

2014 ANNUAL REPORT

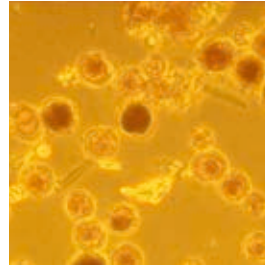


30 years of progress and discoveries

1984

THE TOWED ACOUSTIC SYSTEM (SAR)

is developed. It will be used in 1985 to take a mosaic of 300 km of sonar images from the area where the *Titanic* wreck is resting at a depth of 3,800 m.



1988

NETWORK IDENTIFIES A SPECIES WHICH PRODUCES A NEUROTOXIN

of the PSP (*Paralytic Shellfish Poison*) type. This preventive role has made it possible to avoid food poisoning in humans due to toxic shellfish.

1985

DEVELOPMENT OF THE METHOD TO MAKE SURIMI

Cryo-protectants are perfected, enabling protein properties to be preserved.



2003

COMPLETE SEQUENCING OF THE GENOME OF PYROCOCCLUS ABYSSI,

an archaeobacteria living at depths of 2,000 m and a temperature of 100°C in hydrothermal fluids. The complete sequencing of its genome has opened the path to numerous biotechnology applications.

> 1999

PURIFICATION OF THE HERPES VIRUS

infecting marine molluscs. This is a decisive step in establishing the complete sequencing of the viral genome.

2005



**CHRISTENING OF RV
POURQUOI PAS?**

the flagship of Ifremer's oceanographic fleet. Named in tribute to Commander Charcot, this vessel performs multidisciplinary missions.



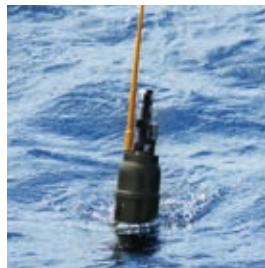
2012

**MOLECULAR
MECHANISMS
OF THE FORMATION
OF NACRE**

covering the Tahiti black pearl which develops in the *Margarita margaritifera* pearl oyster.

> 2006

First French application for **EXTENSION OF THE CONTINENTAL SHELF**



2007

ARGO, the global ocean observing programme, achieves its initial objective:

**AN ARRAY
OF 3,000 AUTONOMOUS
PROFILING FLOATS**

distributed over all the world's oceans.

2014

Experimental demonstration of the **POSSIBILITY OF INDUCING AN ANTI-VIRAL RESPONSE IN THE OYSTER**



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A WORD FROM THE CHAIRMAN AND CHIEF-EXECUTIVE OFFICER



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François JACQ
Chairman and
Chief-executive officer

In a context marked by global change and ever-developing uses of the sea, the marine environment is subjected to growing pressures. This is contributing to making oceans and the coast a "new frontier". As one of the most highly integrated institutes in the field of marine sciences, for thirty years now, Ifremer has made its contribution over a large range of activities, from the most basic research to technological development, as well as supporting public policymakers, expert assessments, observation and monitoring.

This year was marked by the preparing of a new contract of objectives between the French State and Ifremer, which was signed in August 2014. The contract is based on seven major objectives and outlines the orientations for our institute for the 2014-2017 period. In particular, it sets out the principal scientific priorities, clarifies the institute's role in terms of providing support to public authorities and describes the major projects to be conducted which will reinforce its position in coming years.

Amongst the list of advances made during the year, the success of Euro-ARGO, the ocean observing system profiling float array, is an excellent example. On 12 May 2014, the European Commission officially awarded the ERIC (European Research Infrastructure Consortium) legal status to the core component of Euro-ARGO. Thus the Euro-ARGO ERIC, coordinated by Ifremer, will make it possible to develop and federate large communities around ocean observation.

Ifremer has continued its work to strengthen its cooperation with academia. In this respect, two new joint units working on marine biodiversity and host-pathogen interactions were created at the start of 2015 around Montpellier, Sète and Perpignan, making it possible to mobilise a highly valuable critical mass with our partner universities and research bodies.

In the field of support provided to public policymakers and to fisheries, the growth of bluefin tuna stocks in the Mediterranean Sea can be noted. This is the outcome of protracted efforts to organise stock management, in which Ifremer's teams will have made an outstanding contribution under sometimes difficult conditions. Achieving this type of success relies on a medium-term strategy and on mobilising expertise and skills to develop these lines of research in conjunction with public authorities and professionals. Signs of this can likewise be seen in the significant research initiatives for sea bass or king scallops which materialised in 2014.

The ocean is also considered to be a major source of mineral resources for the future. But that will require mastering their management and exploitation. To this end, CNRS and Ifremer conducted a collective scientific expert assessment (ESCo) on the environmental impacts of exploiting deep-sea mineral resources, in order to draw up an inventory of knowledge and to guide research. This opens up the possibility of a coordinated progression between knowledge of the ecosystems and their possible exploitation.

Science and technology cannot exist without high-quality support. That is why the institute has begun a progressive overhaul of its information systems used for human resources and finance, with better mastering the utilisation of Ifremer's resources as a constant concern.

In December 2014, a new task emerged with the Prime Minister's confirmation that Ifremer's headquarters will be transferred to Brest; preparing this operation will be a milestone in the coming year, with the dual preoccupation of offering the personnel the most appropriate solutions and ensuring that our institute functions optimally in taking advantage of this new setting.

For its thirty years of existence, I think that Ifremer can be proud of its achievements. Much remains to be done, seeing how much is expected from the institute and how much there is to learn about the marine environment. I am convinced that with our teams' talents and commitment, our institute will rise to the numerous challenges awaiting it.

HISTORY, CHALLENGES, MISSIONS AND ORGANISATION



■■■ The background of our institute

Ifremer's history combines two worlds. The first, related to maritime fisheries, began with the creation of the Maritime fisheries technical service in the second half of the 19th century. As the outcome of this process, the Maritime fisheries scientific and technical office was created by the 31 December 1918 Finance Act, then took the name of Maritime fisheries scientific and technical institute (ISTPM) on 14 October 1953. The second is linked to the development of oceanography and harks back to the development, more than a century ago, of measurements and cruises to explore the oceans. Following World War II, a Committee for the exploitation of the oceans called Comexo was created. It was followed by Cnexo, created

by law n° 67-7 of 3 January 1967 and which would become a specialised institution in charge of exploring the oceans, with a significant technological component.

Ifremer was created on 5 June 1984 with the merging of Cnexo and ISTPM. So 2014 marks the institute's thirtieth anniversary.

As set out in the decree which brought it into being, the French research institute for exploitation of the sea, Ifremer, has the remit to conduct and promote basic and applied research, expert assessment reports and action for technological and industrial development intended to:

- know, assess and enhance ocean resources and enable their sustainable use,
- improve methods for monitoring, forecasting trends, protecting and enhancing marine and coastal environments,
- and foster social and economic development of the maritime world.



■ ■ ■ Scientific and technological stakes

A major challenge must be met: the Earth's ability to bear the presence of 9 billion human beings by the 2050 horizon. Today, over 60% of the world population lives less than 150 km from the shore and this has a direct impact on sensitive coastal areas. Other questions concern our planet's ability to feed its inhabitants, its development model and the concomitant requirements, primarily in terms of energy sources and raw materials; and finally whether the environments will be able to bear the consequences of these choices. All of these factors, both local and global, contribute to making the oceans and the marine environment a "new frontier" for mankind.

France holds a singular position in this respect, thanks to its presence on three oceans thanks to its extensive continental shelf, the second largest in the world. It enjoys a further advantage with Ifremer, which has emerged as one of the most integrated institutes in the field of marine sciences. This capacity for integration is especially crucial in a context where the needs for expertise, knowledge and development are seen as increasingly important.

Marine sciences play a vital role in informing public policies. They open up a way to reconcile both protection and exploitation of the environment. Indeed, understanding of ecosystems, the processes governing them and the services they can offer, is an absolute prerequisite for rising to the challenges facing us.



■■■ Ifremer's calling

Ifremer contributes, as an integrated research institute in marine science, to the national system for research and innovation as well as to the European research area, by producing:

- fundamental knowledge in a systemic approach making it possible to better grasp the processes governing ecosystems and understand the changes affecting them;
- more finalised results to answer questions raised by society, based on its observation, monitoring and expert assessment capacities, and giving policy-makers support for managing the marine environment and its resources;
- outcomes and technologies contributing to economic development in the framework of a balanced partnership with various economic players, including industrial firms.

To rise to this calling, our institute is involved in a wide range of research arrangements and partnerships.

- It invests in research excellence, grounded on key disciplines or themes. On the national level, it relies on partnership with universities and research bodies. From the outset, Ifremer has been part of the AllEnvi and Ancre alliances. It is a driving force, on European and global scales, for joint or concerted programming initiatives, both for research and infrastructures (fleet, observatories and databases);

- the institute's research bolsters the deployment of maritime policies, whether this concerns the implementation of the Water Framework Directive (WFD), the Marine Strategy Framework Directive (MSFD), the Common Fisheries Policy (CFP), national strategies for biodiversity or human and animal health policies; this expertise is an integral part of our institute's remit, as in order to ensure quality, it must control the scope and reach, making it compatible with Ifremer's skills base and its resourcing, whilst transferring our methods to other stakeholders once they have been well-proven and require no further development;
- thanks to numerous partnerships with industrial and economic realms, Ifremer is committed to a rationale of business development, which has notably led to a Carnot institute of excellence called Ifremer Edrome within our institute;
- marine scientific research builds upon high level technologies in many fields, such as underwater operations, instrument systems, observatories (coastal, offshore, seafloor), mineral and energy resources, fisheries and aquaculture. Ifremer acts as a turnkey contractor and integrator;
- The institute is in charge of a large part of a very large research infrastructure (VLRI) called the French oceanographic fleet (FOF). The quality of the scientific equipment of Ifremer's fleet is inextricably linked to the technological investments made, working closely with our research scientists and engineers and our industrial partners.

■■■ How the institute is organised

→ The territorial organisation is based on:

- a head office in Issy-les-Moulineaux, near Paris,
- five centres, each covering one or more regions or territories:
 - Atlantic (managed from Nantes),
 - Brittany (managed from Brest),
 - Channel-North Sea (managed from Boulogne-sur-Mer),

- Mediterranean (managed from La Seyne-sur-Mer),
- Pacific (managed from Tahiti).

Along with these centres are nearly twenty stations located on the coasts of metropolitan and overseas France.

The five centres ensure local support to teams of scientists and technicians and relations with local partners, through helping to set up projects and developing cooperation.

The institute has two main components to its structure:

- the scientific component, made up of the scientific management, four thematic departments uniting scientific and technical staff and the Fleet resources and operations division;
- the component supporting research and expertise, made up of six functional divisions (human resources, finances, legal affairs, business development, communications, international and European affairs) and the accounts department;

Under the authority of the general management, the scientific management proposes and implements the institute's policy for science. It organises and coordinates its scientific and technological foresight. It defines and implements the policy for scientific and technological partnerships, as well as the doctoral policy. It leads the work to prepare, update and define the strategic plan.

The four science and technology departments are in charge of managing the human and financial resources used for scientific and technological projects and research. They implement these projects and map out the strategy.

The Biological resources and Environment (RBE) department's remit is to study and enhance knowledge about living resources in the ocean, so that they can be sustainably exploited while contributing to social and economic development in the maritime realm, especially the fisheries and aquaculture sectors. This mission is inextricably linked to better knowledge about the marine environment as a dynamic system subjected to strong natural and anthropogenic variability.

The Physical resources and Deep-sea ecosystems (REM) department bases its activity on knowledge and understanding of phenomena which have led to the creation and location of mineral and energy reserves and deep-sea ecosystems. Study of the latter aims to describe the biological diversity there and to understand interactions between biological communities and associated mineral structures, using interdisciplinary approaches spanning scales ranging from ecosystem to molecular. The department is also developing a technological activity aiming to develop marine instruments.

It coordinates the Carnot Ifremer Edrome institute (Label of excellence renewed every five years) through its scientific and technical guidance committee.

The Oceanography and Ecosystem Dynamics (ODE) department's activities focus on acquiring knowledge, observing and modelling of:

- the physical ocean at different scales, from the global ocean to transitional coastal waters,
- pelagic coastal ecosystems (only the first links in the food chain), and
- benthic coastal ecosystems.

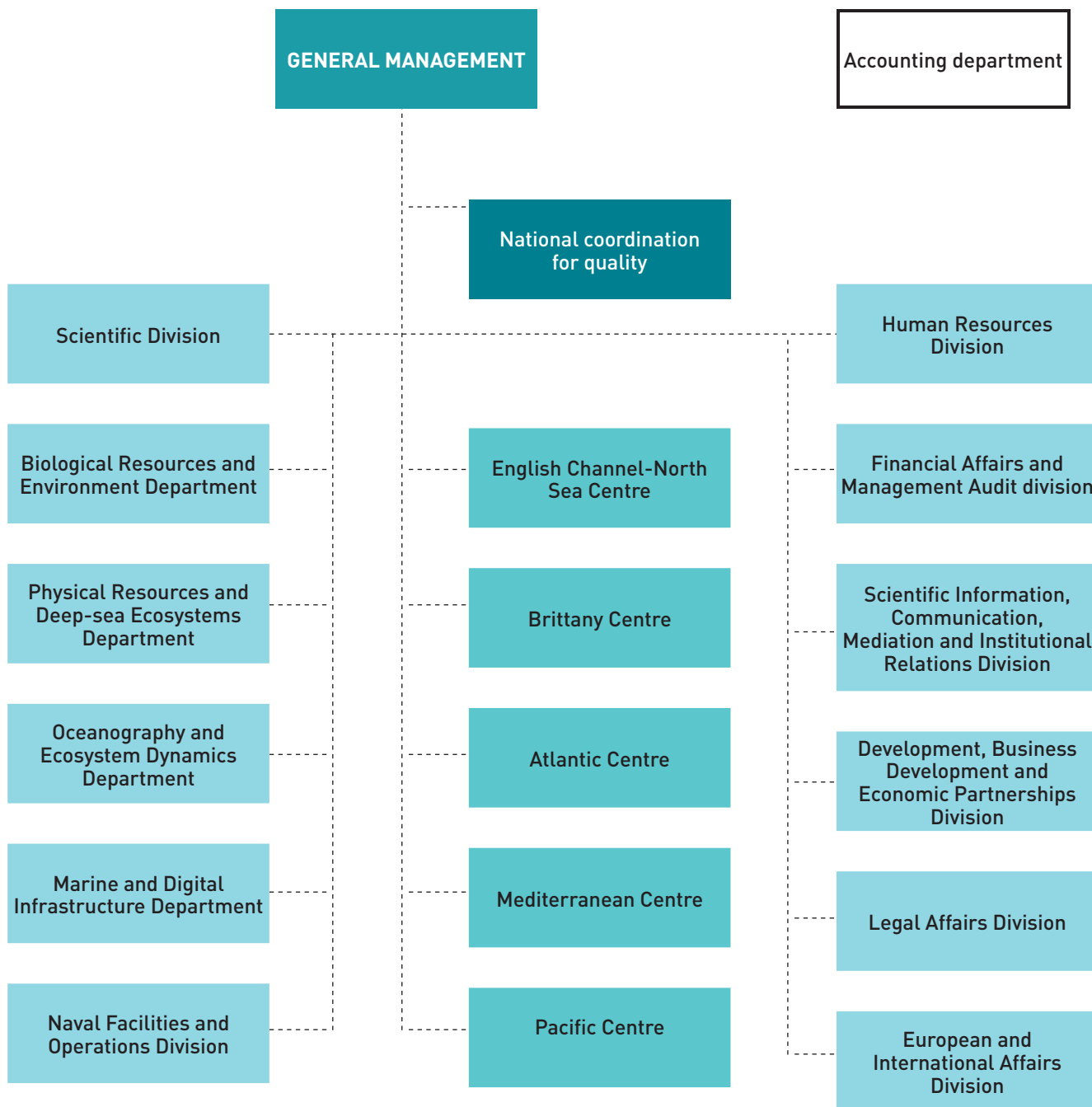
In relation with its research on observation methodologies and diagnosis, the department collects data from *in situ* instruments, coastal arrays and satellites. It designs and deploys systems for processing, archiving and disseminating these data and develops numerical modelling tools in order to simulate marine ecosystem functions and exchanges at the interfaces. It contributes to the environmental and health monitoring of coastal waters required by regulations, through the observation and surveillance networks it coordinates.

The Marine and Digital Infrastructure (IMN) department delivers services and leads projects whose objective is to create and/or constantly improve the infrastructures which support research in the field of the fleet and related instruments and information services. The department develops, programs and upgrades all of the information system facilities and infrastructures needed by our institute. It also develops and manages the oceanographic data centre which gathers data on the marine environment and makes them available to the scientific community. It develops and operates Ifremer's information systems for marine data in compliance with the national and European directives in effect.

Sea-going facilities and equipment for French oceanographic research are managed by CNRS, Ifremer, IPEV and IRD. Since 2011, they have been coordinated within a joint service unit (UMS). Within the Fleet large-scale Research Infrastructure, is owner and operates via the EIG Genavir, under the French flag, four of the five French ocean-going vessels, three of the seven coastal vessels and all of the underwater vehicles and embarked equipment. Fleet management relies first and foremost on the technology and instrumentation teams in the institute who underpin fleet service quality.

The naval facilities and operations (DMON) department defines and implements oceanographic fleet scheduling to serve the various communities which use it. It also acts as the interface with the UMS FOF joint service unit.

■■■ Ifremer organisation chart

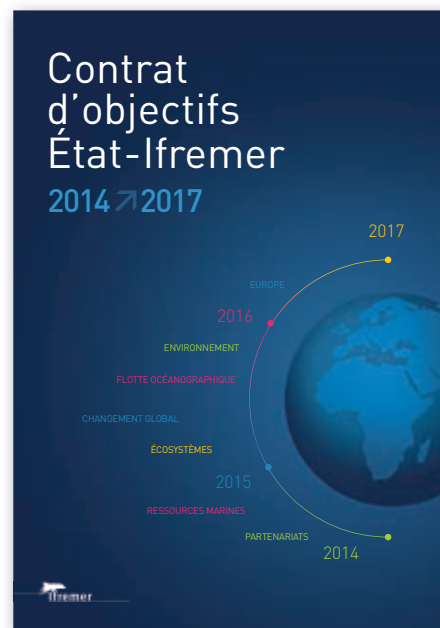


■■■ The new State-Ifremer objectives contract

The previous contract setting out objectives between the French State and Ifremer had reached its term late 2012. Therefore, 2013-2014 was a time of transition. The objectives contract is based on seven major objectives which are in turn broken down into actions:

- 1 consolidate the position of French marine science research on European and global scenes,
- 2 galvanise research in marine science fields in France by making it one of the site strategies, in a balanced partnership with academia and the economic sector, whilst asserting the institute's scientific priorities and relying on its observation capabilities and expertise,
- 3 give policy-makers support based on the most relevant scientific knowledge, working with the principals to set up regulation of demand and ensuring the complementarity of these activities with the institute's scientific dynamics,
- 4 be a driving force to simplify and optimise the management of the French oceanographic fleet, from a multifunctional perspective,
- 5 contribute to blue growth thanks to a proactive development, valorisation and transfer policy,
- 6 broaden Ifremer's commitment to fostering dialogue between science and society,
- 7 improve our institute's in-house practices to contribute to more efficient operation.

The institute's Board of Directors adopted the draft contract which was signed by the our supervisory ministries in August 2014.



PARTNERSHIP-BASED RESEARCH



©Genavir/L. Treluyer

1 Understand, document and observe the marine environment in global change >

Better knowledge about ocean currents and ocean-atmosphere interactions is essential to reduce uncertainty related to interpreting observed climate trends and to anticipate future changes. Progress in this field depends greatly on continuing observations which inform about water body dynamics and exchanges occurring at the air-sea interface, and on developing numerical models which are capable of reproducing how the ocean system evolves.

SCIENTIFIC MILESTONES OF THE YEAR, PROGRESS AND RESULTS

The advances made this year are presented according to the three scientific orientations which structure the State-Ifremer contract of objectives for 2014-2017.



deep sea hydrographic
profiles



Geovide

From 15 May to 30 June 2014, during the Geovide multidisciplinary cruise aboard RV *Pourquoi pas?*, physicists from the ocean physics laboratory (CNRS/Ifremer/IRD/UBO) and biogeochemists from the marine environment science laboratory (IUEM), the LEGOS laboratory for geophysical and spatial oceanography studies (CNES/IRD/UBS/CNRS) and seven other international labs, collected 216 deep hydrographic profiles and over 10,000 samples which will be used to measure trace elements and their isotopes (TEI) in the North Atlantic. These TEIs, such as iron or rare earth elements, for instance, exist in dissolved or particulate form, but in such tiny quantities in the ocean that it has only been possible to measure them in very recent years. Knowledge about their distribution in oceanic water bodies is a way of better appraising the large cycles which govern the functioning of the ocean and marine biological production.

This cruise is part of the international Geotraces programme, and was also the seventh cruise in the Franco-Spanish Ovide programme, which has been supported by Ifremer, INSU, UBO and CSIC for the past twelve years. The programme seeks knowledge about natural variability in the North Atlantic in terms of circulation, heat transport and carbon uptake. Along with the traditional section between Portugal and Greenland performed since 2002, a Greenland-Newfoundland section was added this year seeing the fundamental importance of characterising Labrador Sea water on the site where it forms. The data show that this water mass was visibly renewed last winter to depths reaching 1,500 m, making 2014 one of the years with the deepest vertical mixing since 1997.

To learn more, see: <http://www.geovide.obs-vlfr.fr/>; <http://www.ifremer.fr/lpo/ovide/>



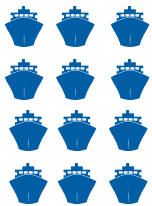
Interview

Pascale LHERMINIER

co-chief scientist on the Geovide re-search cruise




12



super-stations

What were you expecting from the Geovide cruise?

The challenge was to collect data which could meet the following five scientific objectives: continue the Ovide time-series, i.e. measuring currents, the meridional overturning cell, the properties of bodies of water and carbon transport at the Portugal-Greenland section (project begun in 2002 with two-yearly cruises); map the concentrations of trace elements and their isotopes (TEI) from surface to seafloor in the different water masses present in the subpolar gyre and in the inter-gyre region of the North Atlantic; better understand the processes controlling primary production and export of organic matter to the seabed based on measuring TEIs which may play a limiting role (iron, cobalt, zinc, etc.); identify TEI sources and sinks, particularly at continental margins and the air-sea interface; and measure in today's ocean, the isotope ratios used to reconstruct past climates in order to further refine the interpretation. The last four objectives are from the international Geotraces programme, which was the Geovide cruise is part of, as the French contribution to a plan covering every ocean on earth.

What were the milestones of this multi-disciplinary oceanographic cruise?

We had twelve "super-stations" to perform during the mission. For each of them, the ship stayed in position for about two days and the operations followed in sequence to measure the sixty parameters in their various forms in the water column. The operations involved firstly lowering a classic

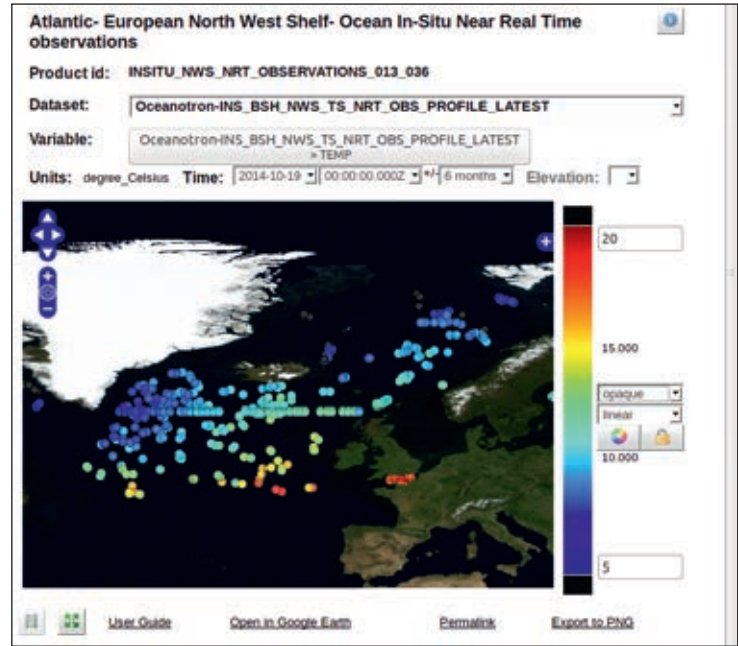
rosette and a clean rosette alternately, each of them covered by sensors and fitted with twenty-four sampling bottles; and secondly to stabilise *in situ* pumps for several hours at selected depths in order to recover particles by continuously filtering the seawater; and finally, to deploy a plankton net and a mini-corer for sediment. The first step of a super-station consisted in determining the depth of the water masses of interest for measuring TEIs, using the first temperature, salinity and dissolved oxygen profiles. The team leaders met immediately after the first data were acquired, whether day or night, in order to quickly set up a sampling plan. Thus, the order of sampling, depths and volumes of water to take for each parameter were quickly determined, the aim being to have enough water for all the scientists and to begin with the parameters which are most rapidly contaminated by the atmosphere (especially dissolved gasses). One of these super stations was moved in real time to take account of the Mercator forecast on the position (proven true *a posteriori*) of the North Atlantic current.

Was the initially planned programme accomplished?

Yes, almost in its entirety! I'd like to thank the crew of RV *Pourquoi pas?* here for their great efficiency and their professionalism, particularly when we had winch failure which could have compromised the entire cruise, but in the end simply obliged us to abandon one of the super-stations which was considered to be less critical for the programme. On the other hand, we were able to improve the resolution in the boundary currents and had the benefit of exceptional conditions to the south of Greenland, because the ice-pack had been pushed by winds the day before we arrived. This allowed us to take samples on the shelf, which is very precious in determining the sources of some TEIs (like rare earths), and measure the intensity of the coastal current of Greenland.

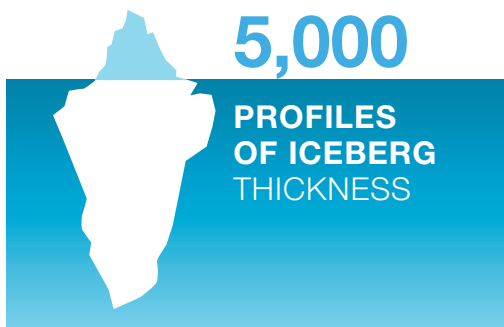
MyOcean2

The marine component of the European Copernicus earth observation programme, the MyOcean2 project, was completed in October 2014. Coordinated by the Mercator Ocean civil society, it achieved the setting up of a pre-operational marine service for ocean monitoring and forecasting, now recognised at European scale with the delegation agreement between the European Union and Mercator. Ifremer played a significant part in the *in situ* and satellite observations strand by extending the French national services developed by the Coriolis data centre and Cersat (French ERS processing and archiving facility) to European scope. The Coriolis data centre, which is unique in Europe, supplies data collected by instruments deployed at sea in real time. It thus meets the needs for validating and recalibrating the ocean forecasting systems implemented by Mercator-Ocean on the global scale. Mainly archiving temperature and salinity measurements from various platforms, including Argo profiling floats in the open sea, it has added other parameters (oxygen, chlorophyll) which are characteristic of marine ecosystem functioning.



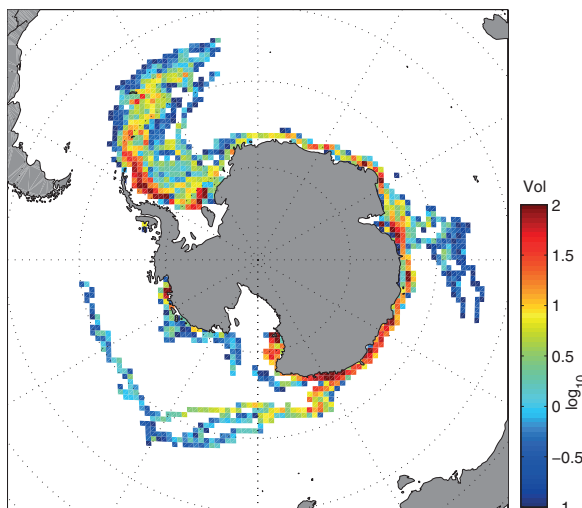
> The map generated on line by the Oceanotron software for the MyOcean portal shows the temperature of the upper layers of the ocean (0 to 125m in depth) in degrees Celsius

© Ifremer/ESA



Polar zone observation

The volume of ice of very large icebergs coming from the Antarctic ice sheet is a key parameter for studying the glacier mass budget and for estimating flows of fresh water in the Southern Ocean. A database covering over a decade (2002-2012) of data and containing more than 5,000 profiles of iceberg thickness (the characteristic giving information about their volume), backscattering coefficients and lengths was created by Ifremer's spatial oceanography laboratory. This was achieved by combining iceberg positions supplied by the National Ice Center (NIC) and Brigham Young University databases, archived Jason-1, Jason-2 and Envisat altimeter data on icebergs and a new method to analyse waveforms.



