, and working now with other research bodies, I am struck by the significant assets and advantages which Ifremer enjoys. It benefits from a well-define scope of activity and evolves in a field which closely combines science and dreams.

Ifremer has a field of expertise which is clearly dedicated to the marine environment and quite well known by citizens. Its missions are perceived as key to strategic economic and energy stakes, to exploring the abyssal plains and to discoveries. Ifremer responds to the pressing societal challenges of our time in the fields of food, energy and health, but with that extra aspect that makes us dream, the "Ifremer touch" so to speak.

My final image of Ifremer would be that of an organisation which holds a wealth of scientific expertise and technological tools for investigation. This range of men and women, highly advanced scientific expertise and sophisticated technologies make Ifremer a key player, well armed to understand and take part in the challenges of a demanding marine environment.


victor6000

The quality approach and dynamics of sustainable development

Build and maintain true trust and confidence with partners

STEPS TO OBTAIN THE INSTITUTE'S ISO 9001 CERTIFICATION: TEAMWORK

Already holding ISO 9001 certification for our headquarters, in 2010 the Institute had launched an approach for comprehension certification covering all our sites. This meant continuing to implement the general quality approach conducted since 2009 within our Institute.

Its activities were grouped together into seventeen macro-activities, called processes. For each process, a working group was set up in early 2011, each with a process leader, representatives from the departments involved and a representative from each centre, in order to precisely describe the process in question. Process sheets and progress plans were drafted (with the objective of permanently improving the way they work) and indicators for monitoring performance and results defined.

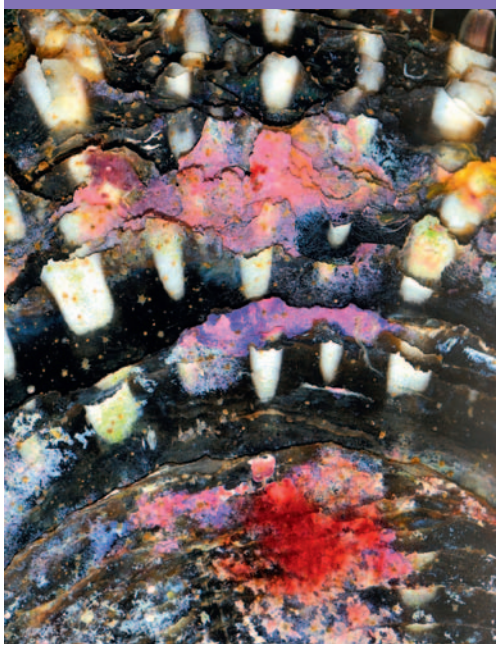
Deployment and awareness-raising actions were conducted for all personnel over the entire year.

The ISO 9001 certification audit of all Institute activities is scheduled for June 2012.

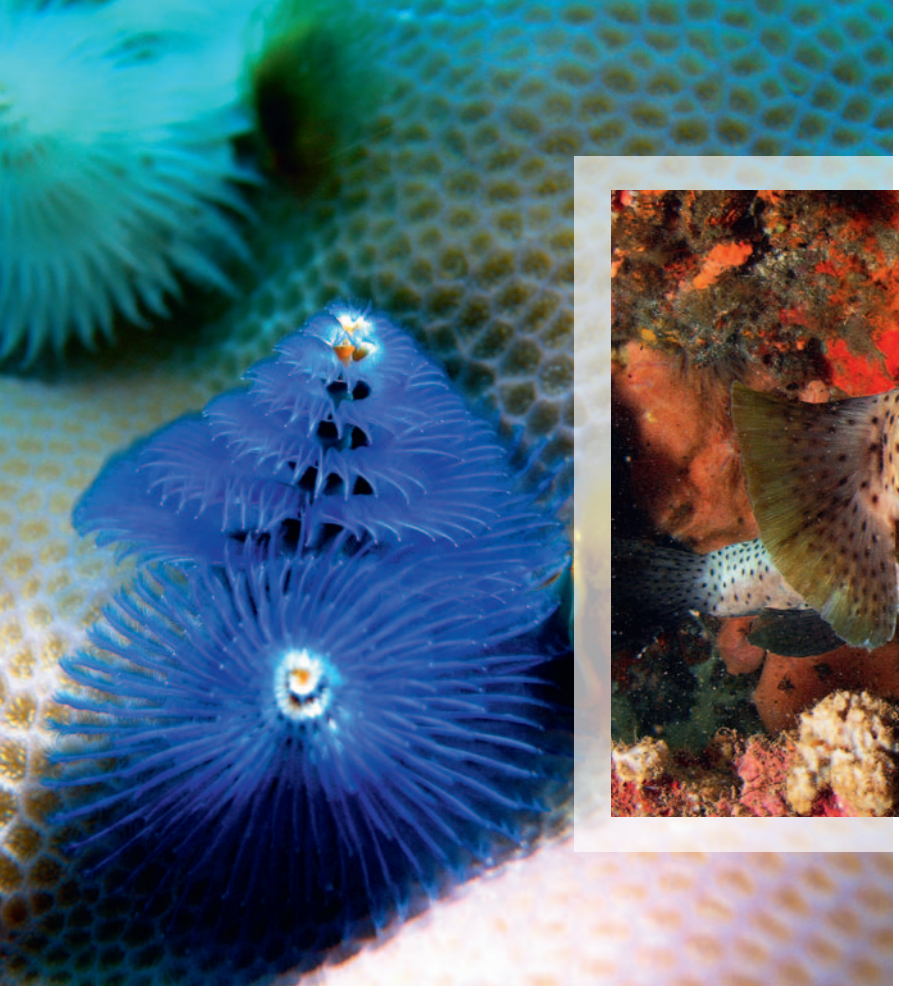
The quality approach to obtain certification fulfils several objectives: it should make for more consistency in practices and documents within our Institute, to improve efficiency in performing our different tasks. It provides better and simpler definitions of practices, so that the way work is organised will be more streamlined and effective. Above all, it makes it possible to better assess Ifremer's performance, so that our Institute appropriately fulfils its role for the community. Indeed, this certification brings the public recognition which can establish and maintain true ties of trust with our different partners. And finally, any malfunctioning can be better identified and thus better corrected.

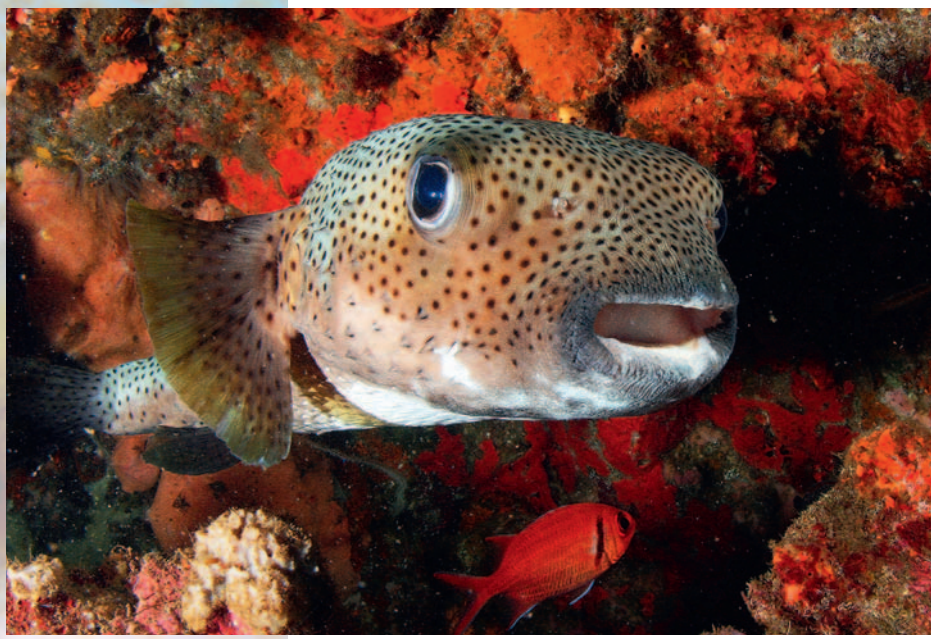
Certifications and accreditations in 2011

Confirmation of ISO 9001 certification for Institute headquarters, the Ships and shipboard systems service and Genavir.
Confirmation that accreditations of laboratories were maintained.
Initial accreditation of the Environment Resources laboratories of Port-en-Bessin, Arcachon and Nantes for nutrient analyses.
Audit performed for initial accreditation of the Biogeochemistry and ecotoxicology unit for monitoring-related activities.
Continuation of the Quality approach in order to obtain ISO 20000 certification of the Information system and marine data department.
In the short to medium term, the objective is to integrate part of the existing certifications within the overall quality system.



> “A lasting commitment and contribution to sustainable development”





“ECO-RESPONSIBILITY” PLAN, A LASTING COMMITMENT

By their very nature, Ifremer’s activities make direct contributions to sustainable development. Indeed, the studies related to knowledge about and utilisation of resources, feed for farmed fish, the maritime economy or biotechnologies are active components in this approach. They give rise to drafting of advice, expert assessments, patents linked to the design of innovative tools which contribute to sustainable development as defined in the law called Grenelle 2.

Concurrently, our Institute is continuing to apply its “eco-responsibility” plan which was implemented as of 2007. As part of the Sustainable development progress plan, relayed by a network of correspondents, the approach concerns every field: energy, transport, waste, water, buildings, green space management, etc.

It then takes the form of setting up waste recovery policy for all Ifremer sites and vessels in the fleet, increasing the number of video-conference room, radically changing the way green spaces are cared for and by evaluating the carbon footprint of the Lorient station and the Boulogne-sur-Mer centre.

Actions to raise staff awareness, combined with deployment of new equipment by the office services, aim to reduce consumption of power, fluids and paper. Thus, there was a 35% drop in consumption of printer paper at Ifremer over four years, i.e., the equivalent of fifteen to twenty pages per day and per salaried employee.

Recording and analysing the trends for consumption of power (electricity, gas and fuel) and fluids means that the knowledge is available to make it easier to define the lines of our future actions to reach a 20% drop in consumption in 2020.

Strategic think tanks, research, and actions for development, recycling and enhancing value... Ifremer is continuing to anticipate regulatory obligations in order to make our contribution to sustainable development.

Financial performance

Ifremer's overall resources for 2011 reached 243.40 million euros. Not including internal transactions[1], they amounted to 214 million euros, showing a rise of +1.15 million euros from 2010 (+0.54%).

This trend is the result of the combination of two factors: the drop (-1.11%) in subsidies for public service charges (SCSP) and the parallel increase in contractual resources (+5.31%).

Ifremer's overall resources (in thousands of euros)

TOTAL RESOURCES (Operations and Investments)	2010	% OF DU TOTAL	2011	% OF DU TOTAL	2011/2010 TREND IN AMOUNTS	2011/2010 TREND IN %
Programme 187: Research in the field of environmental and resource management	147,816	60.32%	147,072	60.42%	-743	-0.50%
Programme 113: Urban planning, landscapes and biodiversity	2,461	1.00%	3,202	1.32%	741	30.11%
Programme 154: Sustainable management of agriculture, fisheries and rural development	4,321	1.76%	2,407	0.99%	-1,914	-44.30%
Programme 206: Food safety and health quality	3,469	1.33%	3,708	1.52%	239	6.89%
Programme 172: Multidisciplinary scientific and technological research	148	0.06%	74	0.03%	-74	-50.00%
Available resources on Grants for Public Service charges	158,216	64.56%	156,464	64.28%	-1,752	-1.11%
Contractual resources	54,632	22.29%	57,533	23.64%	2,900	5.31%
TOTAL RESOURCES AVAILABLE Not including internal transactio	212,848		213,997		1,149	0.54%
Net book value of assets written off (internal transactions)	2,644	1.08%	852	0.35%	-1,792	NS
Depreciation expenses (internal transactions)	29,564	12.06%	28,554	11.73%	-1,011	-3.42%
TOTAL RESOURCES AVAILABLE	245,056	100%	243,402	100%	-1,654	-0.67%

1 depreciations and book value of assets sold. A reminder that these accounting entries have no impact on the Institute's balanced budget.

With regard to these means, Ifremer's consolidated expenditure for 2011 amounted to M€ 240.49. Not including internal transactions, they reached M€ 211.09, making a 1.22% increase with respect to 2010 (M€ 213.70).

The trend showed the relative stability of expenses related to running the Institute as a whole: the difference between 2011 and 2010 performance, under the operations section, was -0.60%. This is also related to fewer investments made in 2011 compared to 2010 (-6.68%) and particularly to the situation of expenses devoted to the Fleet in 2011 with respect to those of 2010.

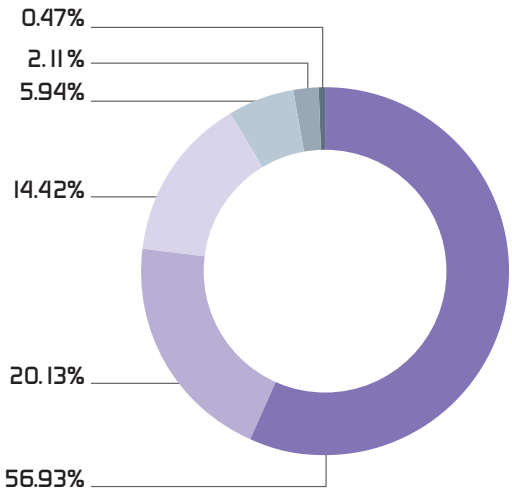
These data show the effort to control costs, mainly obtained thanks to better management audit, consistent with the implementation forecast for the financial year and the constraints imposed in terms of investments and new facilities.

Consolidated expenditure (in thousands of euros)

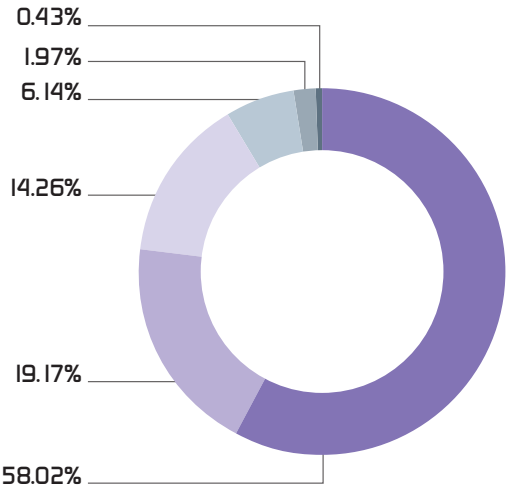
CONSOLIDATED EXPENSES (Operations + Investments)	PERFORMANCE 2010	PERFORMANCE 2011	2011/2010 TREND IN AMOUNTS	2011/2010 TREND IN %
Payroll expenses (Ifremer)	109,139	110,558	1,419	1.30%
Fleet-related spending	41,648	38,028	-3,621	-8.69%
Scientific programmes	399,544	40,167	213	0.53%
Infrastructures and laboratory resources	173,746	17,073	-301	-1.74%
Support spending	4,683	4,441	-242	-5.17%
Fiscal year depreciations - operating costs	907	820	-87	-
GRAND TOTAL NOT INCLUDING INTERNAL TRANSACTIONS	213,706	211,087	-2,619	-1.23%
Book value of assets sold	2,644	852	-1,792	NS
Fiscal year depreciations - internal transactions	29,564	28,554	-	-
TOTAL	245,914	240,493	-5,422	-2.20%

On the balance sheet, the following elements indicate Ifremer's financial performance:
- the profit and loss account shows a credit balance of M€ 2.58.
- the working capital was raised to 4.90 million euros.

DETAILED 2010 OPERATING BUDGET PERFORMANCE
(NOT INCLUDING INTERNAL TRANSACTIONS)



DETAILED 2011 OPERATING BUDGET PERFORMANCE
(NOT INCLUDING INTERNAL TRANSACTIONS)



Payroll expenditure
Fleet-related spending
Scientific programmes
Laboratory infrastructures and indirect resources
Support expenses
Depreciation - share of revalued assets

RESOURCES

OPERATIONS

Operating assets for Ifremer in 2011 came to 222.53 million euros. Not including internal transactions, these assets amounted to M€ 193.12, making a 0.26% increase with respect to 2010 (M€ 192.63).

The change seen between the two financial years in the amount of subsidies for public service charges (SCSP) is mostly due to the following elements:

• the fallback in the share of the subsidy allocated by the Ministry of research for operations. Since the implementation forecast becomes more accurate during the financial year, 1.20 million euros were thus transferred to cover new investments following the vote by the Board of directors in June 2011;
the increase in the subsidy for the implementation of the Marine Strategy Framework Directive and for an information system on marine biodiversity;

• the decrease in the subsidy allocated under programme 154 on "economics and sustainable development of agriculture, fisheries and territories" to the amount of M€ 2.4 (-M€1.91), which is linked to the end of the sustainable and responsible fisheries plan's (PPDR) execution in 2010.

The contractual operating resources taken into account reached 51.99 million euros, i.e. + M€ 2.53 from the 2010 financial year. The weight of these resources, set against the total operating funds, is now situated at 26.92%, compared to 25.67% in 2010.