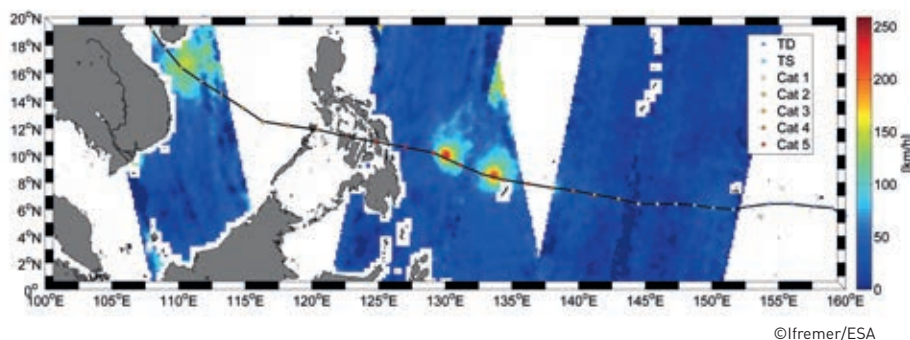
> Mean volume of ice on a regular polar-stereographic grid of 150 x 150 km² for the period from 2002-2012. Logarithmic colour scale

This database will make it possible to study the distributions of heights, lengths and backscattering coefficients of icebergs and to infer which glaciers they came from. The available measurements also provide information about how icebergs evolve over time, their melt rate and fracture coefficient. By combining estimations of size made by NIC and of thickness from the altimeter, the daily volume of ice present in the Southern Ocean was calculated for the period from 2002-2012. The volume was around 22,000 km³ in 2002, i.e. about thirteen to sixteen years of total annual calving. It steadily decreased, to reach 9,000 km³ in 2012, i.e. five to six years of calving. The study also showed that large volumes of ice can be injected into the sea within a very short lapse of time. However, the disappearance of icebergs due to melting and break up is a more regular and a much slower process.

¹ lost by a glacier of part of its volume (iceberg training)

Cyclone observations based on SMOS (Soil Moisture and Ocean Salinity) data

A novel method for observing tropical cyclones was developed by Ifremer using data acquired by the SMOS (Soil Moisture and Ocean Salinity) satellite's interferometric radiometer. By processing the data collected by SMOS in the 1.4 GHz electromagnetic frequency band - which is hardly affected by crossing the atmosphere - it was possible to measure winds at the ocean surface under extreme storm conditions for the first time. The method is especially useful for characterising tropical cyclones accompanied by very heavy precipitation. This progress gives access to accurate observations which are out of the scope of instruments which meteorological agencies use traditional to measure winds at the sea's surface. Overcoming this obstacle related to measuring parameters at the heart of hurricanes will help to better estimate their intensity and predict how they will evolve. Supported by the European Space Agency (ESA) and working in collaboration with the Met Office (United Kingdom's national weather service), the five years of data acquired by the SMOS satellite since its launch in 2009 were entirely reprocessed in 2014.



> Measurements of the surface wind speed obtained from SMOS satellite data during the passage of the super typhoon Haiyan, which devastated the Philippines in November 2013. The black curve with coloured dots indicates the successive positions of the eye of the typhoon and how its intensity evolved on the Saffir-Simpson scale

Phenomer

The Phenomer project explores participatory science, aiming to collect additional information to that from the RePHY network on sometimes very fleeting episodes of microalgal blooms. The principle behind Phenomer is to invite non-specialists to alert Ifremer and project partners in the case of coloured water or foam at the sea surface. These events are often the visible sign of microalgal blooms.



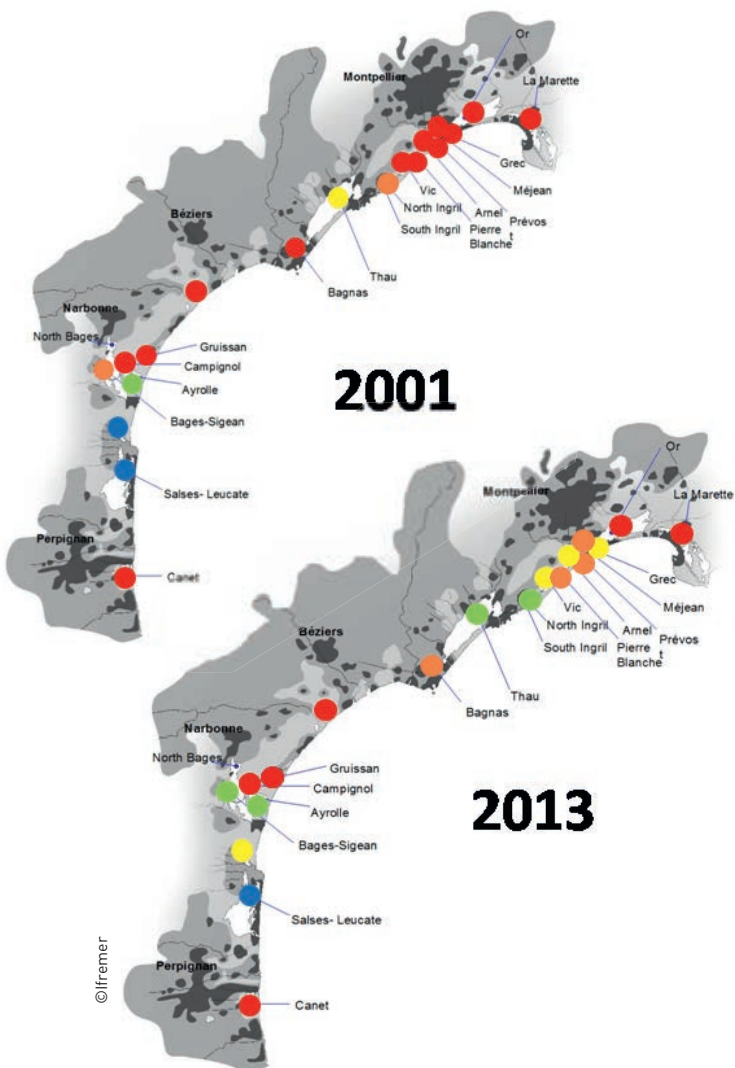
This experimental phase, deployed in Brittany for the second consecutive year and in the Loire-Atlantique region for the first time, led to seventy-five reports over the period from March to August. Once confirmed by sampling and analysis of a sample by a scientist, forty of these alerts proved to be phytoplankton blooms.

Hommage

Lagoon monitoring network: from observing to helping manage lagoon environments (2000-2013)

An assessment of the RSL (lagoon monitoring) network, operated in partnership with the Languedoc-Roussillon regional council, the Rhone-Mediterranean & Corsica water agency (AERM&C) and Cépralmar (<http://rsl.cepralmar.org/>) and devoted to the observation of Mediterranean lagoon environments was drawn up in 2013. By using an ecosystem-based approach, the network of scientists and managers has shed light on dysfunctions within lagoons subjected to excessive nutrient inputs and made it possible to monitor the evolution of these ecosystems following measures taken to reduce pollutant flows. A statistical analysis of data collected over the 2001-2012 period highlighted the fact that half of the twenty-one lagoons considered, including those of Bages-Sigean, Thau and La Palavas, were on the track to restoring environmental quality. One strand of the RSL focused on optimising methods to diagnose eutrophication and developing indicators for lagoon environmental status which are compatible with the Water Framework Directive (WFD).

<http://archimer.ifremer.fr/doc/00210/32154/>



› Water-column status with respect to eutrophication in 2001 and 2013

International symposium organised in tribute to Bach-Lien HUA

→ «Ocean scale interactions»

An international scientific symposium on “ocean scale interactions” was organised at Ifremer’s Brittany centre as a tribute to our colleague and friend Bach-Lien HUA. She was a brilliant research scientist who had worked at Ifremer since 1985 and who died suddenly in 2013.



Lien was a physical oceanographer who extensively contributed to understanding mesoscale (100-200 km in diameter) eddies, Equatorial dynamics and very fine-scale ocean layering structures (strikingly observed around mesoscale vortices on seismic images of the water column). She was behind the creation of the ‘Very high resolution ocean’ team, within Ifremer, aiming to appraise the impact of very small-scale mechanisms on the largest ocean and climate scales. But above all, on the international level, she initiated new research directions involving non-linear interactions between scales whose repercussions on our understanding of ocean dynamics can now be measured. Lien’s energy, scientific expertise and infectious enthusiasm made it possible to take this approach and obtain all these outcomes today. The international community wanted to take the opportunity to pay her tribute at this three-day symposium attended by over one-hundred-seventy participants, more than 40 of whom came from the United States, England and Japan. In all, nearly 50 lectures and over 30 posters were presented.

Thanks to the high quality of papers and discussions, the symposium was described as “of the highest standard” and “warm and friendly”, which means that these three days were a reflection of Lien herself! <http://www.ocean-scale-interactions.org/>

The papers presented during the symposium will be part of a special collection by the Journal of Physical Oceanography. The scientific exchanges also highlighted a new direction for research concerning not just the importance of oceanic fine scales, but more especially their determining impact on World ocean dynamics through a continuum of scales.

2 Understand and represent the dynamics of marine ecosystems and related services in order to envisage their sustainable utilisation



Sustainably utilising marine ecosystems and associated services requires being able to understand and represent their dynamics. For fisheries science, elucidating the processes which govern the structuring of exploited populations is decisive for managing them.

Species which are fished, harvested or farmed are also subjected to anthropogenic disturbance from various sources which have sharply increased in recent years. It is essential to study the mechanisms at play in response to these forcings, in order to appraise their resilience.

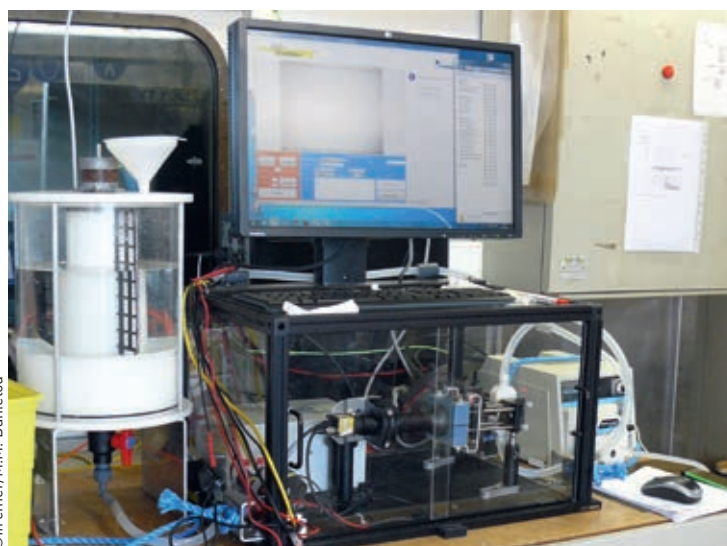
Thus, in a context of massive mortalities in cupped oysters which is detrimental to the shellfish farming sector, progress has been made in understanding their defence mechanisms, particularly by exploring processes of auto-

phagy. The reprotoxic effects on cupped oysters due to the marine environment being permeated by microplastics have also been demonstrated.

Assessing ecosystem services produced by this marine and coastal biodiversity is the core challenge for coastal environmental protection. In the context of the Marine Strategy Framework Directive's (MSFD) implementation, improving good environmental status and services rendered by marine ecosystems raises complex issues. This requires increasingly great multidisciplinary integration.

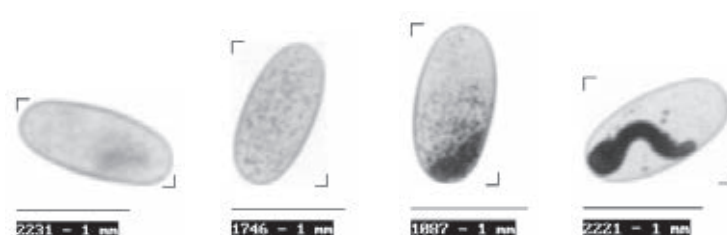
Pelgas 2014 cruise: operational success in using the ZooCam

The integrated ZooCam system combines an in-flow imaging instrument with image analysis and automated organism classification software. Based on the technological progress acquired in the existing Flowcam and Zooscan instruments, it allows fast processing (about five minutes per sample) and semi-automated recognition of organisms in the mesozooplankton size-class aboard oceanographic vessels. The design work and initial tests performed on the third leg on the 2012 and 2013 Pelgas cruises made it possible to achieve operational use during the Pelgas, Camanoc and Evhoe fisheries cruises as of 2014. Its industrial transfer is currently being examined. The processing software extracts the organisms passing in front of the camera to create individual thumbnails, on which some fifty parameters are measured (morphometry, symmetry, greyscales, contours, and so on), which then enable classification using a known learning set.



© Ifremer/M.M. Danielou

> Shipboard ZooCam instrument on RV Thalassa

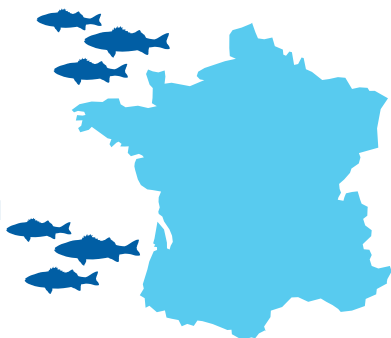


© Ifremer/Zoocam

> Thumbnail images from the Zoocam illustrating successive phases of development of anchovy eggs

600

seabass tagged
in the English
Channel and
Bay of Biscay



4



**ELECTRONIC
TAGGING CRUISES
IN 2014**



Bargip: connectivity of sea bass populations

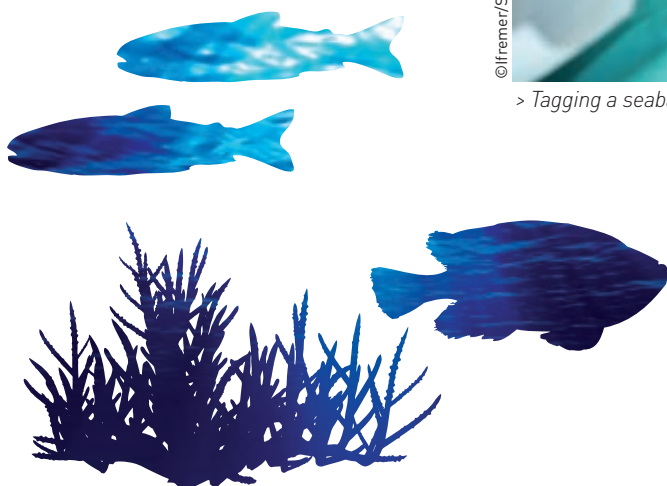
The Bargip (<http://wwwz.ifremer.fr/bar>) project, is co-financed by the Maritime fisheries and aquaculture division (DPMA), the France Filière Pêche (FFP) sectoral organisation and the national marine fisheries and mariculture committee (CNPMEM), aiming to acquire biological and ecological knowledge about European sea bass (*Dicentrarchus labrax*) in order to optimise its management. The 'adult tagging' action aims to determine sea bass migrations on the English Channel/Atlantic seafronts to understand the population's spatial-temporal structure and address the question of the species' distribution area's possible extension under the impact of climate change. Four electronic tagging cruises were performed in 2014, in partnership with the CNPMEM which took care of chartering the fishing vessels taking part in the operations. Nearly 600 sea bass were tagged in the English Channel and the Bay of Biscay.

The methodological developments related to retracing trajectories using data from tag records (temperature, pressure) were presented at two international conferences. This large-scale tagging project followed on from a pilot study conducted between 2010 and 2012 in the Iroise Sea in partnership with the Iroise marine nature park. Data from some thirty re-catches (out of 246 fish tagged) showed the existence of a fidelity process in the summer feeding zone already observed by British researchers. These data also suggest, for the first time, a process of fidelity to a spawning zone. This means that the Iroise Sea would be a functional summer feeding zone as well as being an area where stocks mix.



©Ifremer/S. Lesbats

> Tagging a seabass in the laboratory





70 STRAINS OF 4 DIFFERENT SPECIES OF *PSEUDO-NITZSCHIA*



ANR Comanche: connectivity of King scallop beds in the English Channel

The ANR Comanche project (ecosystem interactions and anthropogenic impacts on King scallop populations in the Channel) is improving knowledge about scallop populations on the scale of the Channel. A map showing the connectivity between different beds has been proposed. The influence of surface temperature and major climate cycles helps to explain the interannual fluctuations in stock recruitment in the Bay of Seine. This goes hand in hand with understanding the appearance of toxic algae phenomena: over seventy strains of four different species of *Pseudo-nitzschia* have been identified from samples taken in the Bay of Seine and cultured. A biochip was perfected for fast identification of various *Pseudo-nitzschia* species. An ecosystem model, coupled with a biogeochemical model (Ecomars3D) and with a population dynamics model was developed over the entire English Channel. The project has given rise to significant scientific (fourteen publications and thirty-seven papers presented) and media (thirty-eight results) coverage.



©lfremer/O. Dugormay

> Eelgrass bed

Valmer Interreg project: assessment of ecosystem services in the Channel



The Valmer project is one of the first attempts to apply the ecosystem services approach in an operational perspective for aid in managing the marine environment in Europe. In order to help define the future management orientations for the Marine park project in the Normandy-Brittany gulf, an initial diagnosis of the site's ecosystem services was performed using various as-

essment methods. An adaptation of the Invest models developed by Stanford University in the Natural Capital Project framework was used to construct a spatialised model of marine habitat vulnerability and to simulate the site's ability to supply these ecosystem services depending on typical scenarios ("development", "business as usual" and "conservation").

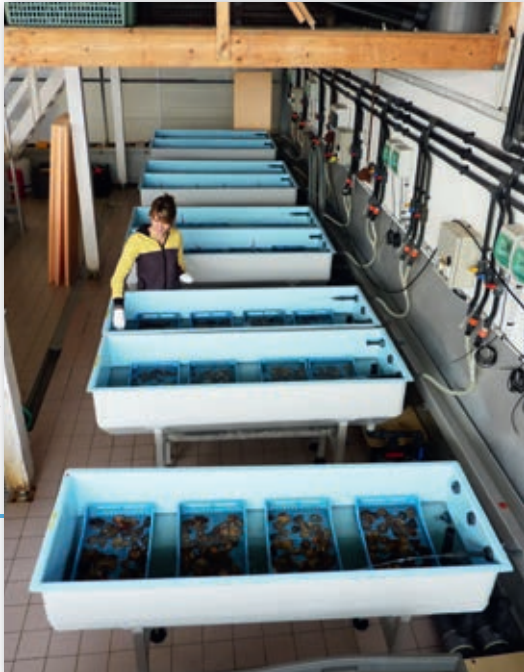
<http://www.sciencedirect.com/science/article/pii/S2212041614001090>



ANR Gimepec: genotoxicity, immunotoxicity and reprotoxicity of pesticides in *Crassostrea gigas*

A trans-generational effect of exposure to the herbicide diuron has been highlighted in cupped oysters. The effect is shown by modified ge-

netic material being transmitted to the offspring when parents are exposed to environmental concentrations of diuron during the gametogenesis phase. In spat produced by exposed broodstock, diuron causes an increase in the rate of overall DNA methylation and an aneugenic effect, i.e. leading to anomalies in the number of chromosomes, which affects 15% of the individuals analysed. Cytogenetic analyses demonstrated in embryos that chromosomes 4, 5 and 10 displayed hypo- and hyper-diploidy in response to exposure to the herbicide. At the gene level, another protocol was developed in parallel for fine-scale analysis of genomic alterations in genes of interest. These alterations were observed concomitantly with abnormalities of development and growth. Data analysis is underway and should enable the identification of the potentially altered physiological functions and propose molecular markers for diuron exposure. To date, the Gimepec project has led to the publication of three peer-reviewed scientific articles with three additional articles currently being written. Furthermore, the project results were shared in five papers presented at international conferences (Setac US, Setac Europe, Primo and Ecobim).



© Ifremer/ Projet Gimepec

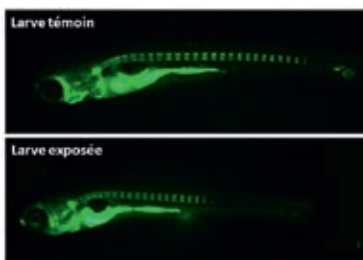
> Exposure of *Crassostrea gigas* broodstock to diuron at Ifremer's experimental hatchery in La Tremblade



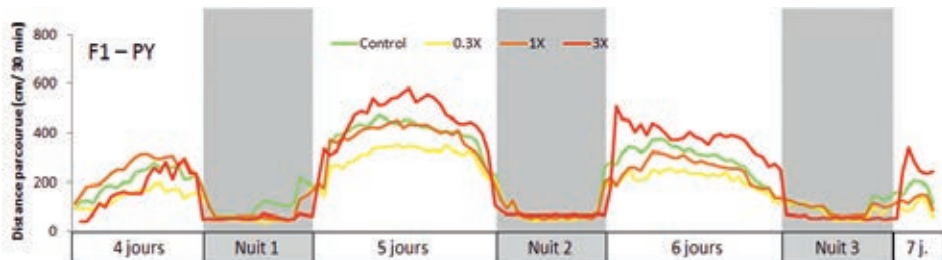
ANR ConPhyPoP project: characterising reprotoxic and neurotoxic effects of chronic exposure of fish to environmental mixes of polycyclic aromatic hydrocarbons (PAH)

The ANR ConPhyPoP project focused on the effects of fish's exposure to three mixtures of polycyclic aromatic hydrocarbons (PAH) which are representative of contrasting environmental situations and compositions. The exposure was performed at the Fish ecophysiology platform (PEP, L'Hourmeau station). Alterations were observed for most of the physiological variables analysed, at every stage of development. All of these alterations lead to reducing both individual

aptitude for survival and the contribution to recruitment. Moreover, studies conducted on the offspring of these fish - without any direct exposure to PAHs - have also highlighted physiological alterations. These studies also showed the high toxicity of methylated PAH derivatives. Along with supplying fundamental knowledge, this project provides a better grasp of the effects of wild fish populations' exposure to PAHs. ConPhyPoP's outcomes were valorised through thirteen publications, eleven of them in a special issue of *Environ. Sci. Pollut. Res.* published in December 2014



> Delayed formation of spinal column (15-day larvae)

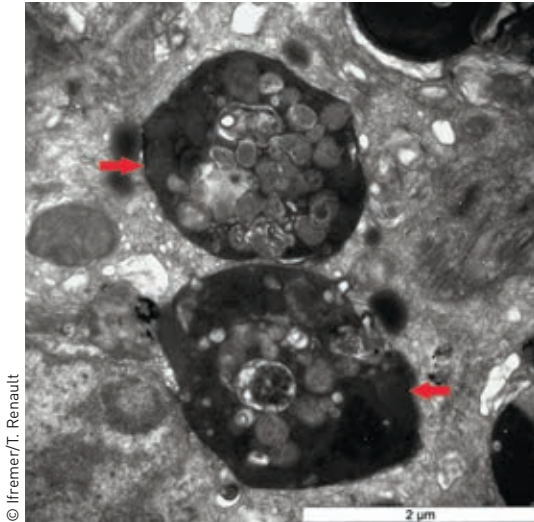


> Altered behaviour in larvae aged from four to seven days which are the offspring of contaminated fish

> Early morphological defects in exposed larvae and altered behaviour in the offspring of these larvae



© Ifremer/ L'Hourmeau/ C. Vignat-X. Cousin

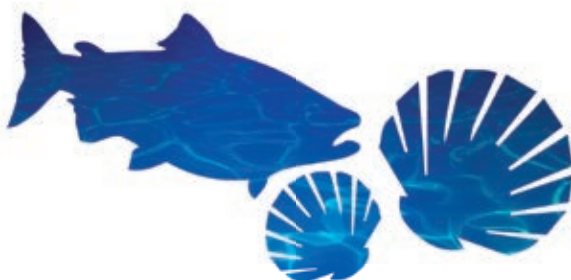


© Ifremer/T. Renault

> Transmission electron microscope analysis of mantle cells in the cupped oyster, *Crassostrea gigas*, in the presence of an autophagy inhibitor (ammonium chloride, NH_4Cl). Ammonium chloride causes autophagic vacuoles (arrows) to accumulate in the cytoplasm of a cell

Microplastics: reprotoxic effects of ingestion of microplastics by marine species

The Interreg 2 seas “Microplastics” project (2012-2014), associating Belgian, British, Dutch and French researchers, studied the impact of microparticles (less than 1 mm) of plastic on ecosystems in the English Channel and North Sea. Amongst the results obtained by Ifremer and CNRS (in the UMR 6539 Lemar framework), was the experimental demonstration that microplastics were ingested by bivalves and fish. In the oyster, significant reprotoxic effects - smaller size and number of gametes, low spermatozoa mobility and altered fecundity - were observed in adults exposed to polystyrene beads for two months. In addition, consequences were noted on the growth of oyster larvae in the next generation.



Autophagy and sensitivity to infectious disease in cupped oysters

Autophagy is a cellular process degrading intracytoplasmic material conserved in eukaryotes. It can be stimulated in response to the cell's detecting pathogenic agents (xenophagy). Studies carried out in the Functional physiology of marine organisms unit at Ifremer showed that this phenomenon is functional in the cupped oyster *Crassostrea gigas*. Its activation by chemical pathway is associated with animals' greater resistance to infection by the herpes virus OsHV-1 and to infection by *Vibrio aestuarianus* (the two main infectious agents implicated in cupped oyster mortalities), whereas its inhibition induces greater sensitivity to both infections. It was also shown that families displaying low sensitivity to viral infection showed high levels of expression of genes coding for effector proteins in this process. The outcomes open avenues for using the cupped oyster as a model to explore the phenomenon of autophagy in invertebrates and identify markers to select animals which are more resistant to infections.

Studying quorum-sensing bacterial communication using molecules extracted from a marine sponge sampled in French Polynesia

Quorum sensing is density-dependent bacterial communication and a regulatory mechanism controlling the expression of certain bacterial genes. The mechanism is based on bacteria's ability to communicate with each other by using signaling molecules that they secrete into the external environment. It is controlled by the bacterial density and regulates numerous physiological functions such as luminescence, conjugation, and above all, virulence (biofilms, exotoxins, etc.). In collaboration with IRD in Tahiti and in the framework of the UMR EIO (joint research unit on Oceanian island ecosystems), a biotest was developed and standardised within the marine resources unit in French Polynesia. It is designed to detect *quorum sensing* inhibitors (QSI) in a pathogenic bacteria model belonging to the *Vibrio harveyi* species which are naturally bioluminescent, in real time using a spectrophotometer-luminometer.

A collection of marine sponge extracts from French Polynesia was screened. Following purification, two alkaloids isolated from *Leucetta chagonensis*, one of them unknown, were identified. Each of them inhibits the three known activation pathways for *quorum sensing* of *V. harveyi*. These studies open interesting perspectives for aquaculture, because contrary to antibiotics, *quorum sensing* inhibitors, which also inhibit some factors of bacterial virulence, do not in any way (quantitatively or qualitatively) modify the bacterial communities present in the farming environment. This is important because some of these communities play a beneficial role for the health of the farmed aquaculture species. In addition, these molecules do not cause bacterial resistance to appear.



© Ifremer LEMA NC/ L. Chim

> Bioreactors at LEMA

→ Amical project: deriving value from microalgal biodiversity in New Caledonia

The Amical (Aquaculture of microalgae in New Caledonia) programme has been sponsored since late 2011 by the New Caledonian Adecal-Technopole science park working in close partnership with Ifremer. The objective is the medium-term development of an innovative value chain to produce microalgae in New Caledonia, with the aim of contributing to the country's economic development through valorising the lagoon's biodiversity through business development.

Microalgae hold potential for creating valuable utilisation, especially in a research approach to find species with high-growth potential which are adapted to environments specific to aquaculture.

The Amical programme receives funding from the interministerial committee for overseas France (CIOM) to set up infrastructures and equipment within the LEMA (microalgae studies) and LTMA (microalgae technology) laboratories where the scientific, technical and feasibility studies will be run. The Amical project also benefits from financing by New Caledonia, three Provinces and the French State for its operational budget, in the framework of the Adecal-

Technopole activities launch and that of the 2012-2015 framework agreement signed with Ifremer.

After fourteen months of operation, 46 bio-prospection surveys were performed along the Grande Terre coast, in the Northern and Southern provinces.

By the end of 2014, the selection system had made it possible to isolate twelve species of microalgae and two species of cyanobacteria. The monospecific nature obtained was verified and monoclonal isolation was performed for some of them.

These species are the first samples in the Caledonian plant library which will be supplemented by new species over the next two years of the programme (2015-2016). Microalgae biochemical composition will be studied at LEMA. Ecophysiological characterisation of the first species selected has begun and growth-predictive species models will be established.

12

SPECIES OF
MICROALGAE

2

SPECIES OF
CYANOBACTERIA



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> Horse mussels and shrimp on a hydrothermal site

3 Explore and understand seafloors and subseafloors in the context of sustainable use of mineral and energy resources



The ocean domain holds a reservoir of mineral (aggregates, nodules, sulphide deposits, crusting, etc.), energy (oil and gas, marine renewable energy sources) and biological resources. These resources are located in a varied range of environments (continental margins, ocean ridges or abyssal plains) and are far from being inventoried. The scientific aim is not only to contribute to developing this knowledge base, but also to use a systemic approach to better understanding how seafloors evolve, the processes of resource formation and the structure and functioning of related ecosystems.

■■■ Continental margins and the new stakes

As the boundary zones between continental and oceanic domains, continental margins hold a unique position on the global scale. Over their evolution and through the sedimentary column deposited there, they have recorded all of the major geological, chemical and biological processes shaping our planet, such as: dynamic movements, erosion and peneplanations [M6], paleoclimate variations, and transfers of sediment and nutrients.

Exploring and modelling margins

In this context, studies on the margins of Brazil, Morocco, the Mozambique Channel or the Western Mediterranean are contributing to understanding how these geological objects are formed, the relationship between surface processes and ones in the deep, and climate and sea-level variations.

The Salsa cruise took place aboard the oceanographic vessel *L'Atalante* in April and May 2014, and provided key information about the segmentation of the North-eastern Brazilian margin, the influ-

ence of its tectonic heritage, the relationship with the terrestrial section and the thermal status of the underlying mantle. The results led to an International Ocean Drilling Program (IODP) proposal for deep drilling, conducted jointly by Brazilian and Ifremer teams. Concurrently, the GOLD pre-proposal for drilling in the gulf of Lion, was accepted by the IODP's international scientific and technical committee in April 2014, with the aim of calibrating a model of how a "young" margin segment evolved.