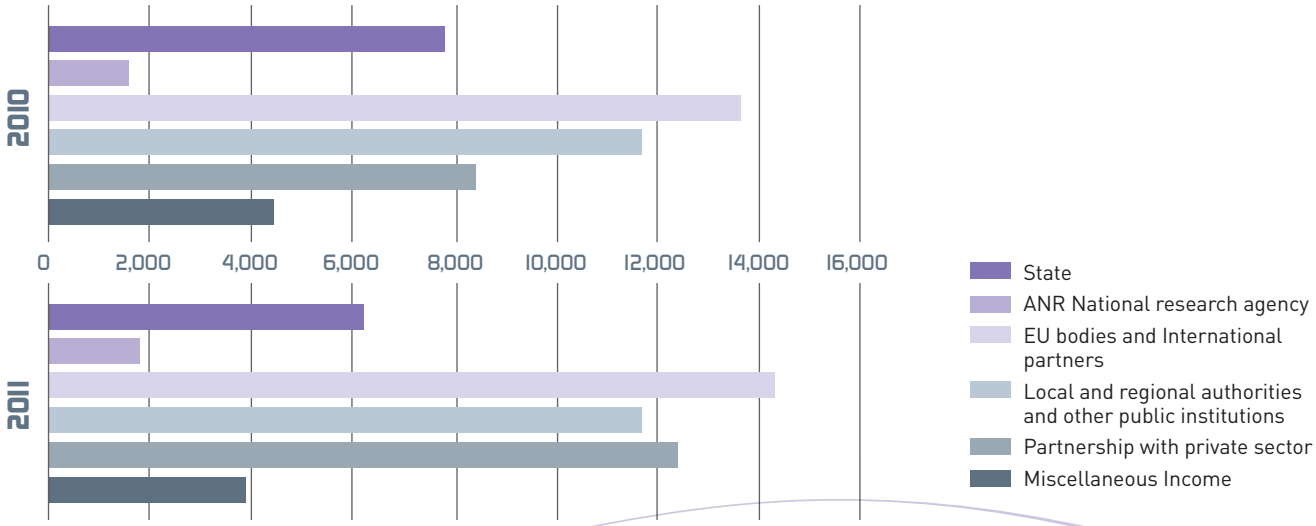
By breaking the co-financing down by source (or by major types of funding), this growth is easier to see and understand. Between 2010 and 2011, the missions which private companies commissioned our Institute to carry out showed the most significant growth (+M€ 3.81), reaching a total of 12.45 million euros. This situation is particularly due to three missions conducted by our scientific teams:

• Futuna, whose performance was entered in the 2011 accounts to the sum of 4.63 million euros. It alone represents a difference of + M€ 2.01 in all, compared to past performance in 2010. Futuna designates the research project to supplement the seafloor exploration studies off Wallis and Futuna;
the Sanba operation, begun in 2010, with M€ 2.51 entered in the accounts for 2011 (i.e. up M€ 0.59 from 2010). The Sanba research programme is part of the study on the deep structure of the Santos margin;

• phase 1 of the Manopi research programme, whose performance accounted for 0.73 million euros in 2011. Manopi is a research programme on technologies to locate wrecks.

Ifremer's other major partners, notably the European Union and ANR, have consolidated the level of their co-financing.

EVOLUTION OF CONTRACTUAL OPERATING RESOURCES PRESENTED BY FUNDING SOURCES 2010-2011



Contractual operating resources (in million euros)

	PERFORMANCE IN 2010	PERFORMANCE IN 2011	% OF 2010	% OF 2011
1 - State	8,071,819	6,537,968	16%	13%
2 - ANR National research agency	1,784,929	2,034,457	4%	4%
3 - EU bodies and International partners	13,846,811	14,745,523	28%	28%
4 - Local and regional authorities and other public institutions	11,929,571	11,998,051	24%	23%
5 - Partnership with private sector	8,863,041	12,537,002	18%	24%
6 - Misc. Income	4,958,135	4,129,987	10%	8%
TOTAL CONTRACTUAL OPERATING RESOURCES	49,454,307	51,982,989	100%	100%

INVESTMENTS

2011 investment funding reached 20.87 million euros and was stable overall with respect to that used in 2010 (+ M€ 0.65).

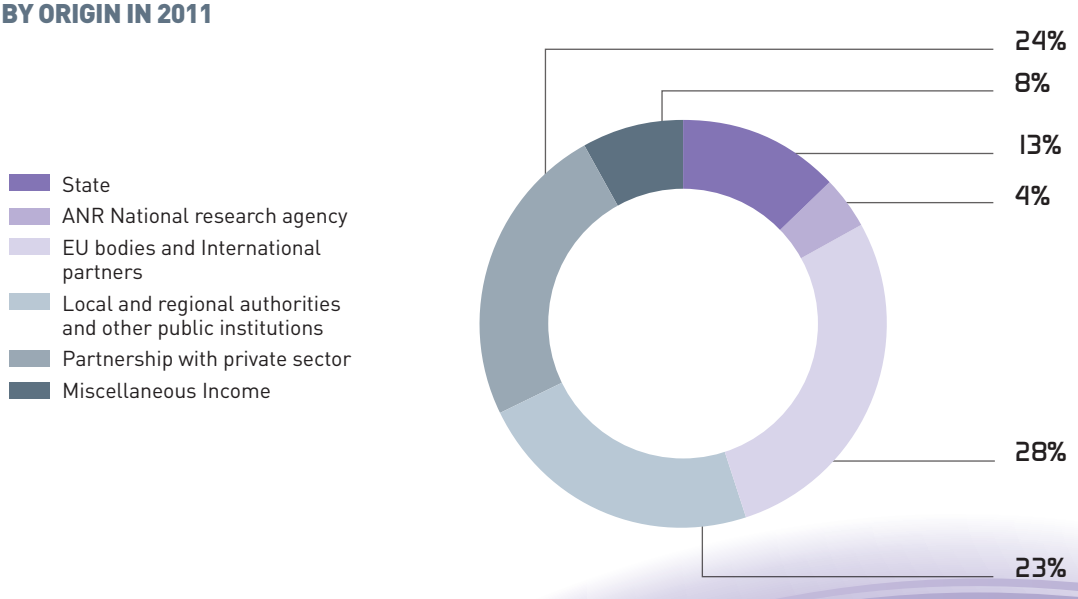
This trend is particularly due to the adjustment of the share of the subsidy for public service charges under mission 187, following the updated budget voted in June 2011.

Contractual resources (M€ 5.55 in 2011) are directly linked to the participation of local and regional authorities in operations which had begun during previous financial years.

The latter mainly concern the CETSM (European underwater technologies centre) programme at La Seyne-sur-Mer (CPER Provence-Alps-Côte d'Azur), the Previmer 2 programme (CPER Brittany and the Bouin programme to renovate the station and specialise the site around two strategic areas - the hatchery and the zone used for detoxification and maturing of tetraploid oysters.

However, they also include the co-funding of operations having a direct link with the National research agency (ANR). These comprise Carnot Edrome approved operations for the Equipex NAOS (Novel Argo Ocean Observing System).

RELATIVE OPERATING RESOURCES BY ORIGIN IN 2011



EXPENDITURE

OPERATIONS

Operating expenses for Ifremer in 2011 came to 220.18 million euros. Not including internal transactions, this spending amounted to M€ 190.54, i.e. a decrease of -M€ 1.15 or -0.60% with respect to 2010 (M€ 191.69).

Ifremer personnel costs, including temporary worker spending, reached 110.56 million euros in 2011 compared to 109.14 million euros in 2010.

The key performance indicators are based on the following main data: the annual average manpower was established at 1,309 FTE in 2011 against 1,299 FTE in 2010. The average pay for permanent staff (RMPP) for employees with private law contracts (EPIC) showed a payroll progression of 1.93%.

Staff under the private law EPST status benefited from measures taken to raise the point value, grade promotions and individual promotion measures.

Fleet expenditure reached 36.53 million euros, down by - 2.07 million euros, which is consistent with scheduling. Activity in 2011 featured 1,061 days at sea for offshore vessels (1,084 days in 2010), and 715 days for coastal vessels (756 days in 2010).

Operating expenses related to performance of the contract with Genavir in 2011 came to 35.80 million euros.

All other expense items for our Institute, and particularly the means allocated to scientific activity, were stable in terms of amounts. Performance of the 2011 expenditure is consistent with the priorities set for teams to develop synergies and optimise the resources allocated to them.

Operating expenses (in thousands of euros)

OPERATIONS SECTION	PERFORMANCE 2010	% OF TOTAL	PERFORMANCE 2011	% OF TOTAL	VOLUME TREND	TREND IN %
Payroll expenses	109,138.69	56.9%	110,557.79	58.0%	1,419.09	1.30%
Fleet-related spending	38,592.69	20.1%	36,525.13	19.2%	-2,067.56	-5.36%
Scientific programmes	27,632.65	14.4%	27,178.61	14.3%	-454.04	-1.64%
Infrastructures and Indirect laboratory resources	11,384.50	5.9%	11,699.83	6.1%	315.33	2.77%
Support spending	40,377.30	2.1%	3,763.10	2.0%	-274.63	-6.80%
Depreciation - share of revalued assets	907.40	0.5%	820.38	0.4%	-87.02	-9.59%
Total Operating Expenses	191,693.66	100%	190,544.84	100%	-1,148.82	-0.60%

INVESTMENTS

20.54 million euros in spending were mandated for the fiscal year (- M€ 1.47 from 2010). The structure of investment expenditure remains the same as in previous financial years: funding allocated to the fleet, scientific programmes, infrastructures and support.