It was necessary to draw up new maps for geodynamics, dynamic topography, paleoclimate and paleocurrent studies, studies of earthquakes and of biological evolution itself, so at the same time, the institute developed the Placa 4D software, which enables paleogeographic reconstructions from georeferenced data.

The outcome of a partnership agreement signed in 2013 by Total and Ifremer, the Pamela (Passive Margins Exploratory Laboratories) project's objective is to study the evolution of passive margins and their associated processes, from the continental shelf break to present sedimentary deposits.

Five key themes requiring that original data be acquired were defined: geodynamics, sedimentary models, geological hazards, fluid transfers and the environment. The partnership was extended to include the CNRS, three university-CNRS joint research units (UBO western Brittany, Rennes I and Pierre & Marie Curie universities) and IFPEN. Other French or European universities are cooperating, as are universities in Madagascar and Mozambique.

During 2014, the exploration of the Mozambique Channel began with three months of sea cruises. The results concern the deep part of the Zambezi



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> Control post screens for ROV Victor aboard RV Pourquoi pas?

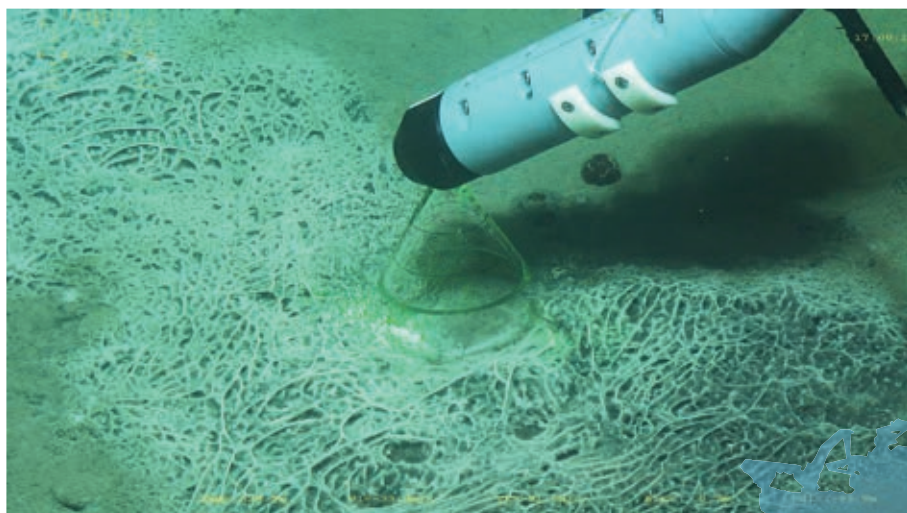
River's subsea system, which receives outputs from erosion in the catchment basins of East Africa, Madagascar and carbonate atolls in the channel. These atoll reefs in the Scattered Islands are excellent examples for understanding both how an atoll comes into being and how a carbonate system evolves under various forcings. Thanks to these investigations, instabilities of volcanic and carbonate edifices were mapped. Specific deep-sea environments and ecosystems linked to these edifices, to hydrothermalism or to fluid circulation were located and some of them were sampled.

In addition, study of the functioning of a vast geological system discovered in 2013 on the edge of the Aquitaine shelf continued in 2014 with the analysis of data from the Pamela-Gazcogne 1 & 2 cruises. Emissions of biogenic methane, authigenic carbonate structures and the related ecosystems were characterised.

Margins exposed to geological hazards

The study of geological hazards is performed following an outline going from the identification of physical processes (triggering, causal or predisposing factors) to detecting indicators of deformation (using geophysical mapping and imagery, *in situ* measures and monitoring over time) and assessing the chances (probability of a danger or hazard occurring during a given period of time).

Two contributions on this subject particularly marked the year 2014.



©Ifremer-Victor/Marsite

> Raman spectrometer deployed during the Marsite cruise, aboard RV Pourquoi pas? in the Marmara Sea

- The research programme called Spiral aimed to study the deep structure of the North Algerian margin. The project's partners are CRAAG, Sonatrach and DGRSDT, Ifremer, CNRS, IRD and the universities Pierre & Marie Curie, Nice-Sophia Antipolis and UBO Western Brittany. In order to train young Algerian researchers and engineers and transfer knowledge, ten PhD theses were conducted, eight of them with Franco-Algerian co-supervision. The programme ended in 2014 with the description of the Algerian margin's deep structure: determining the thickness of sedimentary basins, type of crust and the geometry of the crust-mantle interface as the principal outcomes.

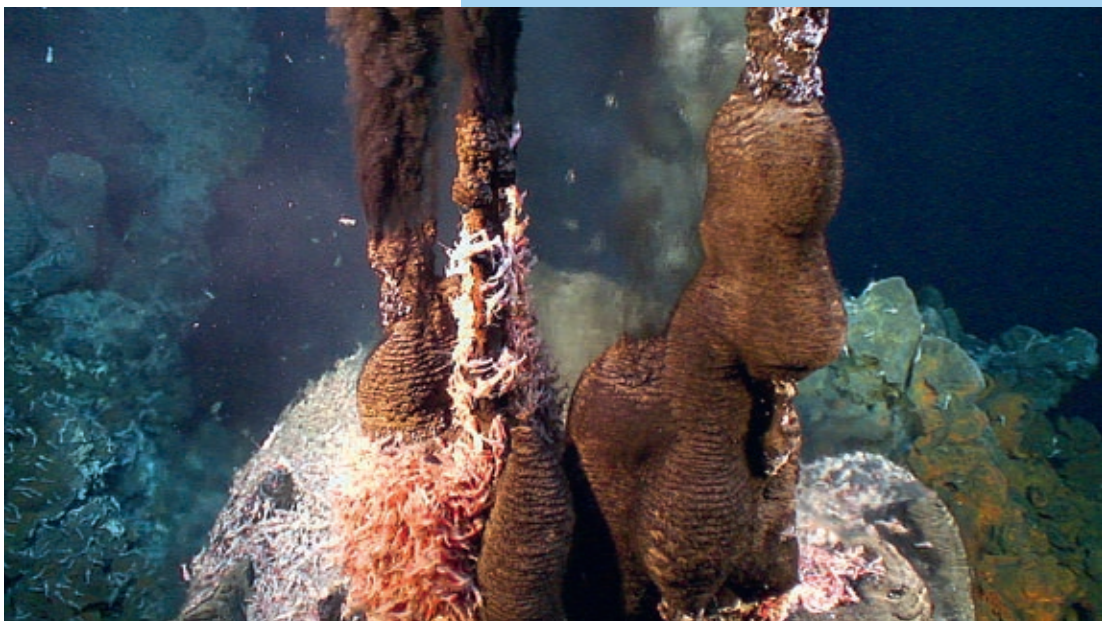
- The Marsite Cruise (28 October-16 November) survey by RV *Pourquoi pas?* led to new data to understand the functioning of the North Anatolian fault in the Marmara Sea, in the framework of the European Union sponsored Marsite programme. Ten acoustic geodesic stations, from Geomar and the IEUM's 'ocean domains' UMR joint research unit, were deployed at the seabed to directly measure, for the first time, the relative movement of plates in the Istanbul region. Furthermore, the *Victor 6000* ROV was deployed to take numerous samples (interstitial water, gas, brines and oil) and Raman spectroscopic measurements *in situ*, with the aim of understanding processes of fluid migration along faults.



→ Metals cycle and genesis of mineral resources

Over the year 2014, the processes by which metals are mobilised in rocks were studied on two active hydrothermal sites on the Mid-Atlantic Ridge during the Bicosse cruise performed aboard RV *Pourquoi pas?*. An *in situ* mass spectrometer was deployed by the ROV *Victor 6000* to detect and map hydrothermal plumes and more especially to measure concentrations of methane, carbonic gas and hydrogen. The hydrothermal plume of the TAG and Snake Pit sites could be detected during the first *in situ* measurement trials in the water column, which leads us to expect that it will be possible to measure very low concentrations.

The transport of metals in the water column was the subject of cooperation between the University of Hawaii, Woods Hole and Ifremer on the low temperature hydrothermal sites located on the Loihi seamount volcano to the east of Hawaii, in order to study the iron cycle using geochemical and isotopic approaches in the water column, hydrothermal fluids and iron hydroxide precipitates. Concurrently, in the Labex Mer framework, new light was shed on the processes of stabilisation which facilitate iron transport in the ocean, based on the analysis of iron isotopes used as tracers of hydrothermal plume dispersal.



> Swarms of *Rimicaris exoculata* shrimp observed on hydrothermal smokers during the Bicosse cruise

©Ifremer-Victor/Bicosse



■ ■ ■ Environmental impacts of mineral resource exploitation

The CNRS and Ifremer were mandated by the general commissioner for sustainable development (MEDDE) to lead a collective scientific expert assessment (ESCo) on the environmental impacts of exploiting deep sea mineral resources. This expert appraisal is mainly focused on the mineral resources situated at depths greater than 300 m, i.e. polymetallic nodules, polymetallic sulphides and manganese crusts.



A synopsis of the scientific knowledge available on the subject worldwide was drawn up. It made it possible to identify the scientific barriers and the research and development activities to be engaged in order to remove them. The conclusions were presented at a conference held on 19 June 2014, at CNRS.

The recently launched Midas project addresses this subject on the European level, with the objectives of identifying the scale, nature and duration of the potential impacts that resource exploitation could have on deep-sea ecosystems, to propose practical solutions and codes of good conduct for judicious exploitation from the environmental and societal point of view and to develop affordable technologies to assess and monitor the environmental impact and for ecosystem restoration.



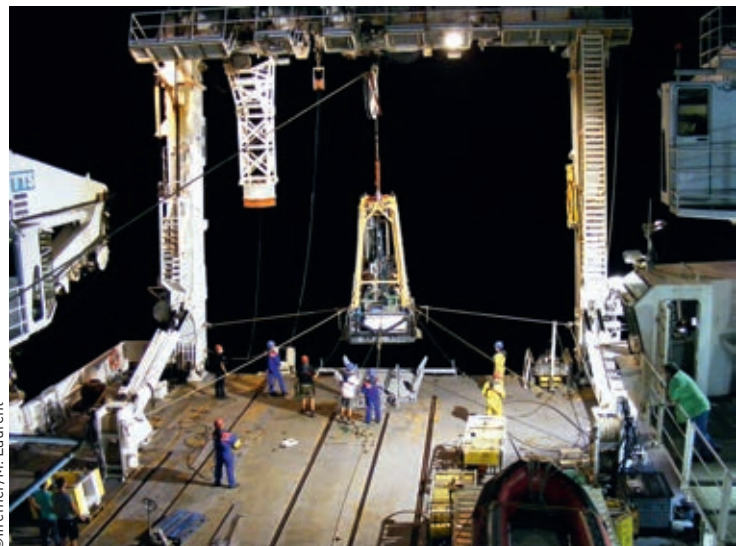
■ ■ ■ Biodiversity on margins

The Madeep cruise, conducted aboard RV *Alis*, explored deep benthic biodiversity in Papua New Guinea, notably by searching for new cold seep zones or seamounts, to shed different light on issues of diversity and connectivity patterns, and to evaluate the impact of onshore mining activities on cold seep communities. MaDeep is part of the Deep Sea Benthos tropical exploration programme (TDSB), for which MNHN and IRD have already been leading a network of taxonomists for over thirty years.

■ ■ ■ Technological developments related to the deep sea

50-metre Penfeld penetrometer and its instrumented rod

The Penfeld penetrometer currently enables in situ and quasi real-time measurement of geotechnical, mechanical and lithological characteristics of surface sediment layers to 30 m below the seabed. Seeing the need for analyses of deeper layers, a study was made with the aim of increasing the Penfeld penetrometer's sinking capability to 50 m. Following studies for feasibility, design and modifications on the apparatus and on the piezometric rod, the first validation trials were performed in the test tank in Brest, in September 2014 and on board RV *Pourquoi pas?* in October.



©Ifremer/M. Laurent

> Deployment of the Penfeld 50-metre penetrometer during the *Estime* technological trials cruise

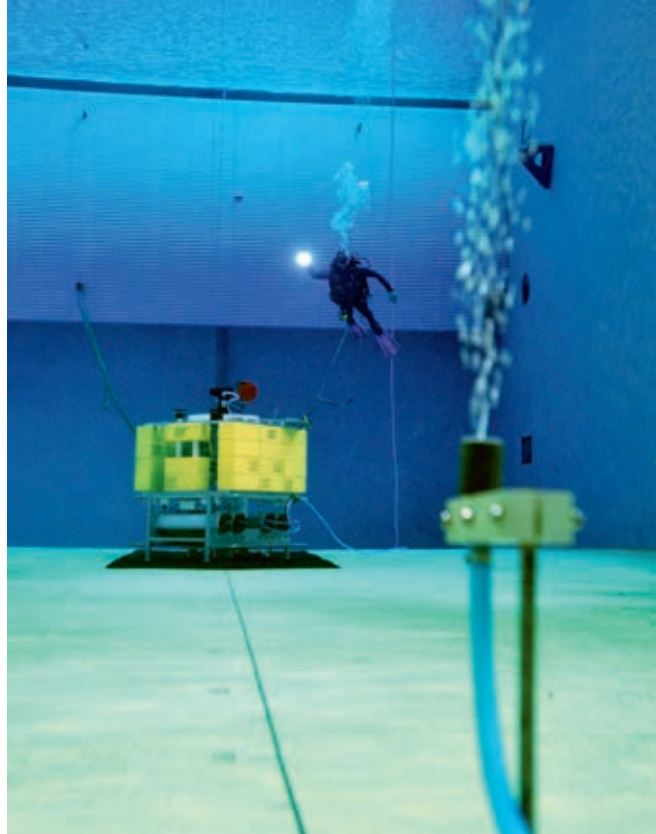
BOB, the “Bubble OBservatory module”

BOB is a standalone non-cabled acoustic observation module designed around a 120 kHz fisheries sounder, intended to collect data on fluid emissions and create time series which are representative of their flow rate evolution. During Marsite, BOB was positioned by the *Victor 6000* ROV near a seeping of bubbles linked to gas hydrate dissociation, in order to record variations [M8] in the flow rate in relation to the seismic activity of the North Anatolian fault in the Marmara Sea.

■■■ Behaviour of structures for resource exploitation

Over the year, the following studies were conducted:

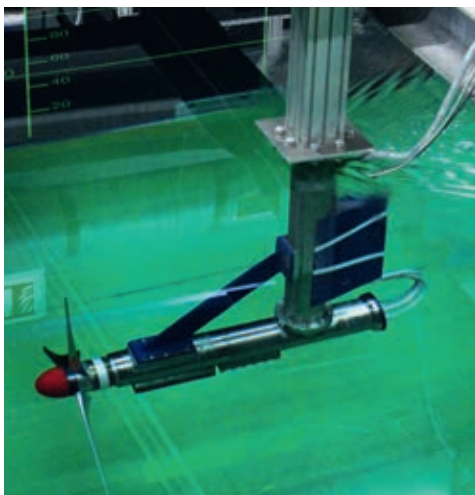
- fine-scale statistical modelling of complex environmental conditions (superimposing several wind and wave systems and current profiles) to determine loadings affecting structures at sea: swell climatology in Western Africa, simulation of non-linear sea-wave histories for coastal installations (ANR Modnat);
- hydrodynamic behaviour of structures for marine energy converter devices: perfecting a system to recover wave power energy (with the ENSTA Bretagne engineering school and the GEPS-Techno small enterprise), influence of ambient turbulence on the effects of interactions between tidal stream turbines and on how their wakes develop;



© Ifremer/O. Dugornay

> BOB acoustic module deployed at the Brittany centre's test tank to test its operation on an artificial target

- durability of materials in the marine environment and conditions of use which are specific to maritime operations: studying the interaction between mechanical load and water diffusion in composites (with the ONR Office of Naval Research), predicting the mechanical properties of elastomers weathering or ageing in the marine environment, the behaviour of synthetic ropes in repeated flexure on pulleys for HMPE (high modulus polyethylene) braided cables, assessing the mechanical properties of biocomposites made from reinforced natural fibres for naval applications.



> Tidal stream turbine trials in the test tank of Ifremer's Boulogne-sur-Mer centre. Studying the influence of turbulent flow on performances. Low-turbulence test on the left and high-turbulence test on the right



Interview



François LALLIER

Director of the 'Adaptation and diversity in the marine environment' research unit at the Roscoff Biology Station

What are the latest major advances made in studying marine biodiversity and what has Ifremer played in them?

Contributions from environmental genomics have revolutionised the way we approach species biodiversity in every environment, including oceanic environments in the deep sea. In microbiology, various lines of *Archaea* and *Bacteria* are now routinely inventoried, particularly by the LM2E lab within the IUEM. The deep-sea environment laboratory at Ifremer has ramped up its taxonomic efforts on meiofauna, which remained a neglected compartment until recently. In my opinion, effort is still lacking on the eukaryotic microbial compartment, which is not systematically explored in extreme environments. The great diversity revealed in other environments, like soils or the pelagic ocean, for instance, should encourage us to grow our efforts in this field. However, Ifremer has taken the functional aspects of biodiversity well into account, thanks to good integration of chemical and taxonomic analyses.

You took part in ESCo. How do you envisage the follow up to this expert assessment?

The work done to collect and summarise recent international publications on deep-sea ecosystems which could be of interest for mining prospection represented a significant effort from the French community. Similar work, although most likely of lesser scope, has been done by other communities, in the United States or in Germany, for example. In particular, the expert assessment showed that we have several knowledge gaps. It was almost impossible to study the strong resilience of communities faced with major disturbances on the

East Pacific Ridge, due to recurring major volcanic or tectonic events. The connectivity of populations living on various hydrothermal fields in the same ocean region is still largely unknown for most major species. Our lack of knowledge about inactive sulphide mount ecosystems also appeared clearly. Although these systems seem to be rather poor in terms of fauna, the microbial diversity there is certainly worthy of interest. Significant investments from the private sector should be necessary to boost work on this theme. In 2015, we hope to bring some of these research themes to the fore at the European level, even though the most fundamental aspects are not well addressed in the H2020 programme. Finally, internationally speaking, several French teams still have an excellent reputation, but generalising the means of access has significantly strengthened international competition in the deep-ocean field, including in ecology. We'll have to react quickly if we want to keep our leadership position.

How can national and international cooperation be improved and strengthened in studying the functioning of deep-sea ecosystems?

At the national level, the fact that the GDR Ecchis research grouping ended in late 2012 was certainly detrimental to our research's good coordination. Although the long-standing and lasting ties between the major players in this field still exist, the Ecchis structure was a driver of cohesion and collaboration, especially with the smallest teams scattered all over France, but who were able to provide us with special expertise or with a broader vision. Time was certainly lacking to relaunch that network, because there have been many oceanographic cruises over the past two years and ESCo also mobilised our troops significantly. I hope that the upcoming conference on chemosynthetic ecosystem ecology in Le Mans in May 2015 will be a new start, perhaps with support from the Sorbonne Bretagne Loire Comue communities of universities and institutions which are being set up.



Interview

Laurent DAGORN

future director of UMR Marbec

humans, as well as the impacts of human activities. The question lies in understanding how marine ecosystems function and how to utilise this biodiversity sustainably.

How can the remit of these different research bodies be taken into account and turned to the advantage of the UMR unit?

The four organisations are different in terms of their missions, job specialisations and geographical study sites. For instance, IRD concentrates on tropical zones, whereas Ifremer focuses more on the Mediterranean Sea. These research specificities are an asset, since the joint research unit broadens the geographical study base and projects. Furthermore, the UMR unit will give our marine biodiversity activities greater visibility at international, national and regional levels as well as for various stakeholders and players in the socio-economic realm.

What does heading this group as of next January mean for you?

It's a true challenge! I want this association of four organisations to work well, and want the research scientists and other staff to feel free to carry out their activity and research. We've got five years to achieve this and I am working to this end with three deputy directors: J.-M. FROMENTIN (Ifremer), C. ALIAUME (UM2) and T. BOUVIER (CNRS). We will be creating events and meetings soon to enable the personnel to get to know each other and to structure the activities around the eight research themes identified.

You are the future director of the UMR Marbec joint research unit. Can you tell us about it in a few words?

The joint research unit called Marbec (Marine biodiversity, exploitation and conservation) will bring together scientists from four other units: UMR EME, UMR Ecosym, UMR Intrepid and LER-LR. This unit will be made up of nearly 230 people, of whom 140 are permanent staff members of IRD (40 %), Ifremer (30 %), the University of Montpellier II (UM2; 15 %) and CNRS (15 %), working mainly at the metropolitan sites of Sète, Montpellier and Palavas-les-Flots, with a few members (mostly from IRD) working abroad.

The scientific objective of this new joint research unit is to cover the challenges of marine biodiversity, from small organisms like viruses and bacteria to top predators like tunas and sharks. This involves studying marine biodiversity (from genes to individuals, populations and communities of species in lagoon and coastal ecosystems and in the open sea) and the uses made of it by

In Overseas France, Ifremer signed a cooperation agreement creating a consortium for research, higher education and innovation in New Caledonia (Cresica) on 25 November 2014. Ifremer, the University of New Caledonia, the New Caledonian institute of agronomy, IRD and Institut Pasteur are amongst the founding members, and CNRS, Cirad and BRGM are associate members. Cresica will be the venue for discussing and coordinating the scientific programmes conducted in New Caledonia, to better structure the scientific potential providing leverage for developing the territory and giving it the skills and expertise it needs (training young people).



> Signing of the consortium agreement at the Maison de la Nouvelle-Calédonie in Paris

© Maison de la Nouvelle-Calédonie de Paris

GDR research groupings

To facilitate partnership-based research, Ifremer provides financial support to about ten research groupings (GDR). One of them, called Phycotox 'from microalgae to risks for humans and the ecosystem', was created in early 2014, working on toxic algal blooms and their health and socio-economic impacts. This GDR is coordinated by Philipp HESS at Ifremer, and brings together twenty-six French teams from various organisations, institutes or joint research units: CNRS, Anses, UBO, IRD, universities of Nantes, Caen, Lille, Bordeaux, Montpellier, Paris VI, Littoral Côte d'Opale University, Louis Malardé institute of French Polynesia and fourteen Ifremer laboratories. The aim is to create a structured network based on the skills and expertise found in the various diversified and complementary teams. It also intends to promote multidisciplinary approaches.



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> Participants at the GDR Phycotox general assembly meeting

In-house incentives

In 2014, Ifremer's scientific management set up a call for scientific projects whose aim is to improve the integration of our institute's teams and centres in research clusters of various geographical sites where they are located. The sum of €150,000 per year has been earmarked for this purpose, and will be used to finance some twenty projects each receiving €15,000 for two years. Thirty-one dossiers were submitted. Twenty of them were selected and funded by the scientific management, proof of the team's reactivity. This is incentive funding for short-term projects which are easy to set up, but special involvement is requested in sharing the supervision of students and making a joint publication.

■ ■ ■ Ifremer's scientific production based on a few key indicators

The volume of Ifremer publications clearly on the rise

In 2014, 535 publications referenced by the Web Of Science were authored or co-authored by Ifremer. The figure rises regularly from one year to the next.

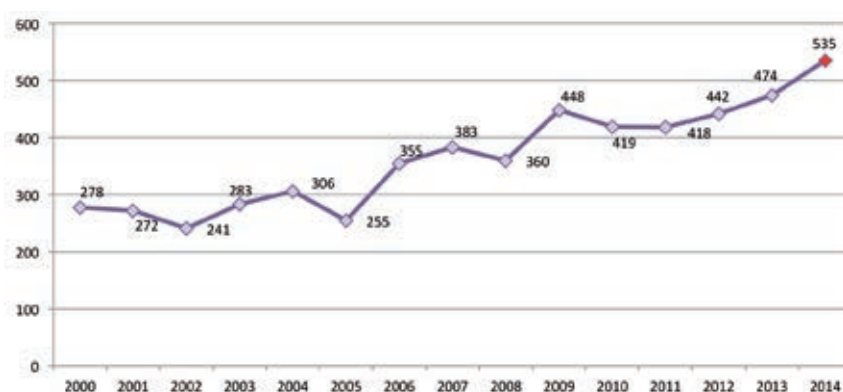
Authors from Ifremer publish their work in a large number of journals spanning a highly diverse range of disciplines. They can be open-access, general interest journals, like Plos One, as well as highly specialised journals like Aquaculture, Environmental Science and Pollution Research, Journal of Geophysical Research or Marine Policies to simply mention those represented most.

Impact factors concerning 75% of the journals where Ifremer is published fall between 1 and 4, and 20% of publications appear in journals whose impact factor is above 4.

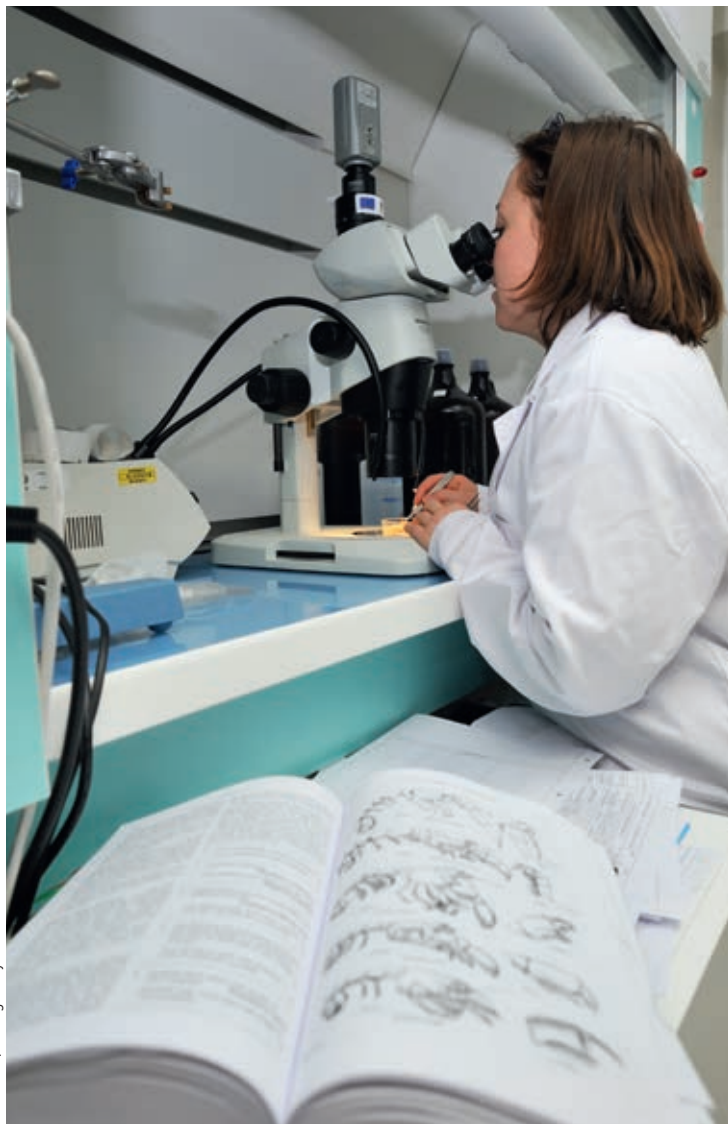


Partnerships reflected by publications

Half of Ifremer's publications are co-signed by one or several authors from a French university, the most prevalent ones being the universities of western Brittany UBO, Paris VI, Montpellier, Bordeaux and Marseille. This corresponds to a scientific strategy which is encouraged by the site policy, but of course this partnership is also linked to the universities' fields of expertise and excellence. The partnership developed by Ifremer's sites in Overseas France gave rise to some fifteen publications with the universities of New Caledonia, French Polynesia, Reunion, Antilles and Guiana. Furthermore, 20% of publications were co-authored with researchers from CNRS and 10% with those from IRD. These figures reflect the partnerships established in the UMR joint research units Ifremer is part of, usually involving CNRS-Ifremer-IRD-University. The partnership with foreign countries is also very active. Ifremer co-authored articles with 63 countries, both with European, including Eastern European countries, and with the United States, Australia, Canada, Japan, Russia, Brazil and China. Moreover, nearly 20% of the articles were co-authored by one or several authors from a "southern" country like Tunisia, Algeria or Malaysia.



> Number of publications in peer-reviewed journals since 2000



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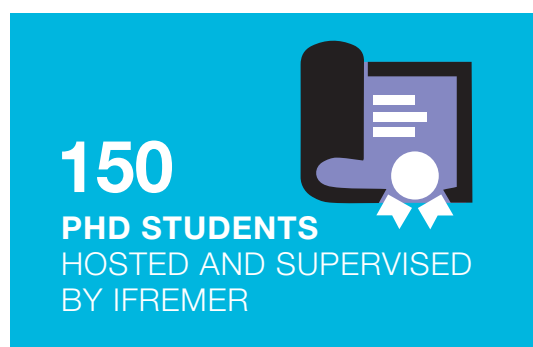
■■■ Doctoral policy

PhD students are an integral part of the research system at Ifremer, bringing their drive, creativity and a wide range of profiles. Ifremer encourages its research scientists to obtain HDR accreditation to supervise research, to give them greater supervisory capabilities.

In 2014, Ifremer has financed twenty-three half-grants for doctoral students, to which can be added eight doctoral contracts secured with 100% outside funding (four PhD theses in the frame of the Pamela research project by Total and Ifremer, one on an ANR Amorad project, one on contract with EDF, one financed by the Fundayacucho/French Embassy in Venezuela and one funded by the Algerian ministry of foreign affairs). Diversifying the way PhD theses are financed is encouraged by Ifremer.

In the framework of cooperation with universities and regional councils, co-funding can be organised. In this way, in 2014, PhD grants were shared by the universities of New Caledonia and Perpignan, with the Côte d'Azur observatory and with the Ecole Centrale de Nantes graduate engineering school.

The number of doctoral students hosted and supervised by Ifremer is around 150; furthermore, some forty post-doc fellows are also hosted within Ifremer units.