In the framework of the Fleet programme spending reached 1.50 million euros which is down by - 1.55 million euros. The trend observed is due to the completion of the upgrading (overhaul and new equipment) of the Victor 6000 underwater vehicle, which accounted for 1.20 million euros in the 2010 accounts. Investments in 2011 involved those which are essential for maintaining the fleet (vessels, equipment and vehicles) in operational condition and replacing scientific and navigational equipment in order to guarantee the required technical level.

Spending for scientific programmes amounted to 12.99 million euros, compared to M€ 12.32 in 2010. Expenses made for programmes were engaged to give priority to upgrading equipment and facilities and covering the needs of teams in the framework of partnership-based operations.

The resources allocated to infrastructures and laboratories were used to the sum of 5.37 million euros in 2011. Most of the actions undertaken to this end went towards commitments made by our Institute with our partners and which were co-financed, specifically the Bouin and CETSM operations.

Balance sheets and profit and loss accounts

BALANCE SHEET

	EXERCICE 2011			EXERCICE 2010 NET	TREND %
	GROSS	DEPR. PROV	NET		
Capital not called up	-		-	-	
FIXED ASSETS					
Intangible fixed assets	**29,364,203.47**	**23,131,765.26**	**6,232,438.21**	**7,407,020.40**	**-15.9**
Preliminary and formation expenses	13,270.16	13,243.87	26.29	438.96	-94.0
Research and development costs	-	-	-	-	
Concessions, patents, licences, trademarks, processes, software and similar rights	25,806,227.62	22,896,343.06	2,909,884.56	3,385,828.86	-14.1
Purchased goodwill	-	-	-	-	
Other	272,658.16	222,178.33	50,479.83	66,829.59	-24.5
Intangible assets in progress	455,353.62	-	455,353.62	2,281,860.31	-80.0
Advances and prepayments	2,816,693.91		2,816,693.91	1,672,062.68	68.5
Tangible fixed assets	**488,980,587.26**	**287,922,681.96**	**201,057,905.30**	**208,829,384.03**	**-3.7**
Land and developments	6,963,019.35	737,822.41	6,225,196.94	6,093,879.60	2.2
Buildings	107,061,759.40	53,774,485.51	53,287,273.89	52,585,178.89	1.3
Industrial fixtures, fittings, plant machinery and equipment	20,659,365.45	106,931,254.70	13,728,110.75	14,872,590.87	-7.7
Collections	983,928.91	-	983,928.91	1,067,845.63	-7.9
Vessels and underwater vehicles	206,671,921.96	96,289,587.14	110,382,334.82	119,431,126.02	-7.6
Other	34,720,911.09	30,189,532.20	4,531,378.89	5,911,299.08	-23.3
Tangible assets in progress	4,293,942.87	-	4,293,942.87	3,449,688.23	24.5
Advances and prepayments	7,625,738.23		7,625,738.23	5,417,775.71	40.8
Investments	**6,683,529.58**	**345,451.85**	**6,338,077.73**	**6,393,574.28**	**-0.9**
Holdings	880,089.93	345,451.85	534,638.08	534,618.08	0.0
incl. Other forms of investment (QUAE)	*125,000.00*	-	*125,000.00*	*125,000.00*	*0.0*
Loans to group companies	-	-	-	-	
Other forms of investments	-	-	-	-	
Other investments	-	-	-	-	
Loans	5,425,722.64	-	5,425,722.64	5,503,346.83	-1.4
Other (deposits and guarantees paid)	377,717.01	-	377,717.01	355,609.37	6.2
TOTAL I	**525,028,320.31**	**311,399,899.07**	**213,628,421.24**	**222,629,978.71**	**-4.0**

BALANCE SHEET

	EXERCICE 2011			EXERCICE 2010 NET	TREND %
	GROSS	DEPR. PROV	NET		
CURRENT ASSETS			**-**	**-**	
Inventory	**38,987.92**	**-**	**38,987.92**	**47,444.22**	**-17.8**
Raw materials and other supplies	38,987.92	-	38,987.92	47,444.22	-17.8
Work in progress (production)	-	-	-	-	
Work in progress (services)	-	-	-	-	
Intermediate and finished products	-	-	-	-	
Goods	-	-	-	-	
Advances and prepayments	**2,739,398.52**		**2,739,398.52**	**332,930.61**	**722.8**
Debts	**54,093,963.07**	**435,947.17**	**53,658,015.90**	**47,532,824.72**	**12.9**
Trade accounts receivable	15,639,856.54	435,947.17	15,203,909.37	14,272,984.18	6.5
Other	38,454,106.53	-	38,454,106.53	33,259,840.54	15.6
incl. Payroll and related accounts	*72,911.63*		*72,911.63*	*109,633.06*	*-33.5*
incl Social security and social organisations	*0.00*		*0.00*	*28,905.16*	*-100.0*
incl. State and local authorities	*38,381,194.90*		*38,381,194.90*	*33,121,302.32*	*15.9*
incl. Grants	*13,234,792.24*		*13,234,792.24*	*9,268,500.60*	
Capital - called up and unpaid	-				
Accounts receivable	**88,854.60**		**88,854.60**	**423,913.95**	**-79.0**
CASH	**26,650,591.94**	**-**	**26,650,591.94**	**23,814,731.79**	**11.9**
Shares (listed securities)	14,019,101.34		14,019,101.34		
Other securities	-		-	10,488,095.80	-100.0
Banking	12,573,235.13		12,573,235.13	13,256,227.90	-5.2
incl. Private banks	*943,202.79*				
incl. Postal banking system in NANTES	-				
incl. Public finances general directorate	*11,553,272.18*				
Cash account	19,040.22		19,040.22	17,859.16	6.6
Secondary accounting officers	-				
Service authorising expenses to be incurred	39,165.25		39,165.25	37,699.01	3.9
Service enabling funds to be received	50.00		50.00	50.00	0.0
Libraries and Publishing unit accounts service	-				
Internal transfers	-				
ADJUSTMENTS					
Prepaid expenses	109,956.23		109,956.23	132,925.96	-17.3
TOTAL II	**83,721,752.28**	**435,947.17**	**83,285,805.11**	**72,284,771.25**	**15.2**
Charges over several financial years	-		-	-	
Loan redemption premiums (IV)	-		-	-	
Unrealized exchange losses (V)	-		-	-	
GRAND TOTAL (I + II + III + IV)	**608,750,072.59**	**311,835,846.24**	**296,914,226.35**	**294,914,749.96**	**0.7**

LIABILITIES

	EXERCICE 2011	EXERCICE 2010	Trend %
EQUITY			
Capital (including paid, etc.)	-	-	
Allocation contributions	**1,371,488.39**	**1,371,488.39**	**0.0**
Allocations from State	291,138.30	291,138.30	0.0
Additional allocations from State	543,382.59	543,382.59	0.0
Additional allocations - Organisations other than the State	536,967.50	536,967.50	0.0
Capital donations and legacies	148,857.58	148,857.58	0.0
Premiums arising from share issues, mergers assets brought in	-	-	
Revaluation reserves	**22,046,464.37**	**22,046,464.37**	**0.0**
Equity method evaluation difference	**-**	**-**	
Retained earnings	**1,327,081.91**	**2,277,515.48**	**-41.7**
Legal reserve	-	-	
Statutory or contractual reserves	-	-	
Regulated reserves	-	-	
Optional reserves	1,327,081.91	389,281.80	240.9
Other	-	1,888,233.68	-100.0
Profits/Losses brought forward	**-**	**-**	
Result for financial year (profit or loss)	**2,579,315.92**	**937,800.11**	**175.0**
Investment grants	**186,356,055.24**	**192,317,928.77**	**-3.1**
Investment grants received	552,049,931.10	549,381,161.09	0.5
Investment grants entered on profit and loss account	-365,693,875.86	-357,063,232.32	2.4
Regulated provisions	-	-	
TOTAL I	**213,829,263.41**	**219,100,054.70**	**-2.4**
PROVISIONS			
Provisions for contingencies	35,000.00	150,000.00	-76.7
Provisions for expenses	13,174,977.12	12,078,980.25	9.1
incl. Provisions for pensions and similar obligations	8,442,895.00	7,588,040.00	11.3
incl. Provisions for UNEDIC commitments	2,866,917.00	2,792,998.00	2.6
incl. Other provisions for charges	1,865,165.12	1,697,942.25	9.8
TOTAL II	**13,209,977.12**	**12,228,980.25**	**8.0**
LIABILITIES			
Loans and related liabilities	**3,448.41**	**3,448.41**	**0.0**
Convertible debenture loans	-	-	
other debenture loans	-	-	
Loans from credit institutions	-	-	
Misc. loans and financial debts	3,448.41	3,448.41	0.0
Received advances and prepayments	**983,246.55**	**2,264,434.74**	**-56.6**
Operating liabilities	**60,072,011.73**	**52,509,813.89**	**14.4**
Trade accounts payable and related accounts	16,130,210.74	13,538,063.48	19.1
Tax and social security payable	43,941,800.99	38,971,750.41	12.8
incl. Payroll and related accounts	11,389,986.06	11,330,273.18	0.5
incl Social security and social organisations	11,152,541.22	10,279,397.43	8.5
incl. State and local authorities	10,034,423.41	9,354,592.92	7.3
incl. advances and prepayments received on grants	11,364,850.30	8,007,486.88	41.9
Non-operating liabilities	**8,543,242.13**	**8,231,172.20**	**3.8**
Trade accounts payable - fixed assets	7,535,128.32	5,316,608.56	41.7
Other liabilities	1,008,113.81	2,914,563.64	-65.4
Liquid debts			
ADJUSTMENTS			
Deferred income	273,037.00	576,845.77	-52.7
TOTAL III	**69,874,985.82**	**63,585,715.01**	**9.9**
Unrealized exchange profit (IV)	-	-	
GRAND TOTAL (I + II + III + IV)	**296,914,226.35**	**294,914,749.96**	**0.7**