Interview



Elda MIRAMONTES GARCIA

PhD student

You are going to spend one month abroad. What is the objective here?

Indeed, I have a grant from the European University of Brittany to spend one month at Ismar-CNR in Bologna. I'm going to recover and interpret additional seismic data located in the Pianosa Ridge zone, which will make it possible to improve the characterisation of the contourite system studied, run granulometry analyses and benefit from this institute's expertise in marine mollusc paleontology. It is an opportunity to develop collaborative work on contourite aspects, and perhaps for me to envisage a post-doc fellowship there.

What are your plans for 2015?

The coming year will be devoted to finalising the geotechnical analyses and to writing two scientific articles taken from the international conferences I took part in (2nd Deep-Water Circulation Congress, 10-12 September 2014, Ghent, Belgium and the 7th International Symposium on Submarine Mass Movements and Their Consequences, which will be held from 1-4 November 2015 in Wellington, New Zealand).

What points could be improved?

The publication and dissemination of the theses proposed. If my Master2 co-supervisor hadn't mentioned Ifremer's call for doctoral applications to me, I would not have known about it.

Elda's doctoral thesis subject focuses on study of submarine landslides in the North Tyrrhenian Sea and relationships with contourite and turbidite deposits. It was started in October 2013, and is part of the Pamela research programme, associating Total, Ifremer, CNRS and several universities.

How and why did you secure a thesis at Ifremer?

I studied marine sciences with a major in marine geology in Spain, at the University of Vigo. During my Master 2 degree, my co-supervisor at CSIC in Barcelona brought Ifremer's PhD thesis offers to my knowledge. It was the institute's renown and the interest of the proposed subject in marine geology that motivated me to apply, all the more so because I had already studied contourite deposits.

What do you like best in your thesis subject?

My PhD topic requires several approaches, because the study focuses on different geological fields (geotechnics, sedimentology and seismics) and also includes modelling. My work is varied, and that is something I like a lot. It also enables me to acquire new knowledge in geotechnics and modelling. What's more, I find it interesting to be in regular contact with Total and thus understand the point of view of those working in industry.

■■■ Research, results and partnerships through a few examples of scientific articles

Ifremer's research and results can be seen in all their diversity through scientific publications in peer-reviewed journals, and they are accessible to the entire international scientific community via the Web of Science and the open-access Archimer database.

Various articles analyse the effect of global change, the environment and anthropogenic pressures on exploited or non-exploited marine species. For instance, a study involving Norwegian and Spanish partners showed that the long-term effect of environmental change, especially temperature, was amplified by the impact of fisheries. The two combined impacts contribute to the decline of cod, plaice, herring or sole stocks in the North East Atlantic (Rouyer *et al.*, 2014).

Ifremer took part in an EU-funded international study in the framework of the "The Ocean of Tomorrow" Framework Programme, showing that biotic and abiotic changes in the ocean, such as algal blooms or chemical pollution, can have effects on human health. This study reports on the need for an integrated approach between the various scientific disciplines, and also highlights the need for dialogue between science and legislation (Fleming *et al.*, 2014).

Alerts about the detritus and waste accumulating in the ocean are often relayed by the media. A study involving work by some ten European countries in which Ifremer took part, showed the accumulation of various litter and waste, mostly plastics, on seabeds in the Atlantic and the Mediterranean. This detritus was found as far as the deepest waters, from 35 to 500 metres (Pham *et al.*, 2014).

During Expedition 317, Integrated Ocean Drilling Program drilling facilities and use of innovative molecular analyses contributed to progress on species living in deep sediment layers. It was demonstrated that different microorganisms, like bacteria, could live at depths of 1,922 m in the deep sediment, whereas until now, the previously known limit was 518 m. Likewise, genomic sequences of eukaryotes like fungi were highlighted in samples taken at 1,740 m, the previously known limit being 159 m (Ciobanu *et al.*, 2014).



A novel study was carried out by research scientists from several institutes, notably Ifremer, CNRS and Ifsttar, to explain the existence of seismic precursors preceding major earthquakes in ocean fracture zones. The proposed model makes it possible to take account of the properties of fluids circulating along faults and to show that before disruption, the compressibility of hydrothermal fluids suddenly rises sharply and significantly, precipitating the phase of instability and generating precursor signals (Géli *et al.*, 2014).

In the framework of its cooperation with CNES, in line with the LabEx Mer axis 1 ("the ocean engine at very high resolution"), a study was conducted by the Ocean physics laboratory with the aim of clearly delimiting the meanders of the Gulf Stream by using temperature, chlorophyll and surface salinity characteristics. The structuring of these currents could be delimited with the unprecedented spatial and temporal resolution obtained thanks to the SMOS satellite (Reul *et al.*, 2014).

Marine biotechnologies have developed considerably over the past few years in Europe and elsewhere in the world. Ifremer has particularly invested its efforts in the field of microalgae and the food, energy and pharmaceutical resources formed by their lipid concentrations. A study co-funded by ANR used innovative proteomics techniques to show which type of protein metabolism is involved in the accumulation of lipids in different strains of algae (Garnier *et al.*, 2014).



Ifremer, along with CNRS and UBO, organised an international gathering of over one hundred researchers on the theme in 2012, called 'Time-series analysis in marine science and applications for industry'. Data were obtained thanks to seafloor observatory facilities devoted to seabed and water column observation, in projects such as EMSO and FIX03 and in European projects like Jerico. These data series are required to answer a wide range of questions concerning the prediction of seismic hazards, the impact of climate change on ecosystems or the effect of anthropogenic pressure on the oceans. Scientific articles related to the papers presented were published in a special issue of the *Journal of marine systems*, this year (Puillat *et al.*, 2014).

A series of four books were published this year in the "Mer et Océan" collection. Several researchers from Ifremer contributed to these publications by writing chapters in the books entitled "Complexité du système océanique", "Vulnérabilité du système océanique", "Risques côtiers et adaptations des sociétés", "Valorisation des ressources marines" (respectively on ocean system complexity and vulnerability, coastal risks and societal adaptation and valuable utilisation of marine resources). These books highlight the anthropogenic pressure exerted on marine ecosystems, but also propose options for governance and management to benefit from ecosystem goods and services.

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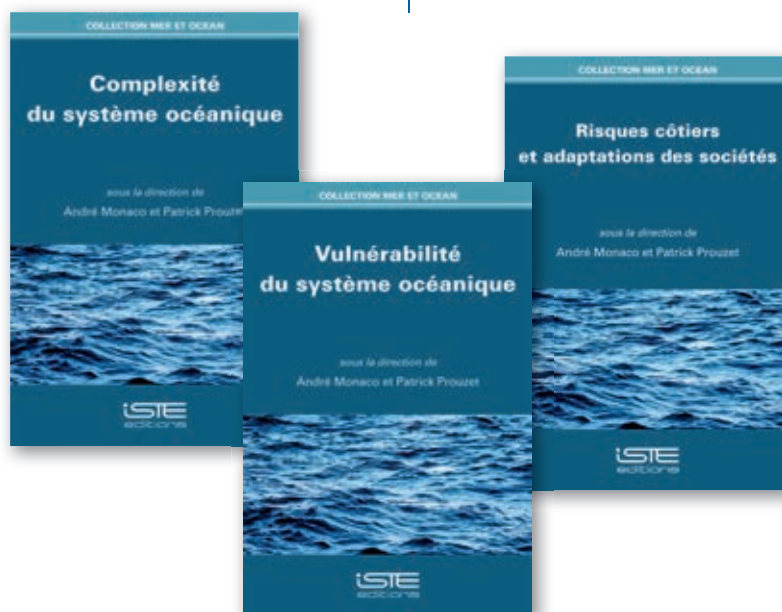
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■■■ Scientific committee

In 2014, the institute's scientific committee met four times to examine Ifremer's scientific strategy for the coastal and littoral environment, marine and deep sea geosciences, functioning of ecosystems exploited by fisheries and biology and ecology of farmed shellfish species.



You have chaired the scientific committee for six years now. What have been the key moments?

The scientific committee backs up the institution in its scientific strategy. In 2011, its working sessions on biotechnologies and operational coastal oceanography organised in the framework of the strategic approach led to the Strategic plan being reoriented. Since the committee was reappointed in 2013, it has worked significantly on the basis of the Aeres advice on Ifremer units, to specify how they have taken this advice on board and what inflections or changes could be proposed or implemented. In particular, the discussions on coastal ecosystems and marine geosciences were quite lively.

Interview

Pascale DELÉCLUSE

Director of the CNRS national institute for sciences of the universe

How does the body organise its work?

Ifremer's scientific committee is made up of outside experts who are recognised key figures in the Institute's scientific fields, two of them from foreign countries. Elected staff representatives, as well as general management and scientific management representatives attend the meetings. Depending on the meeting's agenda, outside guests can also be invited.

Scientific committee meetings are held four times a year. The institute's scientific management proposes topics on which it would like to have the committee's recommendations (e.g. vision and scientific strategy, units' reach and scope).

Prior to the scientific committee meetings, the scientific management analyses and works with the departments and units involved to prepare points of discussion and proposals in response to the questions raised. The session begins by presentations and discussions, then the committee debates behind closed doors before submitting its recommendations to the management.

What do you feel this outside viewpoint brings to Ifremer?

The scientific committee, made up of outside - and, in part, international - members, brings Ifremer both openness and drive in steering its policy for research strategy and its scientific and technological priorities.

EUROPEAN AND INTERNATIONAL PARTNERSHIPS

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> KIOST board of directors
(May 2014, South Korea)

The maritime dimension of the European Union's Europe 2020 strategy can be seen in the so-called "Blue growth" objective, targeting the EU's international competitiveness, efficient use of resources, creating jobs and bringing new sources of growth to the fore whilst preserving biodiversity and protecting the marine environment. Blue growth is one of the themes selected for the first 2014-2015

calls of the Horizon 2020 programme launched on the 1st January 2014 and with a budget of 80 billion euros over seven years. Above and beyond the European scale, the world ocean is at the heart of globalisation today. Marine research is a booming activity, with new players like India, China, Korea and Brazil increasingly weighing in. In this context, Ifremer conducts its activities in the framework of international programmes, but is also trying to maintain and strengthen its scope of bilateral cooperation.

A will for European and international scientific cooperation

European research policy orientations

A coordination mission at national level, linked to joint programming initiatives.

Ifremer is taking part, on behalf of the AllEnvi research alliance, in operating the Joint Programming Initiative Healthy and Productive Seas and Oceans (JPI Oceans), whose aim is to increase the effectiveness and impact of national funding, which can reach 85% of public spending allocated to research in Europe. In 2014, Ifremer supplied a report on marine research infrastructures to the European Commission, destined for the JPI. Likewise, our institute took part in drafting the strategic agenda for research and innovation submitted to the European Commission and to the funding agencies of twenty-one member countries.

Today four “pilot actions” are underway within the JPI:

- multi-use of infrastructures for monitoring the seas,
- ecological impact of microplastics in the marine environment,
- ecological impact of deep-sea mining,
- intercalibration for the EU Water Framework Directive’s implementation.

The institute takes part in each of the pilot actions aiming to test new modes of cooperation for marine research so that European means and resources can be pooled or shared. In particular, the institute provides its expertise for action to be taken on microplastics. On this topic, research project calls for tender will be launched in 2015 with ANR financing from the French side. The institute will also take part with self-financing in the operation led by Germany for deep-sea mining exploration. A team will embark on the research vessel *Sonne* which will be in the Pacific in 2015.

> Sulphides, crinoids and coral on an inactive site in the South-west Pacific

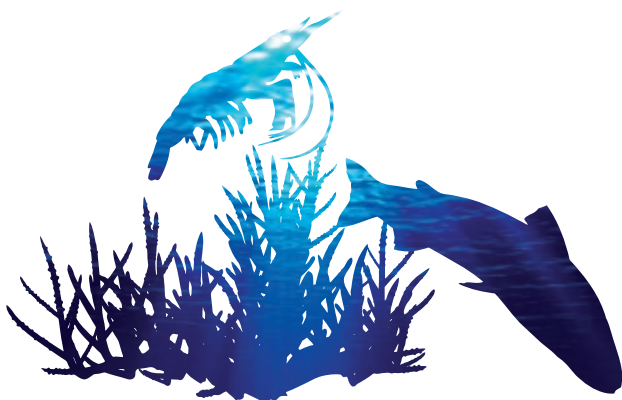


Full involvement in European strategic networks

To make its strategic objectives part of the European research area approach, Ifremer is present in numerous European networks. Through its contribution to European Marine Board analyses, Ifremer, which holds one of the vice-chairmanships, has asserted marine sciences' specificities and their importance in the European scientific community. Ifremer takes an active part in the International Council for Exploration of the Sea (ICES), an inter-governmental organisation one whose aims is to supply scientific advice about the status of marine ecosystems and exploited stocks in the North Atlantic and adjacent seas.

Ifremer and the "Horizon 2020" European framework programme for 2014-2020

On 8 May 2014, the European Commission presented an Action Plan for Innovation in the "Blue Economy" which highlighted a number of obstacles to overcome: still-limited knowledge about the sea and oceans, particularly about their resources, national efforts with little coordination, a growing need for engineers and scientists to utilise new technologies in the marine environment. Ifremer has made submissions to the Horizon 2020 calls for tender, as well as to other opportunities for funding (COST, Interreg, ERA-Nets and European commission general directorates). As of 30 October 2014, Ifremer had submitted fifty-five projects. The initial results showed an increase in co-financing obtained by Ifremer with respect to the previous period.



→ An active role within marine ERA-NETs

A partner in SEAS-ERA (ending in April 2014), our institute was especially involved in two of this ERA-NET's tasks: taking forward joint regional programmes by fostering synergies between national programmes and drawing up recommendations for optimised use of marine research infrastructures. SEAS-ERA financed five transnational research projects, and Ifremer was a partner in four of them (Sealan, EMoSEM, Mermaid and Cigesmed).

Within the Cofasp ERA-NET (2013–2017) on the ecosystem-based approach to fisheries, marine aquaculture and seafood processing, Ifremer is responsible for three tasks: infrastructures, mobility and defining a joint programme for fisheries, and cross-cutting coordination of all activities in the fisheries sector. A call for proposals was published in 2014 and the Safefishdish project, coordinated by Ifremer, was selected. Its objective is to improve the microbial and sensorial quality and food safety of fish, from harvest to consumption.

Funding for several themes of interest to Ifremer is also available within the ERA-NET Arimnet2 and EranetMed network calls published in 2014: sustainable fisheries and aquaculture in the Mediterranean, managing water and energy resources for aquaculture, integrated management of water and its uses on the scale of the catchment basin and associated coastal areas. These calls for proposals mobilised the teams at the La Seyne-sur-Mer centre and Palavas-les-Flots station, in partnership with countries on southern Mediterranean shores (Algeria, Morocco and Tunisia) and with Israel, thus promoting Euro-Mediterranean cooperation.

Involvement in European initiatives on mineral resources

In late 2013, the European Commission launched a "call for commitments" to help in implementing the European Innovation Partnership (EIP) on raw materials. This is a novel concept which was introduced in the Flagship Initiative "Innovation Union" of the Europe 2020 strategy. Ifremer decided to participate through proposals led by Technip and Eramet, two of our industrial partners. The commitments called Seaflores (Breakthrough Solutions for Seafloor Mineral Extraction and Processing in deep water environment) and Albatross (Alternative Blue Advanced Technologies for Research On Seafloor Sulfides : securing long term raw material supply to Europe by developing and testing deep-sea technologies for exploration and evaluation) were selected by the European Commission. They confer a label of excellence to the partners involved, which will be an asset for the assessment of Horizon 2020 projects to be submitted on this theme.



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> The ocean-research vessel Belkacem Grine

■■■ Special partnership with countries on the southern shores of the Mediterranean

Twinning and association agreement with Algeria

In the framework of the “association agreement” signed in 2011 by Algeria and the European Union, Ifremer took part in Franco-Algerian twinning action financed by the European Commission to grow the capabilities of the Algerian national research centre for the development of fisheries and aquaculture (CNRDPA). Exchanges with Algeria will be promoted through this twinning approach. Two concrete outputs which benefited from this dual expertise symbolise the project’s achievements: the CNRPDA’s 2014-2020 strategic plan was drawn up and the RV *Belkacem Grine* is now operational to perform assessment cruises for demersal and pelagic resources.



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> Foresight workshop of the Adecia (Agency for the development of international cooperation in the fields of agriculture, food and rural areas) Public Interest Group



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> City of Istanbul seen from the Marmara Sea

Turkey, maintaining special cooperation in geosciences

Two MoU agreements were signed in 2014 with Turkey, one with the MTA (General Directorate of the Mineral Research & Exploration of Turkey) for collaboration in research-based training in geoscience, and the other with the Koeri (Kandilli Observatory and Earthquake Research institute) in order to realise studies begun in the framework of the European Marsite project, focusing on seismic geo-hazards in the Marmara Sea.

■ ■ ■ A few examples of strategic cooperation in 2014

Cooperation with Japan

A 2014 milestone was the twenty-fifth meeting of the Franco-Japanese committee for the development of the ocean, which was jointly organised by Ifremer and MEXT (Ministry of education, culture, sports, science and technologies). The committee is a venue for discussion and evaluation of collaborative research projects between the two countries in terms of marine science. More than eighteen projects underway and eight new cooperation projects sponsored by French and Japanese institutes and/or universities were presented on this occasion.

The event was followed by a strategic working meeting between Ifremer and Jamstec. Cooperative activities between these two institutes mainly focus on marine technologies, ocean monitoring, seafloor observatories, simulations with Earth Simulator, deep-sea ecosystems, the subseafloor biosphere in the deep sea and fleet management. A new cooperation project has begun, with the objective of comparing the ecological impact of exploiting mineral resources, in the Pacific Ocean for Japan and in the Atlantic Ocean for France.



> Ifremer/Jamstec meeting outside of the Franco-Japanese joint sub-committee, attended by Jamstec's President and the scientific advisor of the French Embassy in Tokyo

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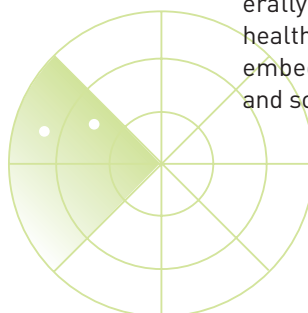


Greater collaboration with Brazil

The Salsa oceanographic cruise, outcome of the partnership-based project led with Petrobras, took place from April to May 2014 and was highly successful. Relations with the interministerial commission on marine resources, the Secirm, were reinitiated with the aim to share and jointly develop strategic positions for the development of marine sciences in the Atlantic Ocean. The mobilisation of Ifremer teams in this partnership with Brazilian research teams is also part of the national dynamics led by AllEnvi.

Cooperation with the United States

In 2014, discussions began with NOAA, more especially in the framework of the European Commission's Galway Statement implementation, in order to launch collaboration on shared issues: deep sea exploration with the use of telepresence and the challenge of data interoperability, the toxic algae issue and more generally the role played by the ocean in human health, physical oceanography and developing embedded shipboard systems with acoustics and sonar data processing.





Interview



Craig MCLEAN is the Deputy Assistant Administrator of NOAA for oceanic and atmospheric research responsible for laboratories and research programmes in ocean, meteorology and climate fields. He worked for nearly twenty-five years at the vessel management service at NOAA.

He represents the United States at the Intergovernmental Oceanographic Commission (IOC) and is co-chairman of the European Union's marine science task force.

How do you value the NOAA/Ifremer collaboration in Oceanography?

I see Ifremer as a valued partner. For more than thirty years NOAA and Ifremer have worked together to combine their expertise and capacity to advance the frontiers of knowledge about the ocean. We leverage assets for our joint actions both at sea and in the laboratories of our organizations. We collaborate, areas of coastal science such as sediment stability and understanding harmful algal blooms. We share experts in deep sea ecology and exploration technology, and in ocean mapping.

Craig McLEAN

deputy assistant administrator at NOAA

Ifremer has a great breadth and depth of science programs and a very high caliber of scientists which inspires us. At NOAA we hold a great reliance on this active and productive collaboration.

How do you envision our future collaboration according to the Galway Statement?

The Galway Statement on Atlantic Ocean cooperation can create great intellectual collaboration across the Atlantic, and there is much science to be done. It offers an opportunity to build on the NOAA and Ifremer relationship and to leverage other EU linkages through the root of that partnership foundation.

I'm pleased to be co-chairing the North Atlantic panel that implements the Galway Statement, and thrilled with the enthusiasm from the EU community about that opportunity. US scientists including and beyond NOAA are engaged already in partnerships that will be furthered and created only because of the energy behind Galway and the Horizon 2020 process. The history of NOAA-Ifremer collaboration is a fine model of lasting partnerships that result from such beginnings as the Galway Statement.

Cooperation with new partners

With the support of the French Embassy in Mozambique, on 28 October 2014 Ifremer signed an MoU with the Eduardo Mondlane University (UEM) in Maputo. The themes selected for this cooperation agreement are marine geosciences and marine biodiversity in the Mozambique Channel. The signing took place aboard RV *L'Atalante* on its call at Maputo in the framework of Pamela project cruises. During this call, the Minister of research and technology (MCTI) of Mozambique expressed the desire to set up institutional cooperation between our two countries on the Mozambique Channel.



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> Aboard RV *L'Atalante*, from left to right: the Captain, the French ambassador to Mozambique, the Unesco Indian Ocean Commission representative, the scientific advisor of the French embassy in Mozambique and the Minister of Research of Mozambique

Iain SHEPHERD

European Commission's Directorate General for Maritime Affairs and Fisheries



© VLIZ/E.Verhaeghe

> Inauguration of the EMODnet secretariat office in Oostende on 19 February 2014. Iain SHEPHERD is first on the left in the photo

Iain SHEPHERD has been working as a European maritime policy officer at the European Commission's Directorate General for maritime affairs and fisheries. He is currently responsible for creating a European EMODnet (European Marine Observation and Data Network), of over a hundred European bodies in order to make marine data more interoperable and more accessible. His physics degree and hands-on knowledge of satellite data processing, in fisheries control and fisheries management gained in a previous job at the European Commission's joint research centre (JRC) make him an acknowledge expert in the technical, financial and administrative challenges involved in constructing and maintaining this network.

What is Ifremer's role in the development of the Integrated Maritime Policy of the European Union (DG MARE)?

It's almost unique breadth of experience from fisheries science, marine genetics, seafloor geology, and satellite image processing through to coastal dynamics gives it an almost unrivalled expertise on marine issues related to societal stakes.

Ifremer's ability to apply this knowledge to complex issues and interrogations of our societies is much appreciated by the

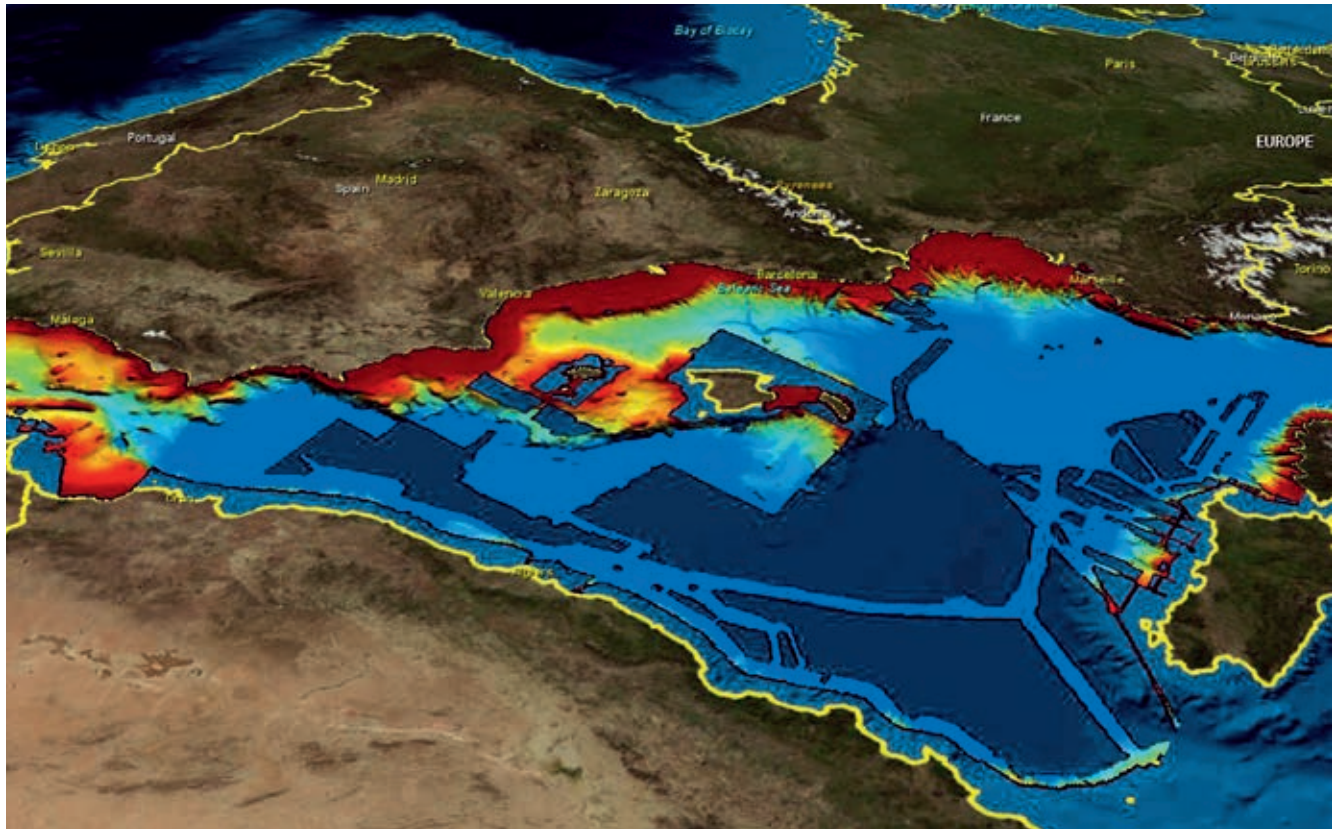
Commission's DG MARE. Its advice is always listened to. Ifremer has followed closely the development of the EU's integrated maritime policy and played a significant role in implementing it. It has been instrumental in encouraging European laboratories to share infrastructure and work together on common goals. It has coordinated and participated in EU research projects. It has provided a measured input to consultations on emerging issues.

What is Ifremer's positioning in EMODnet?

EMODnet partners are organised in seven groups, each covering a specific category of data: geology, bathymetry, habitats, physics, chemistry, biology and human activity. Ifremer is involved in nearly all of them. It has also provided a member of the Modeg (Marine Observation and Data Expert Group), which supervises EMODnet's operations and development. This overarching action by the institute was invaluable in defining how EMODnet should operate and in monitoring its progress; particularly in the early stages. Close collaboration between Ifremer and other important stakeholders such as the *Service hydrographique et océanographique de la Marine* (SHOM), as has Ifremer's involvement in the Copernicus ocean forecasting system, which share the vision of realising the economic potential of the sea through better access to marine data have helped.

Copernicus and EMODnet are both part of the wider European "marine knowledge 2020" initiative, and Ifremer ensures that the two initiatives are joined up.

The next objectives are to provide better access to fisheries data. Here again, the experience of Ifremer, with their fisheries atlas, can help, to involve the private sector more and to join up with more non-European partners.



> In the framework of the EMODnet-bathymetry project, compiling of data from European institutes, for the western Mediterranean basin (DTM EMODnet 2014, Globe software image)

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■ ■ ■ Ifremer and AllEnvi's cross-cutting "Overseas France" group

Ifremer facilitates the cross-cutting group for activities in overseas France. The group is made up of representatives from the Alliance's twelve founding members. In 2014, the group performed an "inventory of AllEnvi members' overseas activities and of overseas scientific bibliometrics". Work began in spring 2013 and the corresponding report was submitted to the Alliance in July 2014. Today research overseas is relatively isolated and insufficiently attractive for metropolitan French and/or European teams. In coming years, the major challenges will be to optimise the costs of this research in overseas France and to strike a balance between overseas research oriented towards local issues and excellence in scientific research.

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INFRASTRUCTURES, TECHNOLOGIES AND TOOLS

> *The ocean-research vessel
Pourquoi pas?*

© Ifremer/M. Gouillou

■■■ Fleet and underwater equipment

News about the French oceanographic fleet *VLRI*

The agreement governing the joint research unit, created in 2011 by CNRS, Ifremer, IPEV and IRD to implement the integrated scheduling of French vessels and embarked equipment, reached its term in 2014. Its members decided to extend its existence for two years, while awaiting the conclusions of the study mission entrusted by the Ministry of research to the national education and research inspectorate general. In particular, this inspection should assess the results obtained over the past four years by the UMS Fleet unit and formulate recommendations to improve the pooling of all sea-going facilities and equipment.

Ifremer fleet activity

European and international cooperation

Following a break-down in the *Maria S Merian* research vessel's pod propulsion system, the German marine research institute Geomar, urgently solicited all partners in the Ocean Facilities Exchange Group (OFEG) in early July to carry out its MSM 40 scientific mission in the North Atlantic Ocean (Labrador Sea). Ifremer gave a positive answer by proposing its research vessel *Thalassa*, and performed the mission from 25 July to 27 August, before conducting a mission on the ecosystem approach to fisheries (Camano).

Serving scientific research and the maritime economy



Performing the first scientific cruises financed by the Eurofleets2 project

The EU project Eurofleets2 continues and consolidates the actions begun in Eurofleets1 in order to promote the integration of European research fleets. It is coordinated by Ifremer, bringing together a consortium of thirty-one partners from twenty countries, and is receiving European Union funding to the amount of 9 million euros over four years.