INCOME

	MOD. FORECAST STATEMENT 2011	FISCAL YEAR 2011	BUDGET PERF. %	FISCAL YEAR 2010	TREND %
OPERATING INCOME					
Sales of goods purchased for resale	33,000.00	12,155.84	36.84	52,494.49	-76.8
Sales of finished goods and services (a)	17,962,557.00	22,425,543.29	124.85	23,212,270.58	-3.4
incl. Studies and service provision	*16,662,557.00*	*20,560,907.70*	*123.40*	*21,123,417.43*	*-2.7*
incl. Revenues from related activities	*1,300,000.00*	*1,864,635.59*	*143.43*	*2,088,853.15*	*-10.7*
Net turnover (j)	17,995,557.00	22,437,699.13	124.68	23,264,765.07	-3.6
Change in stock of finished goods and work in progress	0.00	0.00		0.00	
Capitalised production costs	3,900,000.00	1,051,661.52	26.97	2,131,937.93	-50.7
Production for fiscal year	**21,895,557.00**	**23,489,360.65**	**107.28**	**25,396,703.00**	**-7.5**
Operating subsidies	172,598,588.00	166,324,799.83	96.37	163,282,212.59	1.9
incl. Subsidies for public service charges	*137,087,255.00*	*142,039,606.79*	*103.61*	*141,042,533.85*	*0.7*
incl. Subsidies from National research agency	*1,910,000.00*	*1,907,203.88*	*99.85*	*1,852,890.49*	*2.9*
incl. Other non-taxable subsidies received from State	*8,019,299.00*	*3,954,041.07*	*49.31*	*6,670,459.90*	*-40.7*
incl. Non-taxable operating grants received from local authorities	*4,423,790.00*	*2,249,087.95*	*50.84*	*2,014,185.92*	*11.7*
incl. Non-taxable operating grants received from public authorities or other public bodies	*21,158,244.00*	*15,973,916.14*	*75.50*	*11,553,011.43*	*38.3*
incl. Other operating grants	*0.00*	*200,944.00*		*149,131.00*	*34.7*
Write-off of provisions and depreciations / transfers of expenses	0.00	2,115,904.18		1,958,169.59	8.1
incl. Reversals of provisions	*0.00*	*1,962,749.35*		*1,660,799.37*	*18.2*
incl. Transfers of expenses	*0.00*	*153,154.83*		*297,370.22*	*-48.5*
Other revenues	285,000.00	879,603.74	308.63	1,786,646.21	-50.8
TOTAL OPERATING INCOME I	**194,779,145.00**	**192,809,668.40**	**98.99**	**192,423,731.39**	**0.2**
OPERATING COSTS					
Purchase of goods for resale (c)	0.00	0.00		0.00	
Change in stock (d)	0.00	0.00		0.00	
Purchase of raw materials, supplies and other consumables (c)	101,000.00	93,020.36	92.10	110,977.13	-16.2
incl. Raw materials	*1,000.00*	*0.00*	*0.00*	*2,159.19*	
incl. Other supplies and consumables	*100,000.00*	*93,020.36*	*93.02*	*108,817.94*	
Change in stock (d)	6,000.00	8,456.30	140.94	6,811.44	24.1
incl. Raw materials		*800.05*		*-539.49*	
incl. Other supplies and consumables		*7,656.25*		*7,350.93*	
Other purchases and external charges	7,805,000.00	6,510,584.93	83.42	6,642,730.55	-2.0
Purchases incorporated in products	15,000.00	0.00	0.00	1,144.00	-100.0
incl. Purchase of studies and services	*15,000.00*	*0.00*	*0.00*	*1,144.00*	*-100.0*
incl. Purchases of equipment, plant and work	*0.00*	*0.00*		*0.00*	
Intermediate expenses	**81,145,145.00**	**76,576,508.49**	**94.37**	**79,153,961.72**	**-3.3**
Outsourcing	73,218,145.00	69,964,446.90	95.56	72,392,298.60	-3.4
incl. Sub-contracting	*36,887,610.00*	*37,168,997.68*	*100.76*	*38,060,648.29*	*-2.3*
incl. Rentals and rental expenses	*1,608,000.00*	*1,426,266.28*	*88.70*	*1,616,925.27*	*-11.8*
incl. Maintenance	*3,400,000.00*	*3,384,860.32*	*99.55*	*3,320,462.97*	*1.9*
incl. Insurance premiums	*850,000.00*	*601,486.67*	*70.76*	*580,956.29*	*3.5*
incl. Studies and research	*4,400,000.00*	*2,332,471.48*	*53.01*	*2,216,511.05*	*5.2*
incl. Miscellaneous	*1,300,000.00*	*797,621.28*	*61.36*	*1,219,340.19*	*-34.6*
incl. Outside staff	*400,000.00*	*481,454.09*	*120.36*	*645,999.16*	*-25.5*
incl. Payments to intermediaries and fees	*742,000.00*	*780,393.91*	*105.17*	*738,458.36*	*5.7*
incl. Advertising, publications, external relations	*545,000.00*	*349,454.47*	*64.12*	*448,744.25*	*-22.1*
incl. Travel, missions and receptions	*6,000,000.00*	*4,799,846.31*	*80.00*	*5,722,212.81*	*-16.1*
incl. Mission and travel		*347,022.35*		*480,504.09*	*-27.8*
incl. Postal and telecommunications costs	*1,400,000.00*	*1,184,552.02*	*84.61*	*1,212,533.56*	*-2.3*
incl. Banking and related services	*10,000.00*	*4,482.81*	*44.83*	*6,479.81*	*-30.8*
incl. Miscellaneous	*15,225,535.00*	*16,652,559.58*	*109.37*	*16,603,026.59*	*0.3*
State- taxes and similar levies	9,978,469.04	9,879,755.79	99.01	9,740,378.72	1.4
incl. on salaries and wages	*8,327,469.04*	*8,600,461.67*	*103.28*	*8,459,543.22*	
incl. on taxes and other organisations	*1,651,000.00*	*1,279,294.12*	*77.49*	*1,280,835.50*	
Payroll	102,195,530.96	99,099,609.40	96.97	98,072,253.85	1.0
incl. Salaries and appointments	*68,520,506.91*	*65,449,966.71*	*95.52*	*65,012,550.27*	*0.7*
incl. Social contributions	*33,675,024.05*	*33,649,642.69*	*99.92*	*33,059,703.58*	*1.8*
Depreciation and provisions (e)	40,523,000.00	32,506,639.82	80.22	33,175,249.58	-2.0
Fixed assets: depreciation/amortization		29,373,923.64		30,471,674.62	-3.6
Fixed assets: provision for loss in value		0.00		0.00	
Current assets: provision for loss in value		524,234.96		46,670.00	1,023.3
Provision for liabilities - operating Appropriations to the reserve		2,608,481.22		2,656,904.96	-1.8
Other charges	581,000.00	414,880.38	71.41	840,332.73	-50.6
TOTAL OPERATING INCOME II	**234,423,145.00**	**218,477,393.88**	**93.20**	**220,982,176.60**	**-1.1**
Operating income corrected for share of subsidy	**3,056,000.00**	**3,738,148.57**	**122.32**	**3,649,894.25**	**2.4**
OPERATING INCOME (I-II)	**-39,644,000.00**	**-25,667,725.48**	**64.75**	**-28,558,445.21**	**-10.1**