Eurofleets2 has been particularly active, right from its kick-off in March 2013, with the organisation of calls for proposals for transnational access to twenty-two vessels and five underwater systems opened by fleet managers who are partners in the project. At its second annual general assembly meeting, held in April 2014 in Rome at the invitation of the CNR (*Consiglio Nazionale delle Ricerche*) national research council, a report was made on the outcomes of the first four calls for proposals. In all, thirty-three scientific proposals were submitted, representing two-hundred-twenty partners from one hundred-thirty European or international research bodies. Eleven proposals will be financed; four cruises performed in 2014 aboard the ships *G.O Sars* (Norwegian) off the Svalbard archipelago, *Sanna* (Greenland) in the fjords of the west coast of Greenland, *Sarmiento de Gamboa* (Spanish) and *Aegaeo* (Greek) on the Mediterranean Sea. The fifth and final call for proposals was launched in November 2014. The evaluation of the proposals received will be finalised by summer 2015, so that the funded cruises can take place in 2016 at the latest.

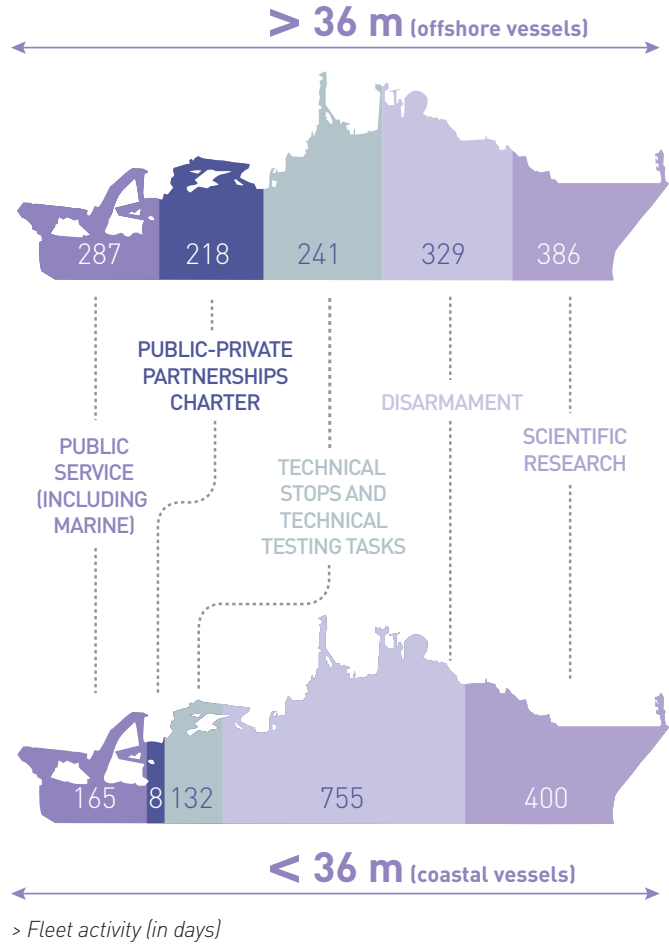


Main cruises performed

RV *Pourquoi pas?* was positioned in the Atlantic and in the Mediterranean all year long. Amongst other things, RV *L'Atalante* conducted cruises in collaboration with industrial partners in Brazilian waters, then in the Mozambique Channel. The activity of RV *Suroît* fell between February and September, conducting a Pirata cruise in the Atlantic and then a deployment in the Mediterranean for the Moose research cruise and the first trials of the HROV. A presentation of all the cruises by Ifremer's fleet is given in the appendix.

Legs in transit, as well as time spent at quay required for operation preparation and logistics (not including mobilisation and demobilisation), are broken down pro rata into the four categories of "Scientific research", "Public service", "Public-private partnership, Chartering" and "Technical stops and technical trials missions".

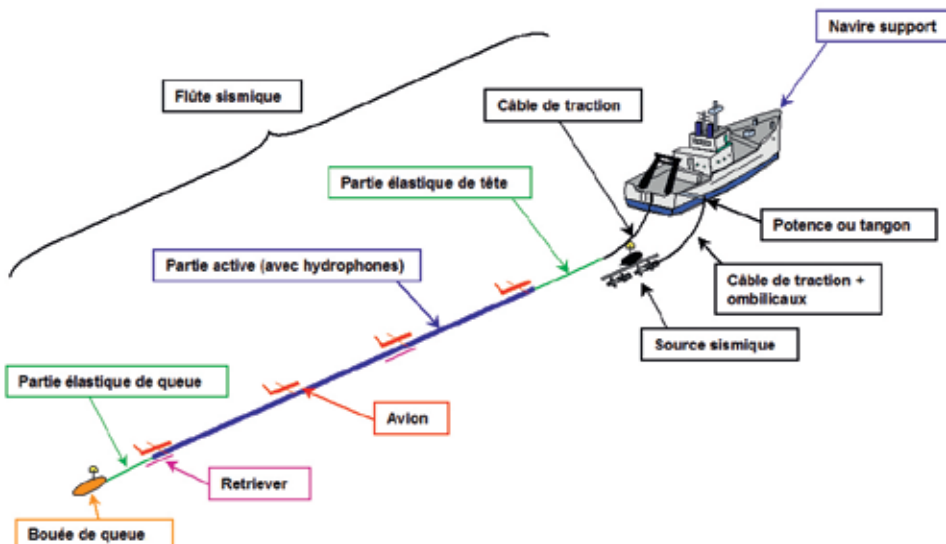
It should be noted that the period of decommissioning for offshore vessels is principally due to RV *Suroît*, whose activity was limited in 2014. As for inshore vessels, the activity of RV *Gwen-Drez*, limited to a single CGFS cruise, explains the decommissioning period indicated for this category of ships.



Seismic equipment

To meet the scientific demand and seeing that current equipment dating back 1999 is not maintained, Ifremer has decided to renew its seismic equipment. The objective defined is to make two main facilities available to scientists: an array system comprised of a 6,000 m-long seismic streamer and a 3D system with two 600 m-long streamers. The operation should be spread over four years, with the first phase spanning 2014 and 2015, making it possible to replace part of the current systems without any "interruption of service".

The first part of 2014 was devoted to technical studies and holding overarching calls for tender covering all equipment and facilities. The first deliveries took place in November.





Interview



**Marie-Anne
CAMBON BONAVIDA**

chief scientist of the Bicosse cruise

we had established this map of active and fossil sites, we could then focus on habitats. So we next worked on the relationship between the animals' physiology and their living conditions in the environment, and on their life cycle and the way they reproduce and disperse.

Why this zone and the need for a vessel like the *Pourquoi pas?*

This is an area of major interest for understanding how the planet functions, both in geological terms, with the existence of a transform fault and in biological ones, with the presence of numerous species of interest at great depths. With its ability to continuously operate vehicles like *Victor 6000* and accommodate a large team of scientists on board, we knew that *Pourquoi pas?* would be an asset for this cruise. And that definitely proved to be true! The exploratory phase was conducted with geologists who brought their experience in finding sites. Once the sites were identified, we all benefited from *Victor 6000*'s working capacity.

Are you already thinking about Bicosse II?

Yes, of course! We are imagining multi-disciplinary scenarios to return to the zone, with more days for exploration in order to identify other areas of interest. We could use a *Nautille*-deep AUV combination and feel that this operational complement would be well-adapted to this type of cruise. See you in a few years from now!

What were the objectives of the Bicosse cruise?

The cruise took place from 10 January to 11 February aboard *Pourquoi pas?*, with a specific work zone on the Mid-Atlantic Ridge: the TAG and Snake Pit hydrothermal sites which are located within the French polymetallic sulphide exploitation mining permit. For the first time, a thorough study was conducted on the inactive zones and those more on the outskirts, without a hydrothermal context, integrating both general and targeted approaches to model species chosen (the *Rimicaris exoculata* vent shrimp and *Bathymodiolus puteoserpentis* vent mussel).

To reach these objectives, what strategy did you follow?

We initially covered the zones known to be inactive, taking surveys with the ship's multibeam echosounder and then, in some areas, made a more fine-scale survey with *Victor 6000* and its ROV track module. Once





Interview



Anne PACAULT

project leader for the makeover of RV *L'Europe*

What were the trickier aspects of RV *L'Europe's* makeover in terms of technology?

The main technical challenges of the project were the fitting of sophisticated scientific equipment into a catamaran which is only 30 m in length and taking into account the fact that these new facilities

will be used and deployed by teams with fewer members and generally without the support of a Genavir electronics officer. The acoustic baselines system on the port hull was revised to leave room for the new ME 70 multibeam echosounder. Some of the premises, in particular the scientific control post and echosounder rack were refitted to allow new equipment to be incorporated and make it easier to monitor acquisition. As regards deployment of facilities, special importance was given to equipment which is robust and simple to use, and procedures were set up to ensure remote maintenance operations for the facilities, notably via VSAT satellite telecommunications.

Besides the technological challenges, what are the main constraints or specificities in a vessel makeover project like that of *L'Europe*?

As well as the technical aspects, it's important to take account of complying with the ship's scheduling constraints and preparing the commissioning of new equipment, especially in terms of the budget.

The project was financed in great part thanks to grants from ERDF and Languedoc-Roussillon CPER state-region contract funding. The allocated budget was set at the launch of the project on the basis of initial estimates, whereas the costs were only specified after the integration studies were made and once the results were in from several calls for tender. That meant that certain choices had to be made, and in particular to abandon the installation of mobile equipment on the starboard hull.

Next, the vessel's scheduling requirements meant that the work had to be done in a very short time period. The ship was immobilised in all for eleven weeks, five of which were used for work in dry dock and two weeks of sea trials. The first scientific cruises began just a few days after the trials had been completed.

Once the new equipment and facilities had been validated, they were transferred to Genavir, the ship operator, and they are utilised and deployed either by Genavir teams or by scientific teams. Therefore, it is essential to prepare these teams to use the new equipment and to involve them in the project from the outset so that their requirements are clearly known.

Once the equipment has been transferred and the project is over, what role do engineers play for the operational facilities?

2015 will be a somewhat special year, because a five-day cruise for trials is scheduled in March and this will allow the NSE project team to come back on board. The planned trials will enable several systems to be updated and the performances of the new echosounders to be checked. The vessel's equipment will be monitored by the NSE unit as is done for other Ifremer vessels, in particular by analysing the end-of-cruise data sheets and the requests for upgrading made within the framework of the Facilities, equipment and works project. Any aspects of keeping the vessel operational are ensured by Genavir personnel.

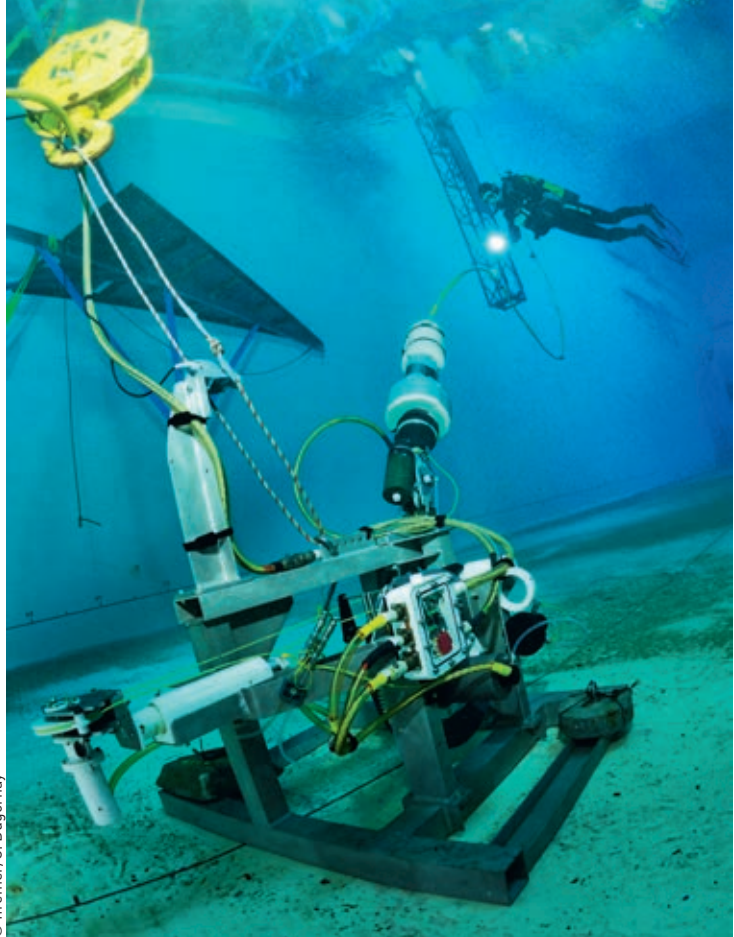


> The oceanographic vessel *L'Europe* in dry dock at Marseille

© Ifremer/B. Crenan

First dives by the HROV

This new and innovative underwater vehicle which is more easily deployed than its predecessors entered its final phase of completion in 2014. Qualification tests were performed on the main components and the first trials of the vehicle were made in wet dock and in the test pool, followed by the first testing cruise in November 2014. The seafloor to surface link was validated at sea (using a mock-up of the vehicle) and several innovative sub-systems were validated, like the fibre optics management system or a new 7-function electric manipulator arm which was developed in the framework of a partnership and business development agreement with the ECA-Hytec firm. The operation of the tether winding system (a vital point for deployment) was also verified under pressure in hyperbaric chambers and tested dynamically in the hydrodynamics test tank at Ifremer's Brittany centre. For the latter test, a special system to generate vertical movements, combined with the movement of the towing carriage, simulated various conditions of the ballast's heave and drift at the top of the tether.



© Ifremer/O. Dugornay

> Testing the behaviour of the HROV tether in the test tank at Ifremer's centre in Brest



Positioning system for underwater vehicles

The Posit project was launched in 2011 with the aim of renewing the positioning systems of underwater vehicles, which required significant data processing and sophisticated interpretation making it difficult to run studies on the data

acquired on dives. The project was finalised in 2014, after all the possible vessel-vehicle couplings had been installed and validated operationally.

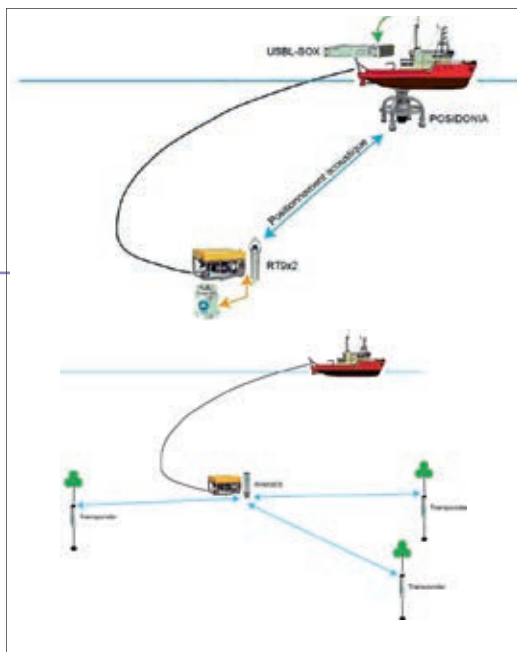
The originality of the Posit project lies in the combination of inertial navigation and two acoustic positioning techniques:

- ultra-short baseline: very easy to deploy without space limitations, but this methods engages the vessel and is less accurate at great depths if it hasn't been hybridised with shipboard dead reckoning;
- long baseline: more difficult to implement but more accurate in deep water, this technique is used in backup modes in the case failure.

The Posit project also made it possible to archive underwater vehicle data with a single position and supply a high-performance post-processing tool, thus facilitating data analysis.



*Ultra-short baseline" technique: the vehicle or the object is located by exchanging acoustic signals with the ship.
"Long baseline" technique: beacons are moored on the seabed during the dive to improve the accuracy in locating the vehicle*

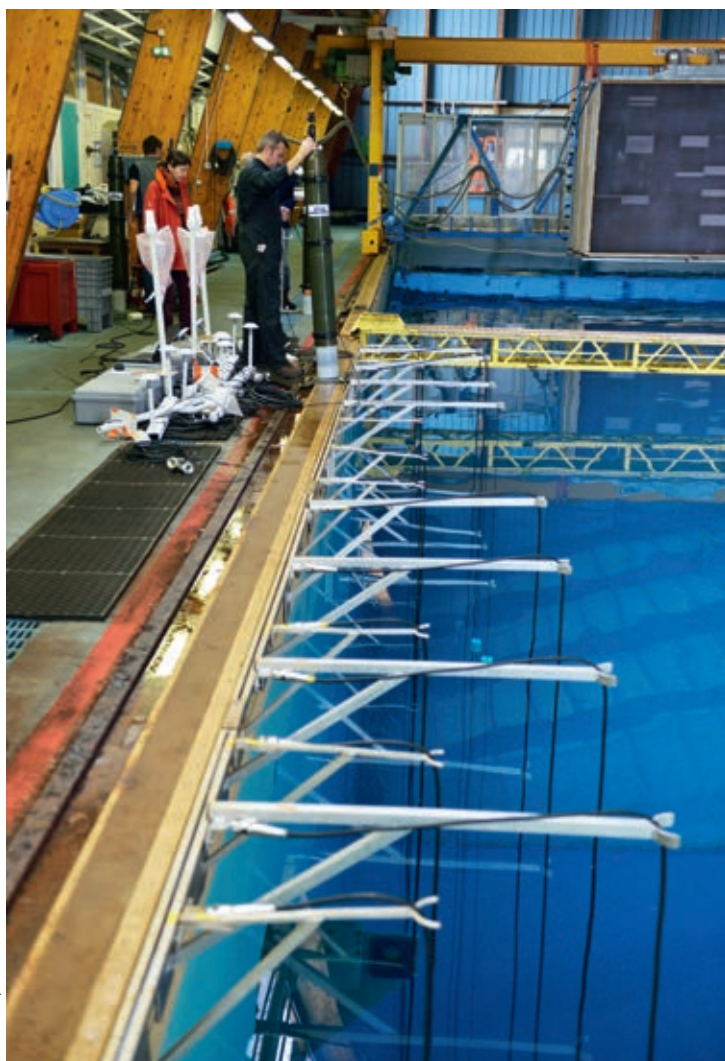


Euro-ARGO VLRI

The international ARGO programme's objective is to develop a global array of more than 3,000 autonomous profiling floats taking real-time measurements of ocean temperature and salinity in its first 2,000 metres. ARGO is a key element in the global ocean observation system set up to monitor, understand and predict the role the ocean plays in planet Earth's climate. Along with satellite observations, ARGO float data are the main source of information for researchers focusing on the climate and ocean, for seasonal and climate forecasting and for ocean forecast analysis centres.

Euro-ARGO is the European contribution to the international ARGO network. The aim is to consolidate and preserve the European contribution ARGO and to provide research (ocean, climate) and operational oceanography (Copernicus and its marine monitoring service) communities with a service of excellence. On 12 May 2014, legal status as an ERIC (European Research Infrastructure Consortium) was officially granted to the Euro-ARGO's core component by the European Commission. This EU legal framework is designed to facilitate the setting up and operating of research infrastructures of European interest. The Euro-ARGO ERIC will ensure coordination and will be in charge of purchasing and monitoring the European floats. It will be headquartered at the Ifremer centre in Brest for a period of at least five years. Nine countries (France, Germany, the United Kingdom, Italy, the Netherlands, Norway, Greece, Poland and Finland) are among the founding members of the Euro-ARGO ERIC structure. Setting up an ERIC legal entity is a major step towards optimising, preserving and consolidating European contributions to global ocean observation. Euro-ARGO is also the first ERIC for environmental sciences set up by the European Commission. Its official inauguration was organised in Brussels on 17 July 2014.

The French contribution to this programme is coordinated within the inter-institutional structure called Coriolis, led by Ifremer, and which brings together the main French research bodies involved in oceanography (CNES, CNRS/INSU, Ifremer, IPEV, IRD, Météo-France and SHOM). The new agreement entitled "Coriolis 2014-2020, a lasting and integrated infrastructure for in situ observation of the ocean for operational oceanography and research", was signed by all the managers of these institutions in 2014.



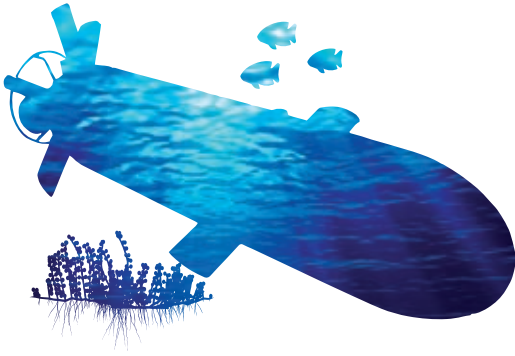
© Ifremer/S. Lesbats

> Deploying Arvor and Provor floats in the test tank of the Ifremer Brittany centre

The NAOS Equipex project in the French "Investments for the future" programme coordinated by Ifremer and carried out with Pierre & Marie Curie University, is preparing the way ARGO France will evolve over the next decade. In 2014, several prototypes of new French ARGO profiling floats were tested at sea. The industrial production phase of the new deep sea float (*Deep Arvor*), capable of reaching depths of 4,000 m, is not complete and two industrial prototypes were successfully deployed during the Geovide cruise, in June 2014. The first significant scientific results have already been achieved, in fact, though inputs from an array of biogeochemical profiling floats in the Mediterranean Sea.

Websites:

www.euro-argo.eu, www.coriolis.eu.org, www.naos-equipex.fr



■■■ Marine databases

Portal for videos from underwater vehicles

Video observations create very little disturbance for the environment and now supply first-rate scientific data for the study of the benthic ocean: biodiversity, habitats and ecosystems, geology and small-scale structures and mapping. Underwater vehicles have been producing video and photo data for nearly thirty years, in various formats, both analog and digital. Generalisation of digital techniques has made it possible systematically save and archive these data and to develop analytical algorithms for scientific purposes; but they were not made available on line. All of the videos have been archived since 2010. However the disadvantage is that these are huge files (4 TB on average for a ROV *Victor 6000* survey) and hard to handle without high performance technical means.

To facilitate access to and processing of the videos which have been collected and databased, a prototype of an on-line portal was developed in 2014. It allows the available video surveys to be identified, previewed on line and downloaded for processing. A study conducted by the French national audiovisual institute INA defined the technical arrangements: coding and compression standards, formats for archiving and recovery in order to ensure that they can be played over the long term and effectively viewed.



→ Links between publications and infrastructures

Methodologies making it possible to quantify the impact of large infrastructures and/or their data on publications referring to them have advanced significantly over the past few months. So that scientific value can be derived from data sets, an approach to assign DOIs (Digital Object Identifiers) is currently underway in the framework of the European Seadatanet2 project coordinated by Ifremer. It involves using the same identification technique as those for publications and thus enabling the "citation" of data sets used in the context of publications. This campaign of DOI attribution is being deployed over all of the data hosted at the Sismer data centre.

As for infrastructures, and particularly the Fleet infrastructure Ifremer has developed an extension of its Archimer open archive, making it possible to link each referenced publication to an ocean cruise or to another infrastructure (Euro-ARGO, and so on).

Vidéos Sciences Marines

Recherche par mot-clé: Recherche par vidéo

313 Vidéos

Zone géographique: Ajuaber

Année: 2011 (1138), 2012 (1000), 2013 (988), 2014 (1500)

Campagne: ICEDTD (448), MOMARSAT2011 (313), MOMARSAT2012 (481), MOMARSAT2013 (512), MOMARSAT2014 (518)

Navire: Pourquoi-Pas? (399), Thalysa (52)

Engin: VICTOR (477)

Source: 116

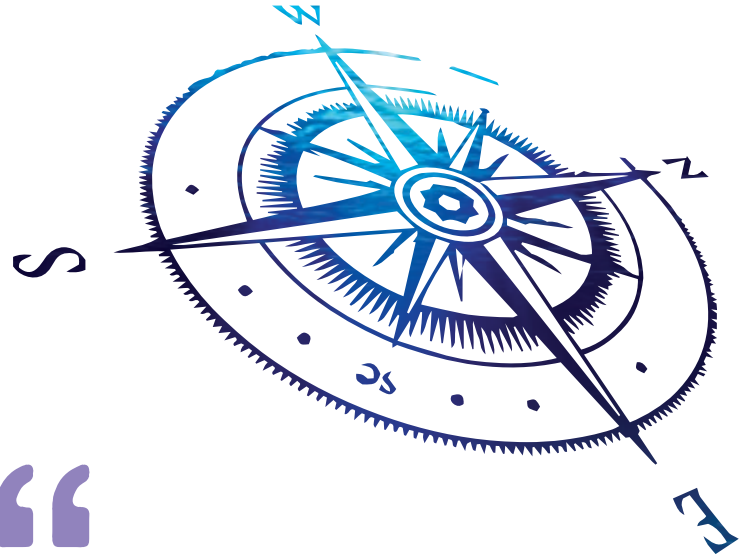
Grid of video thumbnails with metadata:

- MOMARSAT2011 Rongée n°46215/0022 Intrusion Flota (Principale) HDI 22/07/2011 - 09h 42mn 26s 22/07/2011 - 09h 42mn 26s
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Datarmor project

Datarmor's aim is to develop the means of data storage and their inherent processing and computation, by integrating new big-data type technical architectures to cope with the growing volume of data produced by observation systems. Indeed, monitoring has progressively gone from observations carried out on a sporadic or one-off basis to automated and/or global systems, which produce huge volumes of data. Scientists must find or summarise the relevant information they need by processing these data.

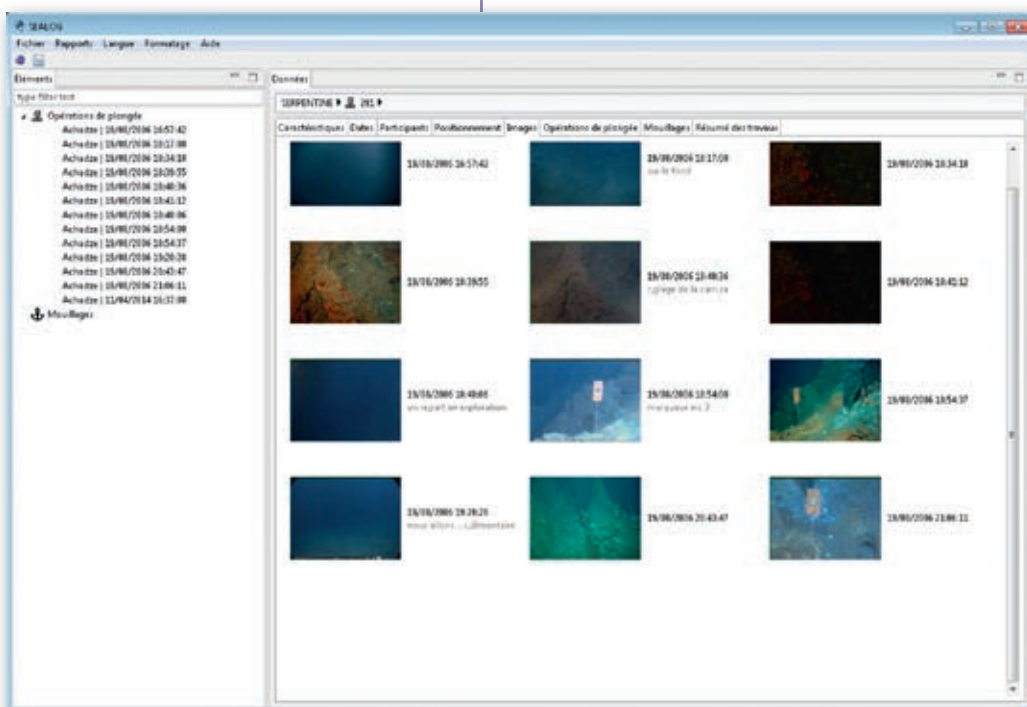
A think-tank group was created to clarify the functional expectations and technical priorities. The Datarmor project, combining computer power and a capability to manage large-volume data, will also make it possible to renew storage and computing facilities which have reached the end of their useful life and which are costly to maintain under operational conditions. In terms of algorithms, the stake for Ifremer (both for scientists and computer scientists) are to progress in data processing which associate data mining and signal processing on the scientific side with parallel computation and disk access on the IT side.



Managing the samples collected during ocean research cruises

Although the numerical data collected by Ifremer's oceanographic ships' equipments have long been databased for preservation, operations for sample collection, particularly geological or biological ones, was still too often recorded manually (log book) and each scientific team had its own way of doing it.

From now on, in order to provide uniform descriptions of the sampling operations and samples obtained, SeaLog software is being progressively made available aboard research vessels. This software makes it possible to note the sampling procedure (instrument used, geographical location and date) and to describe what will become of the sample once it has left the vessel (where held, conditioning, labelling, etc.). By doing so, it guarantees sample traceability, from acquisition to final deposit in a collection.



The Ocean cluster

France's national research bodies have agreed to set up four clusters for coordinated management of "earth observation" data. Ifremer has taken the responsibility for setting up and coordinating the Ocean cluster. Its principal remit is to make available data, products, outputs and services, intended first and foremost for the French scientific community so that it can perform studies on the characterisation and evolution of the ocean and on understanding ocean processes.

The cluster's calling is to take into account all geolocated observation outputs and data concerning the ocean which are available in digital form. These data involve a wide range of disciplines. They comprise every scale of time and space. The Ocean cluster works in close cooperation with operational services, sharing the large number of monitoring networks and data sets they have in common. It also provides the ability to perform the exploratory studies required to set up future operational services. The first phase of the Ocean cluster's conception is underway, to be completed in early 2015 with a presentation during an open workshop. Following the setting-up phase which should be achieved during the year 2016, the Ocean cluster will provide centralised access to the data, products and services under its responsibility. It will progressively consolidate and enrich them, notably in keeping with users' requests.