INCOME

	MOD. FORECAST STATEMENT 2011	FISCAL YEAR 2011	BUDGET PERF. %	FISCAL YEAR 2010	TREND %
Share of profits from joint ventures					
Profit or transferred loss III		0.00		0.00	
Loss or transferred profit IV		0.00		0.00	
FINANCIAL INCOME					
Income from shares and loans to companies (3)	25,000.00	115,933.00	463.73	104,688.00	10.7
Income from securities and other financial fixed assets (3)	20,000.00	11,156.40	55.78	13,055.72	-14.5
Other financial income (3)		2,513.16		2,251.72	11.6
Write-off of provisions and transfers of charges		0.00		0.00	
incl. Reversals of provisions		*0.00*		*0.00*	
Realised gains on exchange differences		16,563.01		8,949.41	8,949.4
Proceeds from sale of securities		108,976.86		46,104.84	136.4
TOTAL FINANCIAL INCOME V	**45,000.00**	**255,142.43**	**566.98**	**175,049.69**	**45.8**
FINANCIAL EXPENSES					
Depreciation and provisions expense		0.00		0.00	
Interest expenses		106.36		5,603.87	-98.1
Realized exchange losses	8,000.00	7,743.44	96.79	9,446.53	-18.0
Net loss from sale of securities		0.00		0.00	
TOTAL FINANCIAL EXPENSES VI	**8,000.00**	**7,849.80**	**98.12**	**15,050.40**	**-47.8**
FINANCIAL RESULT (V-VI)	**37,000.00**	**247,292.63**	**668.36**	**159,999.29**	**54.6**
CURRENT RESULT BEFORE TAX, CORRECTED FOR SHARE OF SUBSIDY	**3,093,000.00**	**3,985,441.20**	**128.85**	**3,809,893.54**	**4.6**
CURRENT RESULT before tax (I-II-III-IV-V-VI)	**-39,607,000.00**	**-25,420,432.85**	**64.18**	**-28,398,445.92**	**-10.5**
EXTRAORDINARY INCOME					
Extraordinary operating profits	0.00	40,645.54		17,566.48	131.4
Proceeds from sales of assets	42,700,000.00	29,424,575.43	68.91	32,220,774.10	-8.7
incl. 775	*0.00*	*18,701.38*		*12,434.64*	*50.4*
incl. 777	*42,700,000.00*	*29,405,874.05*	*68.87*	*32,208,339.46*	*-8.7*
Write-off of provisions and depreciations and transfers of expenses	0.00	0.00		0.00	
incl. Reversals of provisions	*0.00*	*0.00*		*0.00*	
TOTAL EXTRAORDINARY PROFIT VII	**42,700,000.00**	**29,465,220.97**	**69.01**	**32,238,340.58**	**-8.6**
EXTRAORDINARY EXPENSES					
Extraordinary operating expenses	58,000.00	134,076.74	231.17	29,399.06	356.1
Net book value of assets disposed of	3,000,000.00	1,317,321.46	43.91	2,844,433.49	-53.7
incl. 675	*3,000,000.00*	*852,334.12*	*28.41*	*2,644,067.17*	*-67.8*
Depreciation and provisions expense	0.00	0.00		0.00	
TOTAL EXTRAORDINARY EXPENSES VIII	**3,058,000.00**	**1,451,398.20**	**47.46**	**2,873,832.55**	**-49.5**
EXTRAORDINARY PROFIT (VII-VIII)	**39,642,000.00**	**28,013,822.77**	**70.67**	**29,364,508.03**	**-4.6**
Employees profit sharing (IX)	0.00	0.00		0.00	
Corporate tax (IX)	35,000.00	14,074.00	40.21	28,262.00	-50.2
GROSS PROFIT OR LOSS	**35,000.00**	**2,593,389.92**	**7,409.69**	**966,062.11**	**168.4**
TOTAL INCOME (I+III+V+VII)	**237,524,145.00**	**222,530,031.80**	**93.69**	**224,837,121.66**	**-1.0**
TOTAL EXPENSES (II+IV+VI+VIII+IX+X)	**237,524,145.00**	**219,950,715.88**	**92.60**	**223,899,321.55**	**-1.8**
PROFIT (+) OR LOSS (-)	**0.00**	**2,579,315.92**		**937,800.11**	**175.0**
SELF-FINANCING	**823,000.00**	**4,550,965.08**	**552.97**	**2,875,543.39**	**58.3**

Activity indicators

CHAPTER 1: Research and expertise at the heart of the French and European marine science communities network and serving economic development

	OBJECTIVES	INDICATORS	2011	TREND FOR 2012
1	Promote better structuring of French marine research	1. The proportion of marine science publications by the alliance with respect to French, European and world production for oceanography, including Ifremer (LOLF P187)	Publications Ifremer 417 Alliance share Nat'l: 84% (10.5%) EU: 14% (1.8%) Int'l: 5.4% (0.7%)	
		2. Publication map for Ifremer associated with French partners and percentage of co-publications Share of co-publications with P187 operators	279 i.e. 67% 38 i.e. 9%	↗
		3. Mean number of citations of Ifremer publications over three years (LOLF P187)	905 Indice 1.85	↗
2	Be a driver of Marine Science policy in Europe	4. Number of European projects and rate of success for Framework programme R&D proposals (LOLF P187)	35 51%	> 33%
		5. Percentage of coordination of European projects (LOLF P187)	50%	> 20%
		6. Percentage of co-publications with European partners (LOLF P187)	135 i.e. 32%	↗
3	Develop targeted international cooperation and strengthen the action in the Mediterranean	7. Map of international co-publications (including co-publications with the United States, Canada, Russia, Japan, Brazil, China and Mediterranean countries and co-publications with countries in Southern hemisphere, LOLF P187)	128 i.e. 31% 54 i.e. 13%	
4	Optimise the links between public and private-sector research	8. Percentage of contacts with firms in total resources (LOLF P187)	7.35%	↗
		9. Number of private-sector contracting parties.	211	> 250
5	Make French research and expertise more responsive to the needs of society and public authorities	10. Scientific and technological papers and presentations in professional meetings		> 1,000
		11. Number of annual full time equivalent posts mobilised to respond to public-sector orders for data, expert appraisals and opinions	357	Stable
		12. Number of published opinions and appraisals in response to a formal order by public authorities (LOLF P187)	328	
		13. Level of satisfaction of those requesting expert appraisals	See indicator 23 for fisheries	
6	Make technological transfer activity more professional	14. Returns from fees/outside expenditures for filing patents and licenses (LOLF P187)	2.21 601,754 €/ 271,534 €	↗
7	Raise awareness and encourage scientific teams to become more active in valorisation	15. Number of patents and software programmes in portfolio (LOLF P187)	64 patents + 21 software programs	↗
		16. Number of licences/number of patents	27/64	↗

CHAPTER 2: Scientific programming to support strategic objectives

	OBJECTIVES	INDICATORS	2011	TREND FOR 2012
8	Learn more about ocean circulation to supplement the diagnosis of global change	17. Number of publications	62	
9	Learn about and characterise marine biodiversity to better protect it	18. Number of publications	66	
10	Develop knowledge and valorisation of biological resources through biotechnologies and bio-prospection	19. Number of publications	46	
		20. Number of patents	33	↗
11	Contribute to sustainable fisheries and aquaculture	21. Number of publications	144	
		22. Number of reports	126	
		23. Level of satisfaction of those requesting expert appraisals in fisheries and aquaculture	98%	Good to very good
12	Promote sustainable use of mineral and energy resources	24. Number of publications	64	
		25. Number of reports	128	
13	Develop a global surveillance strategy, including both high seas and coastal areas, to meet international and European challenges	26. Number of opinions and expert appraisals using monitoring	297	↗
		27. Number of reports	329	
		28. Number of publications	84	
14	Design and set up a nationwide system of environmental forecasting of changes in coastal environments	29. Number of publications	22	
		30. Number of reports	11	
		31. Number of professionals using operational oceanography services		
15	Implement a national and European strategy for marine databases	32. Number of consultations of on-line marine databases	774,549	> 1 M
16	Promote shared capacity for technological innovation	33. Number of instrument systems completed or transferred.	IMN/NSE: 5 IMN/SM: 13 RDT: 7	Stable

CHAPTER 3: Mobilisation to meet challenges for Overseas France

	OBJECTIFS	INDICATEURS	2011	TENDANCE 2012
17	Promote social and economic development of ROM-COM (overseas regions and local authorities) through scientific support for local sectors	34. Scientific and technological papers and presentations in professional meetings		↗
18	Add to scientific knowledge about tropical environments.	35. Number of publications	11	↗
		36. Number of reports	18	
19	Pursue and develop observation and monitoring activities in response to demands by higher authorities	37. Volumetrics of databases for coastal, aquaculture and fisheries monitoring data, acquired overseas	298,778	↗

CHAPTER 4: A French oceanographic fleet serving marine research and exploration

	OBJECTIVES	INDICATORS	2011	TREND FOR 2012
20	Continue integrating the fleet in Europe and nationwide	38. Number of research scientists on board (French and foreign, including from other European countries)	395	↗
		39. Number of publications associated with research cruises	106[1]	↗
		40. Number of days of scientific activity for the high seas fleet, including public service, cruises submitted to bids for tender and partnerships	742	↗
21	Optimise fleet operations and facilities	41. Number of days high seas fleet was commissioned	1 153	
		42. Ratio of activity for high seas fleet / potential days	72%	
		43. Coastal fleet: number of days at sea	755	
		44. Ratio of activity for coastal fleet / potential days	49%	

CHAPTER 5: High performance functioning

	OBJECTIVES	INDICATORS	2011	TREND FOR 2012
22	Develop the capacity to attract, assimilate and generate loyalty of valuable personnel	45. Percentage of employees, including French nationals, recruited outside of France (in accordance with Marie Curie grant criteria for eligibility)	2, i.e. 6% of recruitments	
		46. Number of salaried employees holding accreditation to supervise research	71	↗
23	Reinforce forecast-based management of jobs and skills	Signature of an agreement (milestone)	/	
24	Promote external mobility and develop hosting capacity	47. Number of PhD students (including foreigners)	231 (62)	↗
		48. Number of post-doc fellows (including foreigners)	63 (15)	↗
		49. Number of Ifremer salaried employees on external mobility for more than two months, including abroad	21 (7)	↗
		50. Number of guests hosted for periods over two months, including foreign research scientists	6	
25	Create instruments to recognise and award individual and collective performance	Stae of progress for the approach (milestones)	50%	
26	Develop a multi-annual financing vision to meet scientific programming targets	51. Percentage of contractual resources (LOLF P187) Production of multi-annual plans (milestone)		↗
27	Broaden the modernisation of the Institute's financial management by providing stronger management support for scientists	Annual certification of accounts		Without reservation
28	Reassert Ifremer's ambitions and positioning	52. Number of citations in the media	3,758	↗
		53. Monthly consultations of the websites of Ifremer	241,690	↗
29	Provide understandable and empowering information about Ifremer's work for the broadest readership	54. Number of communications actions	1,528	
30	Draw up Ifremer's sustainable development progress plan	55. Composite MEEDDM indicator (fluids, energy, video-conferences, etc.)	NC NC 75% recycled waste	↘[2]
31	Aim for quality certification throughout Ifremer	56. Number of renewals for certifications obtained	1 new 3 extensions 10 renewals	100%
32	Make assessment an integral part of the organisation's operation, at every management level	57. Number of assessments for Ifremer units	2 units (Aeres)	100%[3]
		58. Number of outside experts solicited for assessments	11	

(1) The counts made on the basis of data sheets supplied by head scientists of the missions as of 27 April 2012 show a figure of 134 publications published in 2010. This figure is higher than that indicated in the 2010 report. This bias was expected due to the counting method which is linked, amongst other things, to the willingness of the head scientists to update the sheets that they must supply.

(2) Target of – 20% for 2015

(3) Accumulated over four years

Note. The definitions of indicators 1, 3, 32, 56 and 57 have been modified with respect to the wording used in appendix 2 of the four-year contract. Effectively:
- the alliance for marine sciences did not come into being
- OST took the calculation over 3 years for the citation index
- the number of consultations of websites is a better indicator of how much they are used than is the number of extractions, which also creates problems in counting them
- the basis for the rate of renewal of certifications and assessment varies too much for these rates to be compared from one year to another.
Therefore, we have decided to use the counts made.

Boards and committees

BOARD OF DIRECTORS

The members of Ifremer's Board of Directors are elected for five years (decree on appointment of Board: 4 May 2010 and decree on appointment of President-Managing Director published 3 June 2010 in Official Journal dated 4 June 2010)

CHAIRMAN

Jean-Yves PERROT
President-Managing Director of Ifremer

MEMBERS REPRESENTING THE STATE

Ministry of higher education and research
Bernard COMMÈRE // Alternate: Ary BRUAND

Ministry of Ecology, sustainable development, transport and housing
Claire HUBERT // Alternate: Jean-Loup PETIT
Odile GAUTHIER // Alternate: Agnès VINCE

Ministry of Agriculture, food, fisheries, rural life and spatial planning
Cécile BIGOT // Alternate: Pascal BERGERET

Ministry of Defence and Veterans
Rear admiral Frédéric JUBELIN // Alternate: Philippe MINON

Ministry of the Budget, Public Accounts, Civil Service and State Reform
Aurélien ADAM // Alternate: X

Ministry in charge of Industry
Yves ROBIN // Alternate: Claude MARCHAND

Ministry of Foreign and European affairs
Donatienne HISSARD // Alternate: Eric SANSON

MEMBERS CHOSEN FOR THEIR EXPERTISE IN FIELDS CLOSE TO THOSE OF IFREMER

Charles BRAINE
Goulven BREST - *National shellfish farming committee*
Pierre-Georges DACHICOURT - *National committee of maritime fisheries and mariculture*
Alain GOULOIS - *Total*
François JACQ - *Météo-France*

ELECTED REPRESENTATIVES OF IFREMER STAFF

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Larissa HAUGARREAU
Jean-Claude MASSON, CGT
Loïc PETIT DE LA VILLEON, CFDT
Carla SCALABRIN, CGT
Jean TOURNADRE, CFDT
Cathy TREGUIER, CFDT

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Marie-Pierre CAMPO - *Ministry in charge of Overseas France*
Rear admiral Patrick CHEVALLEREAU - *Deputy Secretary General of the Sea*
Sabine FLAMANT- *Head accountant of Ifremer*
Christine COSTE - *Government commissioner, Ministry of higher education and research*
Pascale DELECLUSE - *Scientific committee Chairwoman for Ifremer, Météo-France*
Brigitte KLEIN - *General economic and financial inspection, "Ecology and sustainable development" mission*

SCIENTIFIC COMMITTEE

The scientific committee reports to the President-Managing Director of Ifremer. It is consulted about research programmes and scientific aspects of technological development programmes carried out by our Institute. It issues recommendations on developing major facilities of general interest which are managed by Ifremer, upon proposals for allocating these facilities to the benefit of all users and periodically assesses the outputs and outcomes. The committee meets twice a year. Its members are very high level scientists holding positions of responsibility in their respective institutions.

CHAIRPERSON

Pascale DELECLUSE
Météo-France, CNRS, Paris

APPOINTED MEMBERS

Jean-Marie BECKERS
University of Liège, Liège

Gilles BOEUF
National museum of natural history, Paris

Miquel CANALS-ARTIGAS
University of Barcelona, Barcelona

Loïc CHARPY
IRD, Marseille

Françoise GAILL
INEE, Paris

Serge GARCIA
FAO, Rome

Véronique GARÇON
Geophysics and spatial oceanography laboratory, Toulouse

Jacqueline LECOURTIER
ANR, Paris

Didier MAZEL
Institut Pasteur, Paris

Yves MOREL
SHOM, Toulouse

Patrick POINT
CNRS, Pessac

MEMBERS ELECTED BY IFREMER PERSONNEL

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Alternate: Anne-Gaëlle ALLAIS

Karine OLU-LE ROY, CFDT

Alternate: Jean-François PÉPIN

Raymond KAAS, CGT

Alternate: Christelle SIMON-COLIN

PERMANENT GUEST MEMBERS

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Alternate: Thomas CHANGEUX
IRD, Marseille

Yves FRENOT
IPEV, Plouzané

Pol GUENNOC
BRGM, Orléans

Edwige QUILLET
INRA, Jouy-en-Josas

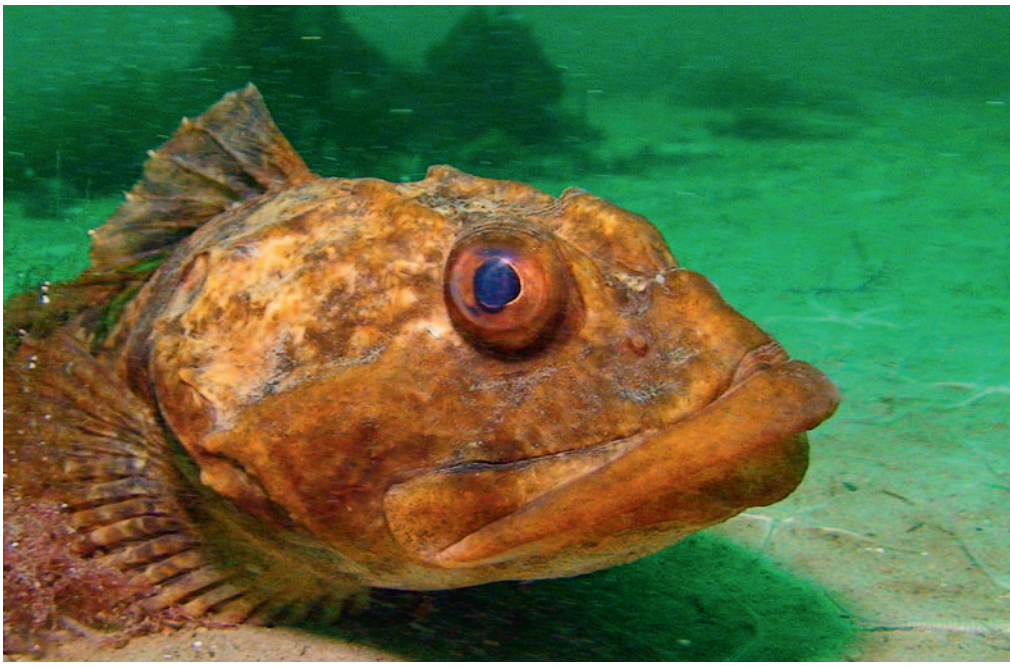
Jean-François STEPHAN

Alternate: Jean-Marie FLAUD
CNRS/INSU, Paris

Pierre TOULHOAT
INERIS, Verneuil-en-Halatte

SECRETARY

Nicole DEVAUCHELLE
Ifremer



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Station expérimentale d'Argenton
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www.Ifremer.fr/implant/argenton.htm