→ EMSO

EMSO aims to acquire long time series (at least ten to twenty years) with the following main objectives:

- studying the impact of global warming on the seas and oceans surrounding Europe;
- studying deep-sea ecosystems with a view to fundamental research as well as sustainable management, by particularly focusing on anthropogenic and climate factors;
- studying tectonic, volcanic, hydrothermal and gravity-driven processes and monitoring the associated natural risks and hazards (earthquakes, tsunamis, slope instability) for coastal zones with high population densities.

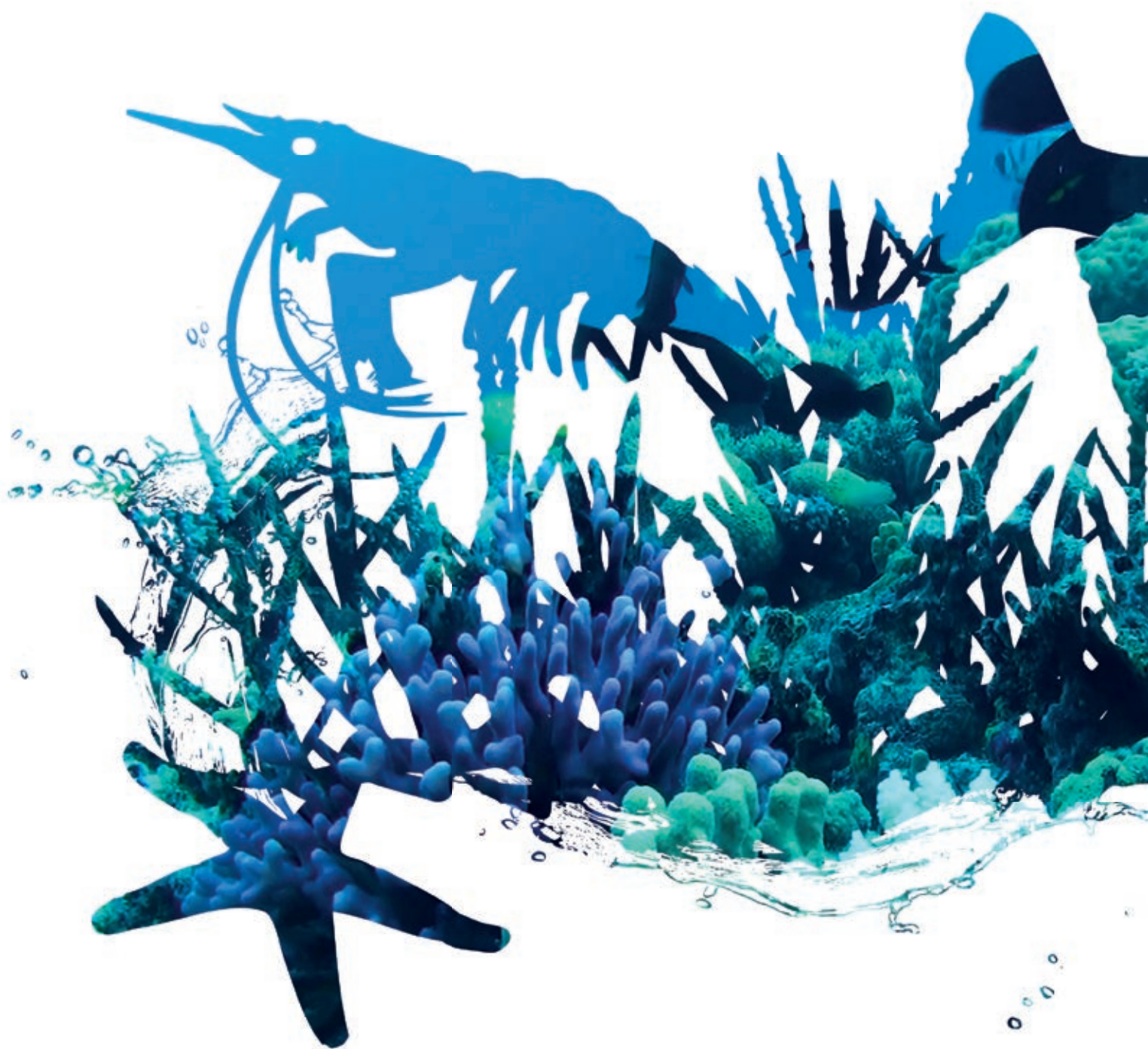
EMSO is a distributed research infrastructure bringing together at the European level observatories on fixed sites located in the deep sea. It is supported by the European Union's Esfri procedure and, in 2014, EMSO reached the second phase in the submission of its proposal to become a legal ERIC entity under European law, i.e. EMSO ERIC. France's commitment is mainly motivated by its role in data management and technological innovation and by the choice of the three sites: the Azores, Ligurian Sea and Marmara Sea. For the infrastructure's governance, Ifremer and CNRS signed a draft agreement. The first steering group meeting for this draft agreement was held on 4 September 2014.



> Hydrothermal smokers on the MoMAR (Lucky Strike) site

Ifremer is one of the main partners in the Fix03 (FP7 2013-2017) infrastructure integration initiative, which supports transnational activities and access to most EMSO sites, including the MoMAR site in the Azores and the extension of the Antares neutrino observatory in the Ligurian Sea. The institute is investigating the Marmara Sea observation site in the framework of the European Marsite cruise project. In the Ligurian Sea, Ifremer is engineering the first phase of the Nice slope observatory's construction.

SUPPORT FOR PUBLIC POLICIES



Anticipate to preserve and manage



In 2014, in order to put the 2014-2017 objectives contract into practice, Ifremer and central administrative divisions worked to draw up work plans to clearly define the tasks entrusted to the institute. Concurrently, a plan was made for an in-house coordination team to work on stakes related to the WFD and the MSFD. Its goal is to make Ifremer's position more consistent between the national level (Ministry, Onema) and that of the seafronts (water agencies). Moreover, many actions were undertaken to support public policymakers, as illustrated by a few examples given in this chapter.

■■■ Policy on water and protection of biodiversity

Implementation of the Water (WFD) and Marine Strategy Framework Directive (MSFD)

The institute plays an important role in supporting the public authorities in the field of the WFD and MSFD directives. Implementation of the directives especially requires the contribution of our institute's monitoring networks, which regularly supply the data needed for assessment and monitoring of the environmental status. The institute has annual or multiannual agreements with the Water and biodiversity directorate, Onema and the water agencies. One milestone in 2014 was the preparation of the MSFD monitoring programme, with Ifremer proposing an outline to the ministries for a scheme to organise and structure its contribution, supporting the contracting authority.

Natura 2000

Since the agreement with the French State was set up in February 2007, Ifremer's expert assessment cluster has greatly contributed to studies conducted in the framework of the Natura 2000 Brittany network. The progress concerns both setting up a standardised framework to perform cartographic inventories and the quality approach for data which have been archived on a regional scale.

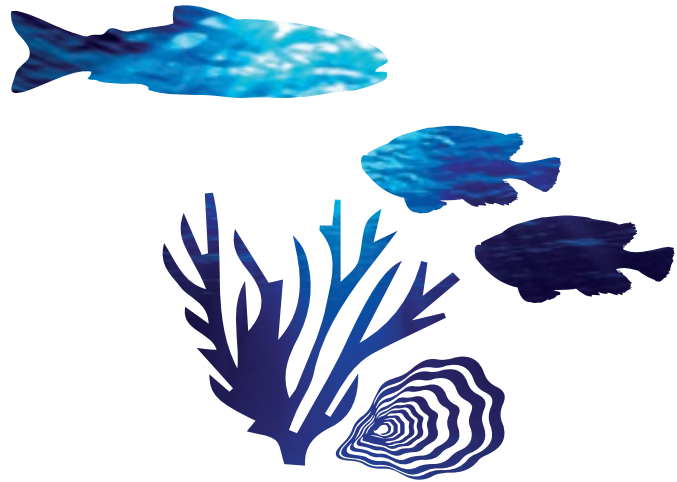
In 2014, efforts were pursued on the regional synopses of habitat distribution on the coasts of Brittany. Using data delivered by the Rebent and Carthamet projects and inventories made in the Natura 2000 framework, mapping outputs were produced, meeting the needs of DREAL for exhaustive inventories and maps of confidence indicators with respect to data sources.

To guide management actions, Ifremer has also been asked to produce executive summaries on habitats where the stakes are high. These are oyster reefs which were identified in 2014. The species has effectively proliferated rapidly outside of oyster farms, creating wild populations in many other sectors, especially in Brittany. The consequences of this phenomenon can sometimes be negative in ecological terms, due to the deep ranging modifications induced by this proliferation in ecosystems and the changes it causes in biodiversity, but also in socio-economic terms, with financial losses for shellfish farming. The need is clear to update available data, grow our knowledge about the distribution of wild cupped oyster populations and set up monitoring of their colonisation and reef formation using harmonised methodology on all sites.



© J. Duchene

> The cupped oyster *Crassostrea gigas* (at top); in competition with honeycomb worm reefs (below)



Ballast water

In the context of preparing the implementation of the International Convention for the Control and Management of Ships Ballast Water & Sediments (London 2004), the MEDDE asked that Ifremer provide the ministry with its support. So the institute took part in the task force on Exemptions to draw up a guidelines document for exemption requests to be presented by some shipowners. The institute also represented France at the International Council for Exploration of the Sea (ICES), in the Working Group on Ballast and Other Ship Vectors (WGBOSV) and in the Working Group on Introduction and Transfers of Marine Organisms (WGITMO), by presenting the national report for each group. The joint work carried out by these groups is reported to the International Maritime Organization (IMO) to help in drawing up or implementing conventions (particularly the Ballasts convention).



© Ifremer/D. Masson

> Taking water sample during deballasting of a cargo vessel

■■■ Policy for maritime fisheries, seafood and aquaculture

Exceptional mortality in the blue mussel *Mytilus edulis*

Following the massive mortality events observed in March 2014 in mussel farms in the Pertuis charentais area, affecting both adult and juvenile mussels, a request for scientific and technical support was submitted to Ifremer by DGAL and DPMA.

For six months, analyses and studies were carried out on the environment and mussel physiology and pathology. The mortality episodes were mostly concentrated in the Pertuis breton area, with mortality rates of 100% in mussels reared on ropes and from 90 to 34% from north to south of those on wooden stakes called bouchots in the sector which are uncovered with the tide. The specific environmental conditions (large inflows of fresh water, re-suspension of sediments due to successive storms and a high residence time of the water mass which is specific to the Pertuis breton lagoon at this period, particularly at neap tides) seem to be significant factors in the mussel mortality phenomenon observed in 2014. These conditions may have induced local modifications in the microbial balance and promoted both the proliferation of bacteria identified as belonging to the *Vibrio splendidus* species (pathogenic for mussels) and their contact with the shellfish.

→ Support in preparing the landing unwanted catches obligation regulation's application

Another 2014 milestone was the preparation to progressively put into application article 15 of the Basic Regulation of the European Union's new Common Fisheries Policy, stipulating the obligation to land unwanted catches ("discards"). Ifremer and DPMA signed an agreement to take stock of the existing situation and help develop technological and other avenues to achieve the greatest possible reduction in unwanted catches. Additionally, at the request of DPMA, Ifremer took part in drawing up an atlas of discards for the south-western waters of the European Union along with regional management plans.

A bibliographic study identified the trawl characteristics which affect selectivity, as well as possible pathways of improvement depending on the target species and métiers (types, gear and grounds). The main areas of improvement proposed focus on gear characteristics (materials, mesh and geometry) and on installing selective devices. The perspectives for ameliorating selectivity on other types of gear (gill nets, vertical nets, etc.) seem to be more limited. The approach also includes exploring alternative fishing techniques, like using large fish traps. Experiments largely rely on underwater visualisation (still photos and videos) in order to best take account of fish behaviour (avoidance, escape) in defining selection techniques and practices. Discussions, bio-economic simulations and experimentation are conducted in close collaboration between scientists and fisheries professionals.



© Ifremer/J.Prou

> Mussels

→ Collection of fisheries data and support for European negotiations

With the new Common Fishery Policy (2013 regulation) coming into effect, 2014 was a year transition in terms of collecting fisheries data within the European Union. Effectively, although the general objectives of the fisheries data collection programme remain unchanged (for the assessment of resources, fisheries, their impact on ecosystems and their socio-economic performances), the revised version will include new orientations, like the need to measure the impact of the landing obligations, as well as the mobilisation of significant efforts to improve the quality of the data collected.

In 2014, while continuing its actions for the collection and management of data in the various strands, acting as DPMA's main partner for the application of the Data collection framework (DCF), our institute prepared the way its contribution would evolve within the national system, in keeping with the guidelines of its contract of objectives and with the perspective of the future framework of implementation. The latter will be defined more specifically through the European Maritime and Fisheries Fund (EMFF).

Furthermore, over the year 2014, nearly eighty experts from Ifremer took part in over fifty working groups and advisory committees in international organisations for scientific consultation and expertise, like the International Council for Exploration of the Sea (ICES), the General fisheries commission for the Mediterranean (CGPM) or International Commission for the Conservation of Atlantic Tuna (ICCAT).



© Ifremer/O. Dugomay

> Ifremer investigators measure fish landed by fishermen in Martinique

■ ■ ■ Raw materials and mineral resources

Marine aggregates

The “Marine aggregates” study commissioned by MEDDE, aiming to assess the environmental stakes and existing uses in sectors known to hold marine aggregate material resources, was finalised through the provision of a GIS-web viewer which is accessible via the Sextant data server (<http://sextant.ifremer.fr/fr/web/granulats-marins>). This gives a broad public access to the results of the study conducted over nearly ten years (reports, maps, display and downloading of data).

In 2014, following on from the work carried out in the study on marine aggregates, the Marine geoscience unit coordinated Ifremer's intervention to support the Ministry, to determine the zones of “least constraint” or “least impact” in the framework of the national strategy on terrestrial and marine aggregates. The project should lead to the creation, by the end of 2015, of a methodological guide to drawing up a sustainable management plan for marine aggregates for each seafront.



> Excerpt from the Sextant website devoted to the study of marine aggregates

Atlantic sulphides permit

Upon the request of the French government, on 18 November 2014, Ifremer signed a fifteen-year contract for the exploration of poly-metallic sulphides in the North Atlantic zone with the International Seabed Authority. The first of the research cruises (Bicose) took place in the zone during the year (see page 45).

Quality control and health safety of agricultural and food products



The Rephy network: thirty years of observation and monitoring of phytoplankton and phycotoxins on the French coast

The Rephy network for observation and monitoring of phytoplankton and phycotoxins celebrated its thirty years of existence in 2014. Although Rephy came into being due to a public health event in 1984 (food poisonings by toxins present in shellfish), the network is also specialised in knowledge about phytoplankton populations on the coast, thus leading to a dual-component network focusing on environment and health.

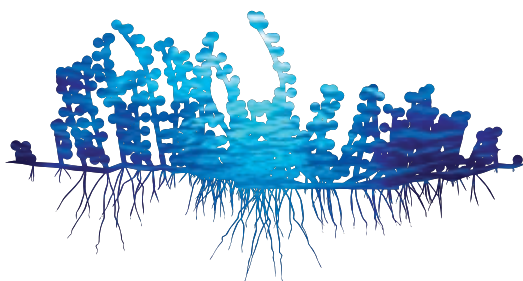
In following years, the implementation of a national databasing strategy for coastal data then made it possible to store all the data acquired by Rephy, developing a database with a great wealth of data over time.

For its thirtieth anniversary, the Rephy network days event was held at Ifremer's Atlantic centre in Nantes on the 1st and 2nd October 2014. Over one-hundred-fifty people interested by phytoplankton and phycotoxins issues were there: Rephy speakers, researchers, supervisory authorities, national and regional partners, and shellfish farming and fisheries professionals. The presentations addressed the environmental and health issues Rephy works on, particularly that of paralytic toxins produced by *Alexandrium*, and the related research projects.



RESP²ONSable (shore fishery health risks & communications)

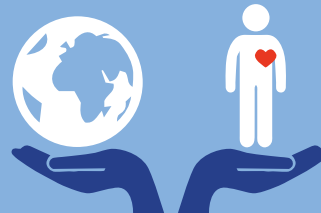
This pilot project for public health, whose on-line website is devoted to communicating about the health risks incurred on the scale of Brittany, meets a strong societal demand, in a context of renewed interest in recreational shore fishing. The website (www.pecheapied-responsable.fr) disseminates comprehensive and standardised information to the general public about the health monitoring conducted by Ifremer and the regional health agency (ARS) in Brittany. In 2014, action to further develop the RESP²ONSable website continued. Numerous communication activities were conducted to make the website better known and increase the number of visitors.



KNOWLEDGE ABOUT COASTAL PHYTOPLANKTON POPULATIONS



DUAL-COMPONENT NETWORK FOR HEALTH AND ENVIRONMENT



Making information available



Sextant-Indian Ocean: a multi-partner and multi-project infrastructure

The marine directorate for the southern Indian Ocean (DMSOI) has worked with Ifremer to implement joint management of geographical references which are relevant for studying the coastal and maritime domains, bringing together all the public-sector players working on the themes in question. Sextant Indian Ocean is an interoperable system which is compatible with the Inspire directive. It enables the exchange of geographical data with most State bodies and services (DEAL, DMSOI, etc.), the institute's numerous scientific partners, marine environmental managers (AAMP, RNMR, TAAF) and with the major national producers of data like IGN, SHOM and BRGM.

BUSINESS DEVELOPMENT, SUPPORTING THE ECONOMIC SECTOR



In 2014, the business development division launched a strategic analysis of the various potential fields for the institute to generate value through developing business. The study was based on a co-construction approach where scientific and technological teams worked closely together, and it has fulfilled two main objectives:

- to map Ifremer's heritage (know-how, expertise, equipments and infrastructures, industrial property and patent rights), whether or not they have given rise to valuable utilisations to date, into value chains and sub-chains, then fields of activity. The latter were then analysed with respect to Ifremer's assets and potential for related business development (market attractiveness);
- and to characterise the fields of activity identified as having high priority through interviews with public and private sector stakeholders, contributions received from or interviews with willing members of Ifremer's technical and industrial, and finally through dedicated analysis and investigation in order to formalise the first action plans.

Industrial offers, services and partnerships



The preliminary results provided a synoptic vision of Ifremer's situation as the basis for ranking the main fields and choosing priorities. This work will continue over the year 2015, in conjunction with the technical and industrial committee and public- and private-sector partners at both regional and national levels. It is necessary to talk with all these players in order to draw up roadmaps relating to the targeted sectors or value chains' requirements. Studies carried out within Research alliances will also underpin this approach.

■■■ Carnot-Ifremer-Edrome institute

In partnership with two other Carnot institutes (Irstea and BRGM), the Carnot Ifremer Edrome institute has participated since 2012 in the environmental strand of the Captiven project (sensors and data for environmental quality of water and soils). The project has four-years of ANR funding, and enables resources, means and skills to be pooled in the field of environmental metrology. It aims to grow the visibility of a joint offer through a one-stop-shop approach mostly intended for SMEs, but above all to consolidate partnerships with



>Captiven showroom

© Ifremer/O. Dugornay

new SMEs and to develop transfer contracts (for cooperation or licensing based on intangible assets). This arrangement provides a complementary offer in groundwater, surface water and marine and coastal water environments. 2014 was also marked by continuing action to enhance the visibility of Ifremer Edrome technologies and platforms. To this end, the showroom devoted to the Captiven project which is located at the Brittany centre was inaugurated on 13 February 2014 with some forty guests in attendance.

Actions to prospect potential industrial partners increased in 2014, for instance based on instrumented buoys to monitor the quality of industrial and river waters or automated sampling and measuring systems for environmental monitoring. There were also actions taken to present the industrial sector with Ifremer's technologies and to seek synergies with SMEs so that agreements for licences or transfers of know-how can be concluded. Several market studies will give us better visibility about possible openings for some technologies, like Chemini (*in situ* chemical analysers), Mastodon (*in situ* pressure and temperature sensors), anti-fouling know-how and automated pumping systems to take samples.

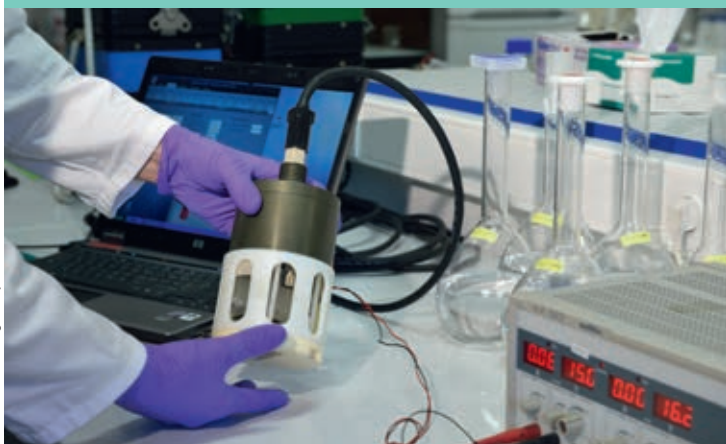
Transferts/licences

Underwater technologies

Following a contract of collaboration for Seaexplorer signed in 2007 with the ACSA company and other partners, aiming to develop an underwater glider, in 2014 Ifremer sold ACSA a licence to manufacture and commercial operate one of this underwater glider's technological building bricks.

Ifremer also sold the Prolexia firm a licence to operation and commercialise the Mimosa software package, which provides mission management for autonomous underwater vehicles.

Cooperation between Ifremer and the NKE company is growing stronger. The licence concerning Arvor and Provor floats was also extended, seeing the commercial success of these products. Likewise, Ifremer is negotiating with the NKE firm to sign a licensing agreement for the Navloc beacons developed by Ifremer during the Recopesca project, which enable fisheries fleets to be geolocated.



© Ifremer/O. Dugornay

> NOSS (Nke Oceanographic Salinity Sensor) in the test phase

Aquaculture

In the perspective of Ifremer's withdrawing from the production of tetraploid oyster broodstock as of January 2017, discussions are underway with all of the French hatcheries holding licences on Ifremer's patent for obtaining this broodstock, in order to strike an agreement on the sale of this patent.

■■■ Milestones

Framework agreements

Multi-themes

DCNS and Ifremer signed a cooperation framework agreement in early March 2014. It has three main strands:

- The first aims to support innovative technological cooperation, such as developing ships of the future or electrical systems which work in the marine environment.
- The second one's objective is to develop collaborative exploratory projects for sustainable utilisation of marine resources.
- Lastly, the third strand is designed to facilitate both partners' access to facilities and equipment onshore or at sea.

This framework agreement has already led to collaboration in the field of underwater technologies in 2014.

Contracts for collaboration

Marine renewable energy sources

A PH4S contract for collaborative work was signed in 2014 with the Geps Techno SAS, STX France Solutions SAS and Mecasoud SAS firms, with the goal of developing a hybrid system to produce electricity using four marine renewable energy sources: waves, tidal stream, wind and solar.

A Cifre grant agreement was also signed with GEPS Techno to experimentally and numerically model a marine energy converter system.



© Ifremer/O. Dugornay

> Marel buoy, Geps Techno buoy and the tidal range tower (pumping seawater) on the Saint-Anne concession (Ifremer Brittany centre)

In the framework of the France Énergies marines institute for energy transition, a collaborative project called Gydro was conducted in partnership with the EDF and DCNS companies. It consists in developing a protocol designed to ensure efficient monitoring - in environmental and societal terms - of the setting up and operation of tidal stream technologies in French coastal areas.

The Aestus cooperation project was launched in the France Énergies marines ITE framework in 2014, in partnership with the Alstom, DCNS, EDF, IXSurvey and OpenOcean companies. The objective is to develop the tools and procedures needed to acquire knowledge about turbulence for tidal turbine technologies.

The Marlin project, whose partnership covers DCNS, France Énergies marines ITE, the regional councils of Pays de Loire, Reunion and Martinique and the University of Reunion, was selected by Ademe in 2014 in the frame of the "Low carbon energies" part of the investments for the future programme. Its aims are to master a technological challenge for ocean thermal energy conversion, i.e. qualification of a deep-sea pipe (piping cold water at a depth of one kilometre), and improving heat exchanger performances.

Underwater technologies

A contract for cooperation called Syvie, whose objective is to develop a system to prepare, plan, simulate and supervise new generation multi-drone missions, was signed in 2014 with the Prolexia and DCNS companies.

Marine biotechnologies

A contract for cooperation was signed at the end of the year with one of the leaders in cosmetic ingredients, aiming to perfect a process to produce polysaccharides through bacterial fermentation. A vast study to find partner operators was made on the institute's portfolio of patents and on its hydrothermal collection. This has led Ifremer to reposition its strategy for filing patents with respect to the expectations of the industrial firms prospected and the capability in-house to provide the indispensable proof of concept.

Services

Underwater technologies

AUV-Docking work was done on behalf of DCNS in 2014. This project has accelerated the development of homing systems to guide and stow underwater drones. Whether they are used in naval defence or in seafloor exploration, underwater drones are, more than ever, high-tech tools serving knowledge: exploring seabeds or monitoring the environment for civilian purposes, reconnaissance of an operational theatre and intelligence for military purposes.



Testimonial

Bernard PLANCHAIS,
delegate general director of DCNS

"There was a remarkable climate of cooperation between the teams of DCNS and those of Ifremer and it was certainly a determining factor in the success of the trials and our compliance with scheduled deadlines and keeping to the allocated budget. Throughout the project, DCNS was able to appreciate Ifremer's experience as regards AUVs. To our knowledge, the operation accomplished was a world first."



Spin-offs

In developing spin-off activities, Ifremer showed its support for the project to create a start-up proposed by Elefterios CHALKIADAKIS (who defended his PhD thesis in November 2013, in the framework of the biotechnology laboratory in Brest working on marine molecules) developed to commercialise original bacterial exopolysaccharides from atolls in New Caledonia. A technical, legal and economic feasibility phase remains for the project, which has been incubated within the Adecad structure since May 2014.



STAKES FOR THE SEA, STAKES FOR SOCIETY



© Ifremer/L. Artzner

In a context where the scientific community is increasingly asked to share its work and outcomes with the largest possible audience, developing the scientific and technical culture has become an Ifremer priority in itself.

Throughout the year, actions were conducted to disseminate knowledge in the field of marine sciences to a broad range of audiences.

Ifremer, an actor in scientific and technical culture

+ 900,000



visits to website

+ 27%

3,909



followers on Twitter

+ 74%

1,472



subscribers on Facebook

+ 140%

In 2014, the institute's scientists or engineers gave a large number (several per month) of lectures on every field where Ifremer has expertise.

Likewise, the rate at which the institute's website has been updated and supplemented has risen, in turn leading to a rise in the number of visits. The use of social networks to communicate with the general public has also been developed.

Ifremer took part in many projects using its exceptional photo and audiovisual collection: working with players in publishing and the media, loaning our photographic exhibits or taking part exhibition projects with CCSTI cultural centres, museums and local authorities. The exhibitions on "biodiversity of the invisible: microalgae, friends or foes" and "the Mediterranean: from A to Z". Marine and underwater viewpoints, by Ifremer, were created in 2014 and were also published as a series of postcards.

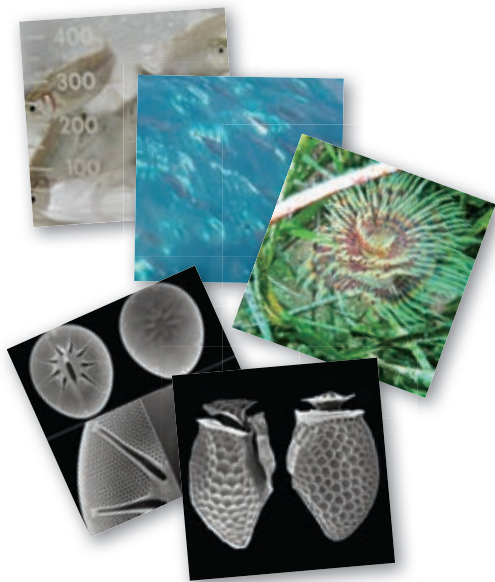
2014 marked the institute's thirtieth anniversary. For the occasion, a six-page section was produced in partnership with *La Recherche* magazine. It reported on the institute's past activities and outlined the perspectives for coming years.



■■■ A policy for exhibitions and cooperation with centres for scientific and technical culture and cultural initiatives by territorial authorities

Through photo and theme-based exhibitions, Ifremer took part in various occasions and events:

- the exhibition on “Women and seas” at the “Photo de mer 2014” festival from 4 April to 4 May 2014 in Vannes and at the sustainable development centre in Rezé, from 3 to 28 June 2014,
- the exhibition on ‘life in the deep sea’ in the framework of the 2014 “Les Océaniques” festival at Saint-Quay-Portrieux and during the final conference on the collective scientific expert assessment (ESCo) on the environmental impacts of exploiting deep-sea mineral resources,
- The Mediterranean: from A to Z. “Marine and underwater viewpoints, by Ifremer”, went on show for the first time at the World festival of underwater pictures in Marseille.



Ifremer also brought its support in setting up:

- the new permanent area “At sea, aboard *Thalassa*” at the Nausicaa centre in Boulogne-sur-Mer, devoted to the Ifremer vessel *Thalassa* which lets visitors experience an ocean research cruise in the English Channel. An exceptional showcase for the research our institute conducts in the field of fisheries science, this exhibition is the outcome of strong cooperation between Ifremer and Nausicaa.



© AS.Filament - Nausicaa

> The Institute's thirtieth anniversary

- the “Mission Odyssee” permanent display at the Mare Nostrum aquarium in Montpellier,
- the travelling exhibition «Oceans and men» in partnership with Océanopolis, presented for the first time at the Museum of natural history in Marseille,
- the new permanent exhibition at the Maison de la Pêche museum in La Turballe harbour,
- the «a whole world beneath the sea» exhibit at the *Villa Méditerranée* in Marseille,

■■■ A sustained contribution to audiovisual production

Amongst the year's interventions made, a few examples given here illustrate our wide range of fields of action.