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Ifremer Cresco Station
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Concarneau station
13 rue de Kérose
Le Roudouic
29187 Concarneau Cedex
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Station de La Trinité
12 rue des Résistants, B.P. 86
56470 La Trinité-sur-Mer
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La Rochelle station
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Station d'Arcachon
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33120 Arcachon
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Bouin station
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85230 Bouin
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La Tremblade station
Avenue de Mus de Loup
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MEDITERRANEAN
Mediterranean centre
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http://wwz.ifremer.fr/mediterranee

Station de Palavas
Chemin de Maguelonne
34250 Palavas-les-Flots
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Station de Sète
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Acronyms and abbreviations

Ademe	Agency for the environment and energy management
Aeres	Agency for the assessment of research and higher education
AllEnvi	national environmental research alliance
AMO	project management assistance
AMOP	Association of Mediterranean producer organisations
AMPP	Agency for marine protected areas
ANR	French national research agency
Anses	French agency for food, environmental and occupational health safety
Aquamay	Association for the development of aquaculture in Mayotte
ARDA	Réunion island association for the development of aquaculture
AUV	Autonomous Underwater Vehicle
AWI	Alfred Wegener Institute of Polar and Marine Research (Germany)
BEA	Bureau of investigation and analyses
BMBF	German federal ministry of education and research
BRGM	Geological and mining research bureau
Camp	connectivity of marine protected areas
CBSOI	Southern Indian Ocean basin committee
CCMAR	marine science centre, University of Algarve (Portugal)
CDMM	marine world discovery centre
CCRRDT	regional advisory council for technological research and development
Cenpes	Petrobras research and development centre (Brazil)
Cerege	European research and teaching centre in environmental geosciences
Cerem	regional centre for the Mediterranean
Ceser	regional economic, social and environmental council
CESU	service vouchers for employers
Cetim	mechanical industry technical centre
Cetmar	marine technology centre (Spain)
Cetmef	marine and river technical studies centre
CETSM	European centre for underwater technology
CEVA	European research centre for algae
CFP	Common Fisheries Policy
CGAAER	general council for food, agriculture and rural areas
CGDD	general commission for sustainable development
CGI	general commission for investment
CHSCT	committee for hygiene, safety and working conditions
Clarec	airborne laser surveys of coastal environment risks
Clivar	Climate Variability and Predictability
Clora	associated research organisations club
CMF	maritime council for the seafront
CNC	national shellfish-farming committee
CNES	national space research centre
Cnexo	national centre for ocean exploitation
CNFC	national coastal fleet commission
CNFH	national ocean-going fleet commission
CNPq	national council for scientific and technological development (Brazil)
CNRDPA	national research centre for the development of fisheries and aquaculture (Algeria)
CNRS	national centre for scientific research
COM	oceanography centre in Marseille
Comes	inter-ministry committee on strategic metals
Coreb	regional conference of representatives of large research organisations in Brittany
COSS	strategic and scientific orientation council
CRFM	Caribbean Regional Fisheries Mechanism
CRH	oyster reference centre
CSAR	Centre for Sustainable Aquatic Resources (Canada)
Csiro	Commonwealth Scientific and Industrial Research Organisation (Australia)
CSTF	Strategic and Technical Committee of the Oceanic and Coastal Fleet
DAAF	directorate for agriculture, food and forests
DEAL	Reunion Island environment and planning directorate
DFO	Fisheries and Oceans Canada
DGAL	general directorate for food
Dimenc	directorate for industry, mines and energy
DMSOI	South Indian Ocean division
DOM-COM	French overseas departments (counties) and regions (DOM); overseas local authorities (COM)
DPMA	Maritime fisheries and aquaculture directorate
ECN	École Centrale de Nantes engineering school
EFF	European Fisheries Fund
EIG	Economic interest group
EMSO	European Multidisciplinary Seafloor Observatory
EPIC	public institute of industrial and commercial nature
EPS	exopolysaccharides
ERDF	European Regional Development Fund
ERIC	European Research Infrastructure Consortium
ESA	European Space Agency
ESF	European Science Foundation
Esfri	European Strategy Forum on Research Infrastructures
Esonet	European seafloor observatory network
ESPCI	school of industrial physics and chemistry
EuroGoos	European Global Ocean Observing System
EURL	European Union reference laboratory
FAD	Fish Aggregating Device
FBIO	Food Borne Illness Outbreaks
FDSEA	county federation of farmers' unions
FIS	Fisheries Information System
FMISM	world festival of underwater pictures

FP	Research and Development Framework Programme for Research and Development
FP RDT	Framework research and technological development programme
FUI	single interministerial fund
GDRE	European research group
GICC	management and impacts of climate change
GIPI	computerised property management
GIZC	Integrated Coastal Zone Management
Gréphy	Martinique phytosanitary group
Grepp	Guadeloupe phytosanitary group
HDR	accreditation to direct research
HROV	Hybrid ROV for coastal applications
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICES	International Council for the Exploration of the Sea
IEED	institutes of excellence in low-carbon energy
IEO	Spanish Institute of Oceanography
IFM Geomar	Leibniz Institute of Marine Sciences, Kiel University (Germany)
IFP	French petroleum institute
Ifrecor	French initiative for coral reefs
INEE	ecology and environment institute
INPI	national institute of intellectual property
INRA	national agronomic research institute
INRH	national fisheries research institute of Morocco
Inria	national Information system and automation research institute
INSA	national institute of applied science
INSTM	national institute of marine sciences and techniques (Tunisia)
INSU	national institute of sciences of the universe
IOC	Indian Ocean Commission
IOTC	Indian Ocean Tuna Commission
IPEV	Paul-Émile Victor Polar institute
IPG	earth physics institute
IRD	institute of research for development
IRSN	institute for radioprotection and nuclear safety
ISA	International Seabed Authority
ISTPM	scientific and technical institute for marine fisheries
IUEM	European university institute for the sea
Jamstec	Japan Agency for Marine-Earth Science and Technology
Jerico	Joint European Research Infrastructure for Coastal Observation
LOS	spatial oceanography laboratory
LOV	oceanology laboratory of Villefranche-sur-Mer
LSCE	climate and environmental sciences laboratory
MAPA	ministry of agriculture, food, fisheries, rural life and spatial planning
Marum	German marine environmental research centre
MEDDTL	Ministry of ecology, sustainable development, transport and housing
MESR	Ministry of higher education and research
MoMar	Monitoring the Mid-Atlantic Ridge
MPA	Marine Protected Areas
MRI	Major Research Infrastructures
MSD	Marine Strategy Directive
MSFD	Marine strategy framework directive
NAOS	Novel Argo Ocean Observing System
Nasco	North Atlantic Salmon Conservation Organization
NATO	North Atlantic Treaty Organisation
NERC	Natural Environment Research Council
NGS	New Generation Sequencing
NIOT	National Institute of Oceanography Technology (India)
NIOZ	Royal Netherlands Institute for Sea Research
NOAA	National Oceanic and Atmospheric Administration (USA)
NOCS	National Oceanography Centre, Southampton (United Kingdom)
NRL	National Reference Laboratory
OFEG	Ocean Facilities Exchange Group
Onema	national office for water and aquatic environments
Osuna	Nantes Atlantique observatory for sciences of the universe
Ovide	observatory of interannual to decadal variability in the North Atlantic
PACA	Provence-Alps-Côte d'Azur region
PAMM	action plan for the marine environment
PARM	Martinique regional agrifood cluster
PBDE	polybromodiphenylethers
PCB	polychlorobiphenyls
PEEC	Pacific Economic Cooperation Council
PEMM	Mayotte maritime excellence cluster
PMR	Reunion island marine cluster
PNAC	national coordinated action plan
PNEC	national coastal environment programme
PSMOI	Indian Ocean marine science cluster
Réphy	phytoplankton and phycotoxin monitoring network
RNMR	Reunion island marine nature reserve
Safsi	sustainable agriculture and agrifood systems
SCSP	subsidies for public service charges
SGAR	general secretariat for regional affairs
SHOM	hydrographic and oceanographic service of the French Navy
SIG	Scientific interest group
Sisdav	seismics of the future
SMEL	joint consortium for coastal amenities
SMRE	sciences of matter, radiation and the environment
Snoco	national operational coastal oceanography service
Somlit	coastal environment observation service
SPSI	multi-annual real estate strategy scheme
STEP	drinking water treatment stations
SWIO	South West Indian Ocean
TAAF	French southern and Antarctic lands
UAOM	union of overseas aquaculture farmers
UBO	university of western Brittany
UES	economic and social unit
URM	joint research unit
UMS	joint service unit
WECAFC	Western Central Atlantic Fishery Commission
WFD	Water Framework Directive
WHOI	Woods Hole Oceanographic Institution

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