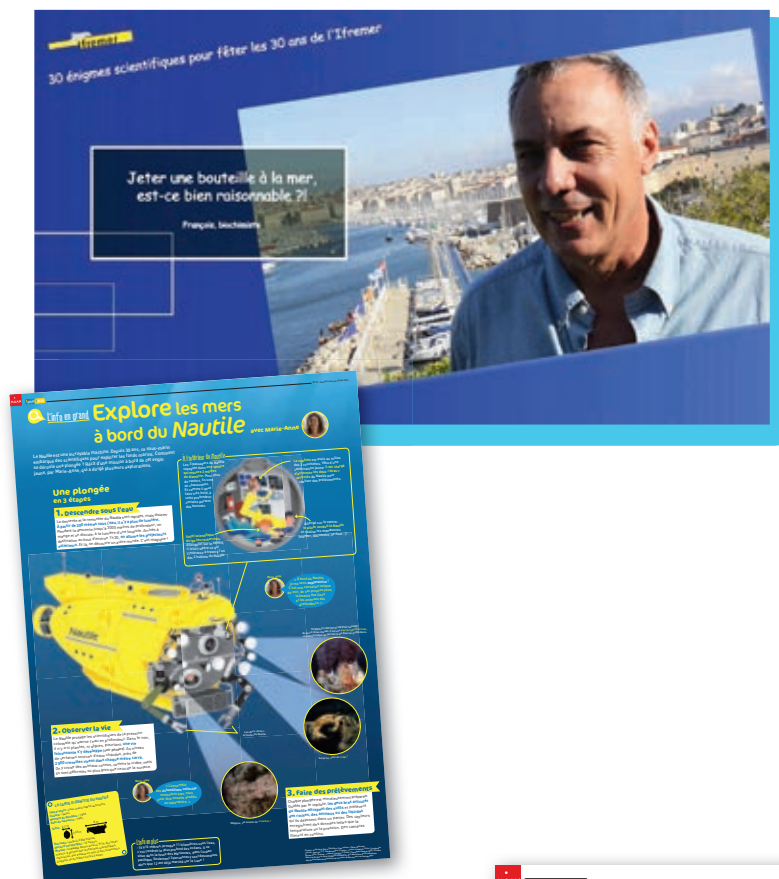
Several teams of reporters were welcomed to Ifremer's sites to prepare TV reports about the research carried out by the institute. For instance, the Ifremer Brittany centre received the team from *X:enius*, a twenty-six minute magazine-style popular science show broadcast by *Arte* TV, three times for programmes dealing with deep-sea exploration, marine renewable energy source and bio-composite materials. Ifremer also took part in two programmes of the *Thalassa* “magazine of the sea” show on the public TV channel *France 3*: on 3 October, the special on “Sète in the Mediterranean” aired an interview with Sylvain BONHOMMEAU about bluefin tuna and on 7 November, a portrait of the engineer Peter DAVIES was shown in the *Thalassa* programme devoted to “Brest, gateway to the Atlantic”.

Ifremer contributed to the production of the “*Abysses, les alliances des profondeurs*” documentary film on the abyssal plains which was an Ifremer/CNRS/Bienvenue Production co-production aired in September on *France 5*. A special preview showing took place at the Ifremer centres on 5 June, the anniversary date of the institute's creation.

Likewise in the context of Ifremer's thirtieth anniversary, a series of video clips dubbed "30 years of science and technology at Ifremer, now that calls for a celebration!" was launched. "Is it wise to throw a bottle in the sea?", "Have fish got guts?", or "Are microalgae really a big thing?!" are a few examples of the quirky and off-beat questions that scientists from Ifremer were asked to answer in a few minutes' time. The videos were first broadcast on Ifremer's intranet site where they were a great success with the employees, and were then put on line on our institute's web TV site.

The nine conferences for the general public were organised by the Brittany centre on the institute's themes were also put on the web TV site, thus broadening their audience.

Finally, a film about microplastics has been added to Ifremer's documentary collection, on a subject that holds great meaning in the marine field as the scope of this pollution is progressively discovered.



Working for young people and schoolchildren

This year, one hundred-sixty fourth-form (8th grade) students benefited from the "discovery courses" held in various Ifremer centres for periods of three to five days, and several groups of high school students accompanied by their teachers were able to visit the laboratories.

Ifremer's participation in various training and job fairs (*Métiers de la Mer*, *Azimuth*, *Place Ô gestes*) gave tangible feedback about the paths of study and access to research sectors, raising awareness of young people at school and university levels about scientific studies and careers.

Adding to the scope of the initiatives regularly undertaken by the different centres of our institute in the framework of the nationwide science festival *Fête de la Science*, Ifremer and MNHN organised an Open House at the marine biology station in Concarneau. Nine hundred visitors, three hundred-seventy of them schoolchildren, discovered this site full of character and the scientists' research work, through educational workshops and lectures.

In 2014, Ifremer joined the internet portal of the National education system at www.eduthèque.fr, which provides access to a very large number

of educational resources and material from some thirty scientific and cultural partners. Ifremer's site on the *Éduthèque* portal was supplemented by over two hundred resources for teachers, which can be made part of educational and learning scenarios.

The second «Sea-Education» summer course session launched by LabexMer, was created in close collaboration with Ifremer and other partners in the project, especially UBO and Océanopolis. From 25 to 28 August 2014, it was attended by fifty secondary school teachers for the "coordinated path of study" courses to discover scientific approaches and tools which they can use in their own innovative and interdisciplinary educational projects.

Ifremer has forged a partnership with the *Jeunesse Bayard/Milan* publishing houses. It led to the publication of an issue of *1 Jour 1 Actu*, for children aged eight to twelve, entirely devoted to the sea in the framework of World Oceans Day and a poster produced on life in the abyssal plains for use by primary school teachers. The partnership was complemented by a contest for drawings on the theme "Imagine life in the abyssal plains" which was open to the young readers of *Astrapi* magazine during Ifremer's Bicosse oceanographic cruise. The drawing by the winner of the «Special jury's prize» was the inspiration for the institute's 2015 New Year's greeting cards.



■ ■ ■ Taking part in the public debate

Ifremer is regularly invited to come and present its results and discuss the state of knowledge.

The forum organised by the FFP fisheries sector association, held in Paris on 19 and 20 November 2014 in relation with social and professional circles, was a good example of exchanges between all of the stakeholders on fisheries, knowledge about resources and management measures implemented by the European and national authorities. Ifremer was there and exercising its remit, participating in the «Fisheries in 2050?» round table discussion, speaking on the theme of banning discards and on the analysis of a changing environment's consequences for fishermen and presenting its studies on fisheries gear selectivity.

” 5,400 citations in the media



■ ■ ■ A novel initiative, following the Bicose cruise

This cruise took place from 10 January to 11 February 2014, along the Mid-Atlantic Ridge, with a multidisciplinary team of scientists, research faculty and staff from Ifremer, UPMC and MNHN aboard the RV *Pourquoi pas?*. The communications role was to give the general public the opportunity to discover an oceanographic cruise, from the dual viewpoint of the science and of life aboard.

This was done with an original approach via an interactive blog (<http://blogs.ifremer.fr/bicose/>) and a Facebook page (<https://www.facebook.com/campagnebicose>) let users keep up with the unfolding mission and the various activities aboard, on a daily and concrete basis. Internet users also had the possibility of asking scientists questions via a special space on the blog.

Live from RV *Pourquoi pas?*, a “Night of the abyssal plains” event was organised on 28 January at Pierre & Marie Curie University in Paris and at the Ifremer centre in Brest. A link was established with the ship, enabling a few scientists from the mission to briefly present their work and answer live questions from the public for over forty minutes. A twenty-minute film excerpt of a dive by the underwater vehicle *Victor 6000* on the Snake Pit hydrothermal site was also shown and commented on by scientists who were present in the lecture theatres.

Everything was rebroadcast live on the UPMC website, followed by 1,500 people who logged on to follow the evening event.

The blog also received broad media coverage and was consulted over 20,000 times during the cruise and is still consulted today (approximately 800 visitors per month).

+ 50

PRESS RELEASES
AND PRESS KITS
DISTRIBUTED

+ 700

STILL PHOTOS
AND FILM IMAGES
SUPPLIED





© Ifremer/M. Gouillou

> Direct link with research vessel Pourquoi pas? from the conference room at Ifremer's Brittany centre during the "Nuit des abysses" event



■ ■ ■ The institute's editorial policy

Ifremer helped create the Quae economic interest grouping, whose mission is to disseminate scientific and technical culture to an informed public.

During the year 2014, several new publications illustrated the diverse facets of the marine environment. Here are a few selected examples:

- *Plancton marin et pesticides : quels liens ?* (Marine plankton and pesticides: what links?) (Geneviève ARZUL and Françoise QUINIOU, collections Synthèses, 128 pages)
- *Bactéries marines et biotechnologies* (Marine bacteria and biotechnologies) (Jean GUÉZENNEC, collection Carnets de sciences, 176 pages)
- *Géants des profondeurs* (Giants of the deep) (Ángel GUERRA and Michel SEGONZAC, collection Carnets de sciences, 144 pages)
- *Anatomie curieuse des vagues scélérates* (Curious anatomy of freak waves) (Michel OLAGNON, collection Carnets de sciences, 176 pages).

In addition, Ifremer ensures the distribution of these publications by promoting meetings between the authors and the public at various events and in book promotions on local and national radio and TV.

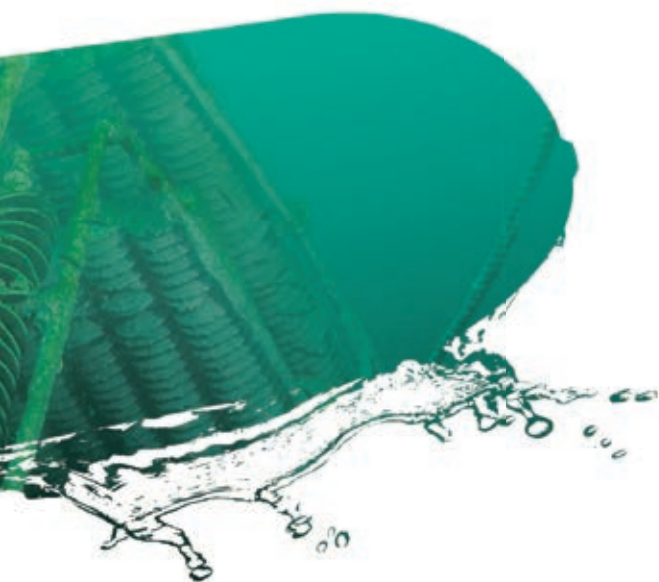


IFREMER ON THE MOVE



With the aim of making the best use of its resources and using them to serve its scientific output, Ifremer engaged in the upgrading of its financial and human resources information systems, with the first step completed in 2014 and the renewal of the human resources dimension. Improving in-house practices to make our institute operate more efficiently is one of the objectives set out in the State-Ifremer contract for 2014-2017.

Life at Ifremer



■ ■ ■ An approach to continuously improve financial management

For several years now, our institute has undertaken to modernize its administrative and financial practices in order to account for its activities as accurately as possible, while enabling more efficient steering of various activities on a daily basis.

■ ■ ■ Certification of the accounts

Although Ifremer is not subjected to any regulatory obligations to this end, it wants to ensure that its accounts are certified. The institute's 2013 and 2014 accounts were approved by the board of directors and certified by the Statutory Auditors. From one year to the next, the monitoring system has been strengthened, with the implementation of a progress plan which provides strong foundations for the upgrading of the management systems.

■ ■ ■ Preparing the implementation of the 7 November 2012 order

Like all State-owned or public institutions, Ifremer is subject to the obligations set out in the November 2012 order on public-sector accounting and budgetary management. This order provides for significant adaptations in the way the institute's accounts are presented, as well as the obligation to submit its accounts by a much shorter deadline. This will represent a substantial effort for Ifremer just when its management information system is being entirely revised. An action plan to this effect was presented to and validated by the Board of directors. It will enable the required means to be deployed progressively and the objectives set for the institute to be fulfilled.

■ ■ ■ Preparing the deployment of the new integrated management software package

Ifremer's accounting and financial information system was becoming outdated, so the institute made the decision to renew it. This should also provide the means to meet the requirements from the State and various stakeholders in terms of turning in financial information. A project launched in 2013 led to SAP software being chosen as the basis of the future system. More particularly, the year 2014 was devoted to identifying and clarifying the institute's main financial processes to enable the eventual move to this new software, which will require significant training efforts for the entire staff of our institute.

2014 budget and financial figures

■ ■ ■ Pursuing the work to professionalise budgeting and financial activities

Modernising the administrative and financial practices of the institution entered the operational phase, firstly with the teams' investment in preliminary work for qualification and the deployment of the new integrated management software suite. The initial studies run formalised the internal management processes to prepare their integration in the SAP software.

In relation with the contract of objectives, work was carried out in several major projects in 2014, specifically work to list the sources of funding (SCSP subsidies for public service charges and own resources) and how it is used by type of activity (monitoring and support for public policies, expert assessments, research) and starting the revision of the total cost assessment methodology.

The year was also spent by the implementation of new procedures in order to cope with the tighter budgetary constraints the institute is facing, i.e. identifying the operational base, optimising expenditure and optimal allocation of resources.

After examining the 2013 accounts, the Statutory Auditors had expressed a reservation about operations earmarking fixed assets. The teams have endeavoured to correct this situation since the start of the second semester. The studies conducted and reports drafted were submitted to the Statutory Auditor to justify this reservation being lifted.

→ 2014 financial year

The main elements of financial performance for the 2014 budget were:

- The profit and loss account shows a credit balance of M€ 2.64. This negative balance is the result of costs reaching 185.7 million euros for deferred revenues amounting to 190.95 million euros. The rate of utilisation of the commitment appropriations made available to teams was 98.11%. The deferred income for the financial year (M€190.95) represents 99.48% of the estimated expenditure budgeted for (M€191.94).
- The difference between the means mobilised by the institute to help finance facilities and investment operations and investment spending as of 31 December 2014 amounted to 1.13 million euros. This balance is the result of investment expenses of 19.15 million euros, for 20.27 million euros of resources established. The level of resources established at the end of the financial year (M€ 20.27) takes the raising of a budgetary reserve of +1.50 million euros in December 2014 into account.

The implementation rates for spending and equities show the efforts made to control costs and that a dialogue for efficient management is progressively being put into place.

In 2013, the institute had ended the year with a deficit of -1.34 million euros. The result was positive for the 2014 financial year, but although this improves the institute's situation, the main observations formulated over the past three years concerning Ifremer's tight financial circumstances still hold true. Indeed, several factors contributed to this amelioration, in part due to the context (certain projects postponed, special effort made for revenue collection, controlling management and reducing costs, controlling payroll costs, etc.).

Thus the 2014 financial year should be appraised from a multiannual perspective, with the associated development of projects. Moreover, the 2015 budget structure, corresponding to a significant drop in own resources and expenditure down by 9.14 million euros from the original 2014 budget appropriations, should be borne in mind.

■ ■ ■ Consolidated resources

Ifremer's total assets for 2014 amounted to 234.48 million euros, which is an increase of +3,30% from 2013 (M€226.99). Not including internal transactions, these resources reached 211.22 million euros, indicating a trend of +8.86 million euros (+4.38%) between 2013 (M€202.36) and 2014.

As concerns the trend for these subsidies for public service charges/ headings III and transfers/ headings VI, the following main points should be mentioned:

- The SCSP subsidy received under the State programme 187, under the aegis of the Ministry of higher education and research (MESR) was set at 149.38 million euros. Between 2013 and 2014, the SCSP increased by 2.02 million euros, i.e. up 1.33%. This trend is mainly due to the amount of earmarked appropriations reserves. However, withdrawals made on these reserves at the end of the year compensated for this effect.

- The funds allocated by the Ministries in charge of the Environment and Agriculture, under the 205, 206 and 113 programmes and funding agreements, went from 7.18 million euros in 2013 to 7.85 million euros in 2014; the change being mostly due to the implementation of the "Fishing gear selectivity" programme sponsored by the division charge of fisheries.

In terms of contractual resources (M€51.15 under adjusted scope, i.e. not including financing related to the performance of programmes 113, 205 and 206), the following aspects can be noted: equities were on the rise with respect to 2013 (+M€7.52). This is particularly due to the cyclical aspect of these assets, a shift from 2013 to 2014 for some contractual resources in the framework of public-private sector partnerships and an effort to increase the co-financing of the institute's operations

2014 approach:

from forecast to performance

(in euros)

							2014 Trends Forecast AB2 / Performance	
CONSOLIDATED RESOURCES	EPRD 2014	% of total	AB2 2014	% of total	Performance 2014	% of total	in volume	in %
Programme 187: Research in the field of environmental and resource management	146,788,876	59.52 %	149,595,042	59.16 %	149,384,424	63.71 %	-210,618	-0.14 %
Programme 113: Landscapes, water and biodiversity	150,000	0.06 %	150,000	0.06 %	150,000	0.06 %	-	-
Programme 205: Maritime safety and affairs, fisheries and aquaculture	1,850,000	0.75 %	1,850,000	0.73 %	1,850,000	0.79 %	-	-
Programme 206: Food safety and health quality	2,500,000	1.01 %	2,485,791	0.98 %	2,485,791	1.06 %	-	-
Programme 172: Multidisciplinary scientific and technological research	111,382	0.05 %	111,382	0.04 %	111,002	0.05 %	-380	-0.34 %
Available resources on Subsidy grants for Public Service charges, Titles II and Transfers Titles VI	151,400,258	61.39 %	154,192,215	60.98 %	153,981,217	65.67 %	-210,998	-0.14 %
Contractual resources	52,279,279	21.20 %	55,727,158	22.04 %	54,515,483	23.25 %	-1,211,675	-2.17 %
comprising Contractual resources NOT INCLUDING subsidies under programmes 113, 205 and 206	50,504,819	-	52,411,363	-	51,149,119	-	-1,262,244	-
of which subsidies in addition to transfers / Titles VI	1,774,460	-	3,315,795	-	3,366,364	-	50,569	-
Self-financing capacity	865,000	-	865,000	-	863,069	-	-1,931	-
By using the Institute's working capital	1,860,830	-	1,860,830	-	1,860,830	-	-	-
TOTAL RESOURCES AVAILABLE not including internal transactions	206,405,367	83.70 %	212,645,203	84.10 %	211,220,599	90.08 %	-1,424,604	-0.67 %
Net book value of assets written off (internal transactions)	500,000	0.20 %	500,000	0.20 %	58,451	0.02 %	-441,549	-88.31 %
Depreciation expenses (internal transactions)	39,700,000	16.10 %	39,700,000	15.70 %	23,199,146	9.89 %	-16,500,854	-41.56 %
TOTAL RESOURCES AVAILABLE	246,605,367	100.00 %	252,845,203	100.00 %	234,478,196	100.00 %	-18,367,007	-7.26 %

■■■ 2013-2014 evolution

(in euros)

CONSOLIDATED RESOURCES	Execution 2013	in % of total	Execution 2014	in % of total	Evolutions 2014	
					in mass	in %
SCSP / Heading III : Research in the field of environmental management	151,399,952	66.70%	149,384,424	63.71%	-2,015,528	-1.33%
TRANSFERT / Heading VI : Landscape, water and biodiversity	1,647,488	0.73%	150	0.06%	-1,497,488	-90.90%
TRANSFERT / Heading VI : Maritime safety, fishery and aquaculture	2,067,712	0.91%	1,850,000	0.79%	-217,712	-10.53%
TRANSFERT / Heading VI : Food safety and health	3,469,608	1.53%	2,485,791	1.06%	-983,817	-28.36%
SCSP / Heading III : Multidisciplinary scientific and technological research	149	0.07%	111	0.05%	-37,507	-25.26%
Resources available from public service charge Headings III and Headings VI	158,733,270	69.93%	153,981,217	65.67%	-4,752,053	
Contractual resources	43,624,427	19.22%	54,515,483	23.25%	10,891,056	24.97%
incl. Contractual resources not incl. programmes 113, 205 and 206	-	-	51,149,119	-	7,524,692	-
incl. Subsidies supplementing transfers	-	-	3,366,364	-	3,366,364	-
Cash flow self-financing	-	-	863	-	863	-
Drawn on working	-	-	1,860,830	-	1,860,830	-
TOTAL AVAILABLE RESOURCES Not incl. Internal	202,357,697	89.15%	211,220,599	90.08%	8,862,902	4.38%
Net book value of assets written off internal	78	0.03%	58,451	0.02%	-19,827	-25.33%
Provisions expenses (internal)	24,559,067	10.82%	23,199,146	9.89%	-1,359,922	-5.54%
TOTAL AVAILABLE RESOURCES	226,995,042	100.00%	234,478,196	100.00%	7,483,154	3.30%



Consolidated expenditure

With regard to these means, Ifremer's consolidated expenditure for 2014 amounted to M€ 230.71. Not including internal transactions, spending reached 207.45 million euros, i.e. up +3.76 million euros between the two financial years. This corresponds to an increase in the

running costs of +2.44 million euros, reflecting a slight rise in staff costs (+M€ 0.84) in spite of the drop in the number of employees and more activity for the oceanographic fleet. The significant efforts made to control spending should also be mentioned, with a drop of nearly 1 million euros on the logistics strand.

Overall expenditures

(in euros)

	BP 2014	BR 2014	Realization 2014	Part of the expense item on the total expenditures executed (in %)	Evolutions prevision/ execution 2014	
					in mass	in %
Personnel expenditures	111,160,000	110,276,594	109,207,998	52.64%	-1,068,596	-0.97%
Fleet-related	42,192,222	43,023,222	42,707,565	20.59%	-315,657	-0.733%
Expenditure related to scientific	30,994,287	35,937,549	35,410,111	17.07%	-527,438	-1.47%
Logistic resources	15,450,193	15,247,220	14,146,485	6.82%	-1,100,735	-7.22%
Support	3,383,541	3,615,494	3,197,971	1.54%	-417,522	-11.55%
Cross-cutting	2,360,124	2,180,124	1,919,912	0.93%	-260,212	-11.94%
Depreciation-share of	865,000	865,000	863,069	0.42%	-1,931	-0.22%
TOTAL (NOT INCL. INTERNAL)	206,405,367	211,145,202	207,453,112	100%	-3,692,091	-1.75%
Personnel (Ifremer + Genavir)	130,770,800	131,161,594	131,270,087	63.28%	108,493	0.08%

	Realization 2013	Percentage of the total executed expenditures (in %)	Realization 2014	Percentage of the total executed expenditures (in %)	Evolutions 2013/2014	
					in mass	in %
Personnel expenditures	108,363,218	53.20%	109,207,998	52.64%	844,780	0.78%
Fleet-related	38,307,334	18.81%	42,707,565	20.59%	4,400,230	11.49%
Expenditure related to scientific	35,892,160	17.62%	35,410,111	17.07%	-482,049	-1.34%
Logistic resources	15,289,364	7.51%	14,146,485	6.82%	-1,142,879	-7.47%
Support	3,762,007	1.85%	3,197,971	1.54%	-564,036	-14.99%
Cross-cutting	1,219,931	0.60%	1,919,912	0.93%	699,981	57.38%
Depreciation-share o	862,960	0.42%	863,069	0.42%	109	0.01%
TOTAL (NOT INCL. INTERNAL)	203,696,975	100%	207,453,112	100%	3,756,137	1.84%
Personnel (Ifremer + Genavir)	132,935,149	65.26%	131,270,087	63.28%	-1,665,063	-1.25%

Contractual Operating Resources

(RG 2013 - 2014) and 2014 trends

(in euros)

	RG 2013	RG 2014	Trend 2014/2013 In volume	BR2 2014 (resources under transfers for Headings VI programme, included)	BR2 2014 (NOT incl. transfers for Headings VI programme)	2014 RG and BR2 trends with same perimeter
1 - CONTRIBUTIONS FROM STATE						
• Ministry in charge of the Environment						
- Extraplac	292,647	312,170	19,524	250,000	250,000	62,170
- Other programmes	110,304	182,371	72,067	179,678	179,678	2,693
- PG113 - DEB funding				1,305,000	0	
- PG205 - DPMA funding				980,423	0	
• Ministry in charge of Agriculture (incl. programme 206)	323,345	252,485	-70,859	1,367,088	336,716	-84,231
• Ministry of Defence						
- SHOM: Contribution to operating expenses of RV <i>Pourquoi pas?</i>	4,408,040	3,837,119	-570,922	3,762,500	3,762,500	74,619
- Other programmes	49,046		-49,046			
• Contributions from other ministries	265,906	411,902	145,997	732,161	732,161	-320,259
sub-total (1)	5,449,288	4,996,047	-453,240	8,576,850	5,261,055	-265,008
2 - ANR NATIONAL RESEARCH AGENCY	2,281,938	2,048,292	-233,647	2,471,500	2,471,500	-423,208
sub-total (2)	2,281,938	2,048,292	-233,647	2,471,500	2,471,500	-423,208
3 - EU ORGANISATIONS AND INTERNATIONAL PARTNERS						
• European Union and other international bodies	8,906,681	12,169,628	3,262,947	10,861,640	10,861,640	1,307,988
• European Space Agency	379,498	352,828	-26,670	328,710	328,710	24,118
sub-total (3)	9,286,179	12,522,456	3,236,277	11,190,350	11,190,350	1,332,106
4 - LOCAL AND REGIONAL AUTHORITIES AND OTHER PUBLIC PARTNERSHIPS						
• Region, county and other local and territorial authorities	5,297,650	4,582,461	-715,189	5,693,588	5,693,588	-1,111,127
• Public institutions and decentralised services	4,791,330	3,930,224	-861,107	3,686,846	3,686,846	243,378
• Onema	1,431,200	1,314,234	-116,966	1,221,050	1,221,050	93,184
• EDF	1,271,074	1,484,947	213,873	1,481,318	1,481,318	3,629
sub-total (4)	12,791,255	11,311,866	-1,479,389	12,082,802	12,082,802	-770,936
5 - PRIVATE PARTNERSHIP						
• Business sector/Social-professional sectors	7,600,943	15,073,013	7,472,069	15,841,309	15,841,309	-768,296
sub-total (5)	7,600,943	15,073,013	7,472,069	15,841,309	15,841,309	-768,296
6 - MISC. INCOME	2,881,677	2,303,513	-578,164	2,236,875	2,236,875	66,638
sub-total (6)	2,881,677	2,303,513	-578,164	2,236,875	2,236,875	66,638
GRAND TOTAL	40,291,280	48,255,186	7,963,906	52,399,686	49,083,891	-828,705

32 RECRUITMENTS ON PERMANENT CONTRACT IN 2014

EXECUTIVES TECHNICAL & ADMIN TOTAL



Training

In 2014, Ifremer devoted 2.81% of its payroll to actual spending on further training.

53% of the personnel took advantage of at least one training course or activity in 2014. In all, nearly 20,000 hours of training were provided.

Ifremer's contribution also involves hosting and training young people.

This year, they included 78 PhD fellows, 28 post-docs and 26 sandwich-course contracts.

Lastly, 26 civil service volunteers (VSC) were posted to Ifremer establishments in Overseas France.



The institute's human resource policy

Careful management of human resources at Ifremer for greater rigour and professionalization

Ifremer's total work force as of 31 December 2014 was 1,432 salaried employees, including 128 on short-term contracts.

The breakdown between managerial and technical staff is 60% managers and 40% technicians.

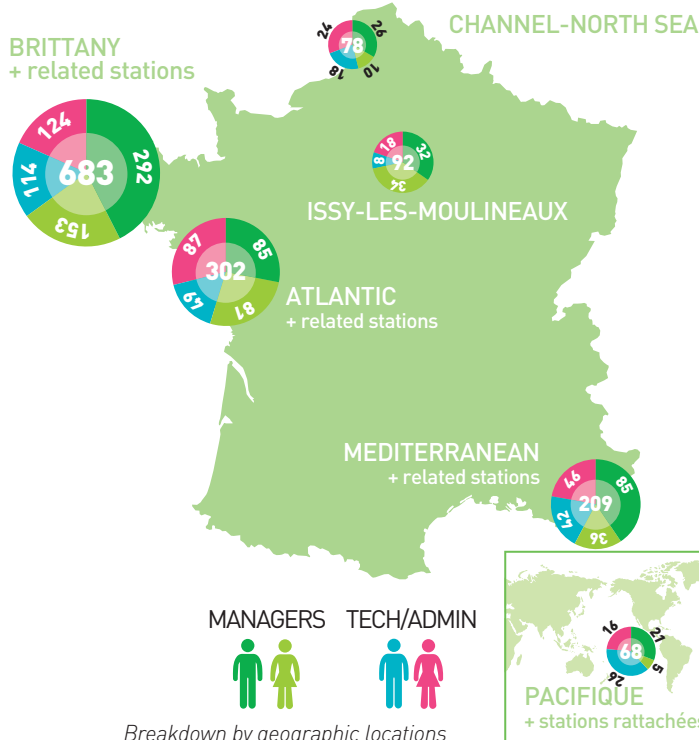
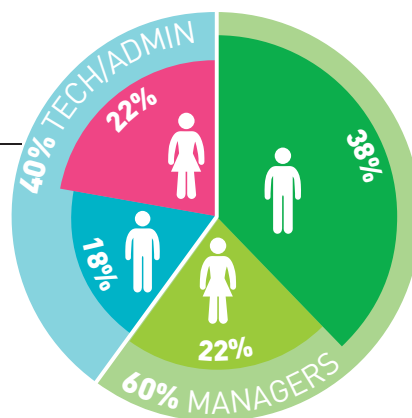
Women represent 44% of the institute's total population.

Half of the salaried employees are over age 45 and nearly a quarter are older than 55.

In a tight budgetary context, Ifremer maintained its recruiting capacity in 2014.

Thirty-two people were hired over the year, 43% of whom were women and 75% managers.

Breakdown by gender and category



Breakdown by geographic locations

Employer-union dialogue

In 2014, there was a renewal of the bodies representing the personnel, following the elections held in March and April: 66 people were elected as members of the various works councils and 91 were elected as staff representatives.

Two trade unions remain representative, i.e. the CFDT and CGT, with the CFDT holding the majority.

Following on from the agreement on the management of older “senior” staff’s careers, signed in 2006 and in compliance with the law of 1st March 2013, an agreement related to the nationwide “generation contract” to promote employment for young people and seniors alike was entered into in April 2014 by Ifremer’s management and the CFDT and CGT trade unions.

It was signed for a three year period and features an operational approach designed to promote the hiring and integration of young people, and keeping seniors in their jobs, particularly through training, and interaction between these two populations by transmitting skills and knowledge.

Modernising management and coordination tools, a necessity for an effective HR policy

The year of 2014 was devoted to preparing the deployment of the new software suite to manage human resources. The model ensures data integrity and strengthens data control capabilities to better steer the institute.

The HRAccess software solution, which merges five existing tools into a single one, will make for more consistent and coherent management of data thanks to information only needing to be entered once and to data traceability.

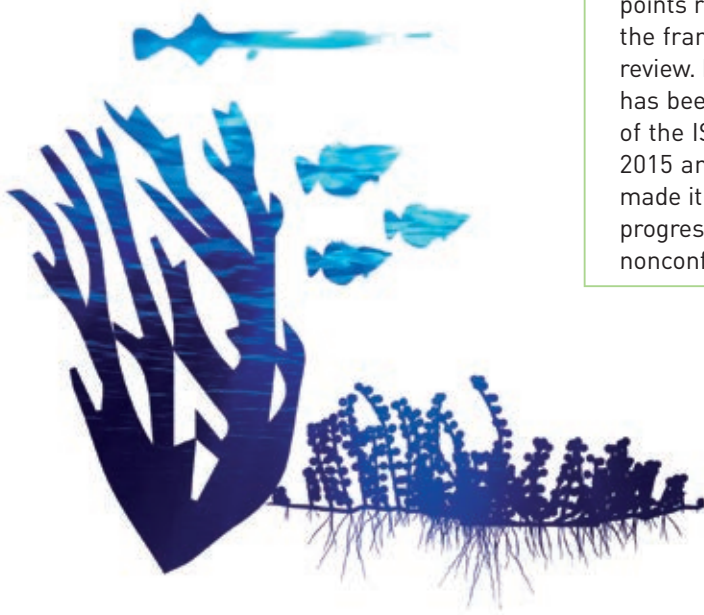
Some processes which are manual today will be automated. Additionally, an “individual employee’s space” is to be opened for all salaried employees, who can consult and update the individual information concerning them.



Maintaining the institute’s ISO 9001 certification

For several years now, Ifremer has been engaged in steps for quality assurance which have been extended to the entire institute. They aim to ensure the reliability and traceability of actions carried out, to promote greater rigour in the management of activities and projects and to give stakeholders, partners and clients of Ifremer assurance of the exacting standards which characterise the way we conduct our actions.

There were important projects led in 2014, like the organisational manual and quality manual being revised and clarified. The principle points raised during previous monitoring audits were dealt with in the framework of an action plan established in the management review. Furthermore, an approach for more advanced risk analysis has been engaged with the perspective of the future 2015 version of the ISO 9001 standard which should be implemented between 2015 and 2018. Ultimately, the audit at the end of the year 2014 made it possible to maintain certification and note the appreciable progress made on several of the audited sites, with only one minor nonconformity found.



■ ■ ■ Sustainable development

Ifremer has been committed over the past several years to sustainable development and mastery of our environmental footprint. The objectives contract between the French State and Ifremer for 2014-2017 sets out a sustainable development approach which structured within the institute in order to consolidate what has already been achieved. This notably means strengthening the link between the quality management system and the efforts made in terms of sustainable development.

Dialogue and discussions continued with the “public institutions sustainable development club” (an emanation from the CGDD general commissariat for sustainable development of the Ministry of Ecology, sustainable development and energy). In this framework, a day of peer meetings and discussions (JRPP) was prepared in 2014 to be held at the Brittany centre on 9 January 2015.

The intranet site devoted to the institute’s sustainable development has been enriched, to raise the awareness of as many staff members as possible about the approach and to make the actions and outcomes known.

A second greenhouse gas emission (GHG) assessment for our institute has just been performed, with calculations based on emissions data for 2013. It follows on from the previously submitted 2012 assessment, which was based on emissions data from 2010. This assessment is compulsory under Article 26 of the so-called Grenelle law for the environment and must be updated every three years. This second detailed report on Ifremer’s emissions identified the main sources of emissions for the different centres as well as for the ocean research fleet.

Scientific research studies’ contribution to sustainable development

Each year, through the Bibliometrics service of the La Pérouse library, the institute runs an analysis of the top ranking publications, and of expert advice and assessment reports related to sustainable development concepts, in order to better evaluate the contribution of our teams and partners in this approach and the way it is dealt with.

In 2014, within Archimer, 330 documents were associated with the Sustainable development theme and as of mid-January represented 16% of Ifremer’s production, irrespective of the type of document (publication, report, expert assessment or advice, book chapter, etc.). Last year, the proportion was 17%.

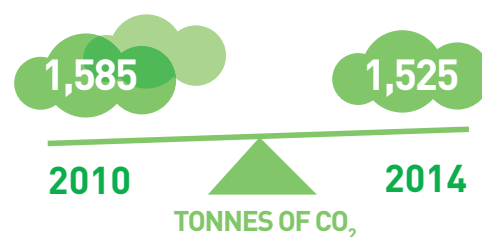
Out of these documents, 146 were articles, of which 103 came from the *Web of Science*. Although the share of these publications in 2014 (20.7%) was lower than in 2013 (22.7%), the proportion of publications related to the Sustainable development theme has been on the rise since 2000. Modelling, in association with themes of biodiversity/ecosystems, fisheries-aquaculture and economics, is the most predominant.

Percentages of collaborative work with national and European partners have stayed relatively stable, whilst they are rising for those with southern countries (17.5% compared to 13.3% in 2013 and 4.2% in 2012) and international partners outside of Europe (37.8% against 30% in 2013 and 28.1% in 2012).

Emissions results broken down by source

The total from Ifremer’s GHG assessment was 1,525 tonnes of carbon (or 5,592 tonnes CO₂ equivalent emissions) broken down between centres and sources, compared to 1,585 tonnes of carbon (or 5,812 tonnes CO₂ equivalent) in 2010, i.e. a stable level of emissions. The total uncertainty for the GHG assessment was 8%. Heating and use of fossil fuels for processes represented 57% of emissions (58% in 2010) and electricity represented 28% (as in 2010).

As in 2012, the GHG emission budget was also calculated for the oceanographic fleet, but this has been set apart from that of Ifremer, seeing the high fuel consumption of the vessels commissioned by Genavir: 5,264 tonnes carbon equivalent were emitted for fuel supplies of the vessels used, compared to 5,916 in 2010. This means that Genavir’s emissions decreased by 514 tonnes (equivalent of the Atlantic and Mediterranean centres together), making a drop of 11% in fuel consumption. They still represent 3.7 times the total of Ifremer’s GHG budget.



Sustainable development week

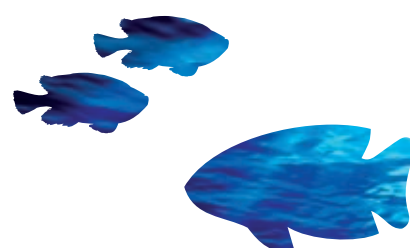
In the framework of this nationwide event, the management at Brittany centre organised a Sustainable development day in Brest. Several organised activities were proposed to inform and galvanize the public, both inside and outside of the institute. An eco-driving initiation was offered and an agreement signed to this effect with the General secretariat of the ministries for equality between French territories and housing and of ecology, sustainable development and energy, in the framework of adult education and vocational training and the exemplary State approach to sustainable development.

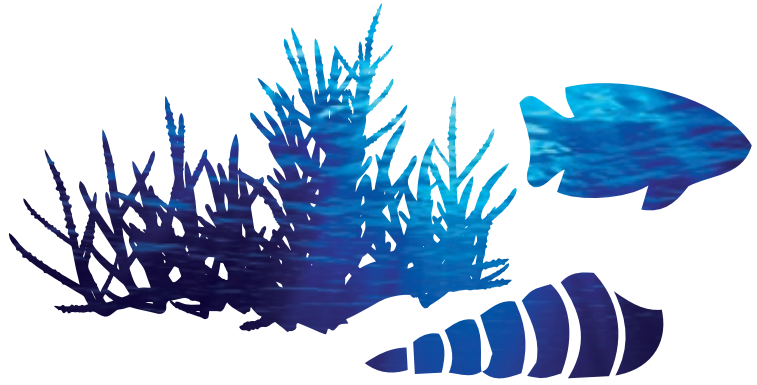
An operation to collect used pens and writing instruments was begun in all Ifremer’s locations, working with Terracycle (<http://www.terracycle.fr/>), whose objective is to collect these objects to recycle them, each object giving rise to two euro-cents being paid to a charity. The monies collected are earmarked for the Dyspraxie France Dys association (<http://www.dyspraxies.fr/>).

FINANCIAL AND ACCOUNTING REPORTS

■■■ BALANCE AT CLOSING BEFORE ALLOCATION OF PROFIT OR LOSS in euros

BALANCE SHEET	FISCAL YEAR 2014			FISCAL YEAR 2013 Net	Trend %
	GROSS	Depr. Prov.	Net		
Capital not called up	-		-	-	
FIXED ASSETS					
Intangible fixed assets	40,103,989.15	30,571,781.24	9,532,207.91	8,376,752.24	13.8
Setting-up and formation expenses	13,270.16	13,270.16	-	1.05	-100.0
Research and development costs	20,000.00	222.22	19,777.78	-	
Concessions, patents, licences, trademarks, processes, software and similar rights	33,695,890.12	30,345,483.37	3,350,406.75	3,826,017.06	-12.4
Purchased goodwill	-	-	-	-	
Other	219,722.16	212,805.49	6,916.67	21,143.63	-67.3
Intangible assets in progress	3,634,759.26	-	3,634,759.26	1,969,340.56	84.6
Advances and prepayments	2,520,347.45		2,520,347.45	2,560,249.94	-1.6
Tangible fixed assets	515,912,871.17	336,469,978.40	179,442,892.77	184,680,807.06	-2.8
Land and developments	7,301,631.47	992,582.66	6,309,048.81	6,260,588.97	0.8
Buildings	114,453,090.75	62,821,626.23	51,631,464.52	54,311,369.17	-4.9
Industrial fixtures, fittings, plant machinery and equipment	127,043,010.49	115,377,225.28	11,665,785.21	13,657,312.02	-14.6
Collections	932,975.82	-	932,975.82	961,735.82	-3.0
Vessels and underwater vehicles	215,084,334.32	125,522,253.10	89,562,081.22	95,300,953.31	-6.0
Other	35,265,171.35	31,756,291.13	3,508,880.22	4,319,848.21	-18.8
Tangible assets in progress	4,957,787.45	-	4,957,787.45	4,257,623.82	16.4
Advances and prepayments	10,874,869.52		10,874,869.52	5,611,375.74	93.8
Investments	6,713,474.88	164,511.85	6,548,963.03	6,403,031.69	2.3
Holdings	680,089.93	164,511.85	515,578.08	515,578.08	0.0
incl. other forms of investment (Quae)	125,000.00	-	125,000.00	125,000.00	0.0
Receivables attached to holdings	-	-	-	-	
Other forms of investments	-	-	-	-	
Other investments	-	-	-	-	
Loans	5,586,511.10	-	5,586,511.10	5,504,777.76	1.5
Other (deposits and guarantees paid)	446,873.85	-	446,873.85	382,675.85	16.8
TOTAL I	562,730,335.20	367,206,271.49	195,524,063.71	199,460,590.99	-2.0





BALANCE SHEET	FISCAL YEAR 2014			FISCAL YEAR 2013 Net	Trend %
	GROSS	Depr. Prov.	Net		
CURRENT ASSETS			-	-	
Inventory	-	-	-	48,567.68	-100.0
Raw materials and other supplies	-	-	-	48,567.68	-100.0
Work in progress (production)	-	-	-	-	
Work in progress (services)	-	-	-	-	
Goods	-	-	-	-	
Advances and prepayments	3,948,819.88		3,948,819.88	3,584,797.11	10.2
Debts	38,630,089.63	2,456,473.65	36,173,615.98	40,691,197.29	-11.1
Customer and related accounts receivable	12,650,301.75	2,456,473.65	10,193,828.10	9,831,360.88	3.7
Other	25,979,787.88	-	25,979,787.88	30,859,836.41	-15.8
incl. payroll and related accounts	92,047.40		92,047.40	104,874.88	-12.2
incl. Social Security and social organisations	0.00		0.00	0.00	
incl. State and local authorities	25,887,740.48		25,887,740.48	30,754,961.53	-15.8
incl. subsidies	8,702,771.23		8,702,771.23	10,906,657.44	-20.2
Capital subscribed/called and not paid in	-				
Accounts receivable	68,459.66		68,459.66	114,336.03	-40.1
CASH	34,197,156.76	-	34,197,156.76	29,038,352.31	17.8
Shares (listed securities)	-		-	-	
Other securities	-		-	-	
Banking	34,153,282.70		34,153,282.70	28,992,151.07	17.8
incl. private banks	308,598.39		308,598.39	566,431.75	-45.5
incl. postal banking system in Nantes	-		-	-	
incl. Public finances general directorate	33,800,571.08		33,800,571.08	28,263,338.69	19.6
Cash	3,321.79		3,321.79	3,662.33	-9.3
Secondary accounting officers	-		-	-	
Services authorising expenses	40,502.27		40,502.27	42,488.91	-4.7
Services enabling funds to be received	50.00		50.00	50.00	0.0
Libraries and Publishing unit accounts service	-				
Internal transfers	-				
ADJUSTMENTS					
Prepaid expenses	17,354.11		17,354.11	25,691.46	-32.5
TOTAL II	76,861,880.04	2,456,473.65	74,405,406.39	73,502,941.88	1.2
Charges over several financial years	-		-	-	
Loan redemption premiums (IV)	-		-	-	
Unrealised exchange losses (V)	-		-	-	
TOTAL GENERAL (I + II + IV + V)	639,592,215.24	369,662,745.14	269,929,470.10	272,963,532.87	-1.1

■■■ BALANCE AT CLOSING BEFORE ALLOCATION OF PROFIT OR LOSS in euros

	FISCAL YEAR 2014	FISCAL YEAR 2013	Trend %
EQUITY			
Capital (including payments, etc.)	-	-	
Allocation contributions	161,435,171.70	1,520,345.97	10,518.3
State subsidy allocations	347,193.57	291,138.30	19.3
Additional allocations from State	508,754,379.43	543,382.59	93,527.3
Additional allocations - Organisations other than the State	-	536,967.50	-100.0
Reversed to income statement	-347,666,401.30		
Capital donations and legacies	-	148,857.58	-100.0
Premiums from share issues, mergers, assets brought in	-	-	
Revaluation surplus	19,581,213.74	22,046,464.37	-11.2
Equity method evaluation difference	-	-	
Retained earnings	1,728,698.74	4,085,304.51	-57.7
Legal reserve	-	-	
Statutory or contractual reserves	-	-	
Regulated reserves	-	-	
Optional reserves	1,728,698.74	4,085,304.51	-57.7
Other	-	-	
Profits/losses brought forward	228,164.75	1,268.48	17,887.3
Result for financial year (profit or loss)	2,641,865.27	-4,821,856.40	-154.8
Investment grants	10,681,590.46	175,869,743.49	-93.9
Investment grants received	24,375,368.16	578,154,754.81	-95.8
Investment grants entered on profit and loss account	-13,693,777.70	-402,285,011.32	-96.6
Regulated provisions	-	-	
TOTAL I	196,296,704.66	198,701,270.42	-1.2
PROVISIONS			
Provisions for contingencies	1,703,105.00	892,545.00	90.8
Provisions for expenses	16,085,453.82	12,739,336.82	26.3
incl. provisions for pensions and similar obligations	12,038,717.08	9,021,184.08	33.4
incl. provisions for Unedic commitments	3,167,721.18	3,007,037.18	5.3
incl. other provisions for charges	879,015.56	711,115.56	23.6
TOTAL II	17,788,558.82	13,631,881.82	30.5
LIABILITIES			
Loans and related liabilities	34,771.41	34,771.41	0.0
Convertible debenture loans	-	-	
Other debenture loans	-	-	
Loans from credit institutions	-	-	
Misc. loans and financial debts	34,771.41	34,771.41	0.0
Received advances and prepayments	318,894.36	1,277,540.73	-75.0
Operating liabilities	47,797,653.18	50,785,161.03	-5.9
Trade accounts payable and related accounts	10,276,860.53	10,736,550.57	-4.3
Tax and social security payable	37,520,792.65	40,048,610.46	-6.3
incl. payroll and related accounts	11,242,999.04	11,537,867.80	-2.6
incl. Social Security and social organisations	11,155,008.90	11,539,884.93	-3.3
including State, regional and local authorities	4,165,854.22	4,629,455.69	-10.0
incl. advances and prepayments received on grants	10,956,930.49	12,341,402.04	-11.2
Non-operating liabilities	7,307,123.67	8,362,470.46	-12.6
Liabilities on assets and related accounts	3,346,293.49	5,660,021.82	-40.9
Other liabilities	3,960,830.18	2,702,448.64	46.6
Liquid debts			
ADJUSTMENTS			
Deferred income	385,764.00	170,437.00	126.3
TOTAL III	55,844,206.62	60,630,380.63	-7.9
Unrealised exchange profit (IV)	-	-	
TOTAL GENERAL (I + II + III + IV)	269,929,470.10	272,963,532.87	-1.1

■■■ RESULT in euros

	FISCAL YEAR 2014	FISCAL YEAR 2013	Trend %
OPERATING INCOME			
Sales of goods purchased for resale	415.49	1,725.76	-75.9
Sales of finished goods and services (a)	23,151,352.20	15,598,421.15	48.4
including studies and service provision	21,320,018.90	13,897,402.06	53.4
including revenues from related activities	1,831,333.30	1,701,019.09	7.7
Net turnover (j)	23,151,767.69	15,600,146.91	48.4
Stock of finished goods and work in progress	0.00	0.00	
Capitalised production costs	1,326,366.84	1,653,309.01	-19.8
Production for fiscal year	24,478,134.53	17,253,455.92	41.9
Operating subsidies	163,883,840.49	159,757,781.01	2.6
Write-off of provisions and depreciations / transfers of expenses	24,065,745.56	355,477.56	6,670.0
incl. reversals of provisions	24,001,985.81	319,078.95	7,422.3
incl. transfers of expenses	63,759.75	36,398.61	75.2
Other revenues	1,688,482.58	3,289,172.55	-48.7
TOTAL OPERATING INCOME I	214,116,203.16	180,655,887.04	18.5
OPERATING COSTS			
Purchase of goods for resale (c)	294.00	202.00	45.5
Change in stock (d)	0.00	0.00	
Purchase of raw materials, supplies and other consumables (c)	0.00	94,235.53	-100.0
incl. raw materials	0.00	394.00	
incl. other supplies and consumables	0.00	93,841.53	
Change in stock (d)	0.00	-5,546.55	-100.0
incl. raw materials	0.00	605.49	
incl. other supplies and consumables	0.00	-6,152.04	
Other purchases and external charges	6,376,991.59	6,221,230.89	2.5
Purchases incorporated in products	29,462.09	33,239.74	-11.4
incl. purchases of studies and services	28,494.79	17,111.77	66.5
incl. purchases of equipment, plant and work	967.30	16,127.97	-94.0
Intermediate expenses	75,757,953.01	73,560,188.69	3.0
Outsourcing	69,351,205.33	67,216,827.08	3.2
incl. subcontracting	40,238,409.52	36,546,773.22	10.1
incl. rentals and rental expenses	1,394,961.96	1,286,214.24	8.5
incl. maintenance	3,915,404.27	3,695,926.44	5.9
incl. insurance premiums	860,115.78	910,971.99	-5.6
incl. studies and research	954,609.75	1,433,350.22	-33.4
incl. miscellaneous	860,900.44	713,020.07	20.7
incl. external staff	441,108.44	375,705.64	17.4
incl. payments to intermediaries and fees	696,174.91	755,439.45	-7.8
incl. advertising, publications, external relations	307,395.09	492,791.86	-37.6
incl. travel, missions and receptions	4,404,917.73	4,950,606.67	-11.0
incl. missions and travel	314,623.49	428,012.38	-26.5
incl. postal and telecommunications costs	885,038.31	1,013,334.47	-12.7
incl. banking and related services	2,416.75	1,636.46	47.7
incl. miscellaneous	14,389,752.38	15,041,056.35	-4.3
Taxes, duties and similar levies	9,278,842.29	9,294,649.62	-0.2
incl. on salaries	8,010,976.43	7,939,281.64	
incl. on taxes and other organisations	1,267,865.86	1,355,367.98	
Payroll	97,255,337.46	99,297,619.09	-2.1
incl. salaries and pay	66,683,752.34	67,534,397.43	-1.3
incl. social contributions	30,571,585.12	31,763,221.66	-3.8
Depreciation and provisions (e)	28,712,131.77	27,554,184.90	4.2
Fixed assets: depreciation/amortization	24,062,214.30	25,422,026.95	-5.3
Fixed assets: provision for loss in value	0.00	0.00	
Current assets: provision for loss in value	463,240.47	1,156,551.87	-59.9
For risks and charges: provisions	4,186,677.00	975,606.08	329.1
Other charges	420,824.33	381,373.35	10.3
TOTAL OPERATING COSTS II	211,425,088.86	210,088,015.65	0.6
Operating income corrected for share of subsidy (for info.)	2,691,114.30	-4,794,783.19	-156.1
OPERATING INCOME (I-II)	2,691,114.30	-29,432,128.61	-109.1

■■■ RESULT in euros

	FISCAL YEAR 2014	FISCAL YEAR 2013	Trend %
Share of profits or losses 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)	69,750.00	94,458.00	-26.2
Income from securities and other financial fixed assets (3)	6,275.21	7,764.19	-19.2
Other financial income (3)	0.00	61.20	-100.0
Write-off of provisions and transfers of charges	0.00	200,000.00	-100.0
incl. reversals of provisions	0.00	200,000.00	-100.0
Realised gains on exchange differences	6,279.61	8,189.88	-23.3
Proceeds from sale of securities	0.00	0.00	
TOTAL FINANCIAL INCOME V	82,304.82	310,473.27	-73.5
FINANCIAL EXPENSES			
Depreciation and provisions expense	0.00	19,060.00	-100.0
Interest expenses	110.52	296.94	-62.8
Realised exchange losses	10,761.14	9,513.49	13.1
Net loss from sale of securities	0.00	0.00	
TOTAL FINANCIAL EXPENSES VI	10,871.66	28,870.43	-62.3
FINANCIAL RESULT (V-VI)	71,433.16	281,602.84	-74.6
Profit before tax of the grant QP	2,762,547.46	-4,513,180.35	-161.2
Current result before tax (I-II-III-IV-V-VI)	2,762,547.46	-29,150,525.77	-109.5
EXTRAORDINARY INCOME			
On operating items	0.00	26,881.26	-100.0
On capital transactions	8,467.04	24,689,823.86	-100.0
incl. 775	8,467.04	29,505.18	-71.3
incl. 777	0.00	24,637,345.42	-100.0
Write-off of provisions and depreciations and transfers of expenses	0.00	0.00	
incl. reversals of provisions	0.00	0.00	
TOTAL EXTRAORDINARY PROFIT VII	8,467.04	24,716,705.12	-100.0
EXTRAORDINARY EXPENSES			
On operating items	14,569.46	74,140.75	-80.3
On capital transactions	79,579.77	278,895.00	-71.5
incl. 675	58,451.08	278,278.08	-79.0
Depreciation and provisions expense	0.00	0.00	
TOTAL EXTRAORDINARY EXPENSES VIII	94,149.23	353,035.75	-73.3
EXTRAORDINARY EXPENSES	-85,682.19	24,363,669.37	-100.4
Employees profit sharing (IX)	0.00	0.00	
Corporate tax (IX)	35,000.00	35,000.00	0.0
GROSS RESULT	2,676,865.27	-4,786,856.40	-155.9
TOTAL INCOME (I+III+V+VII)	214,206,975.02	205,683,065.43	4.1
TOTAL EXPENSES (III+IV+VI+VIII+IX+X)	211,565,109.75	210,504,921.83	0.5
PROFIT (+) OR LOSS (-)	2,641,865.27	-4,821,856.40	-154.8
SELF-FINANCING CAPACITY	7,401,995.27	-2,156,262.97	-443.3

APPENDICES

Board and committees

■ ■ ■ Board of directors as of 31 December 2014

The members of Ifremer's board of directors are appointed or elected for a five year term (order for appointment of the board on 4 May 2010; order of appointment of the Chairman dated 12 September 2013).

Members representing the State

Ministry of higher education and research representative

Elisabeth VERGES

General directorate for research and innovation

Alternate: Bernard COMMERE

Ministry of ecology, sustainable development and energy representatives

Laurent ROY

Director of water and biodiversity, general directorate for planning, housing and nature (DGALN)

Alternate: Christophe LENORMAND

Philippe COURTIER

General commission for sustainable development, Directorate of Research and Innovation

Alternate: Aurélie SUNARA

Christophe CHASSANDE

Maritime fisheries and aquaculture directorate

Alternate: Marie-Bénédicte PEYRAT

Ministry of defence representative

Rear-admiral Anne CULLÈRE

Deputy Chief of Staff Naval aviation operations

Alternate: Captain (Navy) Bruno ROYER DE VÉRICOURT

Representative of the Ministry of finance

Vincent CRISTIA

Budget division

Ministry of Industry representative

Sylvie METZ-LARUE

General directorate for enterprises

Alternate: Philippe BODENEZ

Ministry of foreign affairs representative

Pascal LE DEUNFF

General directorate for globalisation, attractiveness and mobility policies division, scientific exchanges and research cluster

Alternate: Mona DEBBOUN BOUSSEDRA

Members chosen for their expertise in fields close to those of Ifremer

Charles BRAINE

World Wildlife Fund (WWF)

Martha CRAWFORD-HEITZMANN

Areva

Alain GOULOIS

Total

François JACQ

Chairman of the board of directors

Gérald VIAUD

National shellfish-farming committee (CNC)

Representatives of personnel

Raoul GABELLEC, CFDT

Larissa HAUGARREAU, CFDT

Jean-Claude Masson, CGT

Loïc Petit de la Villéon, CFDT

Carla SCALABRIN, CGT

Jean TOURNADRE, CFDT

Cathy TRÉGUIER, CFDT

Members voting in advisory capacity

Benoît DEBOSQUE

Commissioner for the government, department for performance, financing and contractual agreements with research institutions, DGRI

Pascale DELÉCLUSE

Chairwoman of Ifremer's scientific committee

Marie-Pierre CAMPO

Mission officer for the Sea, Ministry in charge of Overseas French departments

Philippe DEBET

General economic and financial inspection, 'Ecology and sustainable development' mission

Michel AYMERIC

Secretary general for the Sea

Orlando COLONNEAUX

Head Accountant of Ifremer

Jean-Bernard DONOU

CCE secretary

The advisory committees

Scientific committee as of 31 December 2014

Members appointed by joint decision of the supervisory authority ministries

Denis ALLEMAND
Coral and acidification, symbioses
Scientific director of the Scientific centre of Monaco

Chris BOWLER
Molecular biology
CNRS, École Normale supérieure, director of the environmental and evolutionary genomics section

Francesco CHIOCCI
Marine geology,
“La Sapienza” University, Rome

Pascale DELÉCLUSE, Chairwoman
Ocean circulation and climate trend ocean-atmosphere coupled models
Director CNRS/INSU fleet

Marion GEHLEN
Marine biogeochemical modelling
CEA, laboratory of environmental and climate sciences, Gif-sur-Yvette

Peter HERMAN
Ecology
Head of department of spatial ecology, Royal Netherlands Institute for Sea Research, Rotterdam, The Netherlands

François LALLIER
Ecophysiology of marine invertebrates
Director of UMR joint research unit on Adaptation and diversity in the marine environment, Pierre & Marie Curie University, Roscoff

Marina LÉVY
Oceanography, meteorology and environment
Research director, head of PhyBioCar team at Locéan, Pierre Simon Laplace environmental science institute, Paris

Jean-Marie MOUCHEL
Ecotoxicology-biogeochemistry
Professor, head of Piren Seine, Pierre & Marie Curie University, Paris

Fabienne PETIT
Environmental microbiology
Professor, director of SFR/Scale, University of Rouen

Edwige QUILLET
Fishfarming
INRA, head of GénAqua team, UMR GABI, Jouy-en-Josas

Hélène REY-VALETTE
Economics (fisheries and public policy)
Lecturer for HDR, UMR Lamenta, Montpellier

Luc VAN HOOF
Fisheries science
Imares, The Netherlands

Members elected by Ifremer personnel

Marie-Édith BOUHIER, CFDT full member
Acoustics engineer

Franck COPPIN, CFDT substitute
Fisheries dynamics engineer

Catherine DREANNO, CGT substitute
Research scientist in molecular biology

Raymond KAAS, CGT full member
Research scientist in algal ecophysiology and biology

Karine OLU-LE ROY, CFDT substitute
Research scientist in ecology of chemosynthesis systems, life sciences

Jean-François PÉPIN, CFDT full member
Animal health supervisor for molluscs



Permanent guest members

Philippe BERTRAND

Biogeochemical cycles, earth sciences and environment
Mer AllEnvi task group, deputy scientific director Océan-Atmosphère, INSU

Jacqueline GARNIER-LAPLACE

Ecotoxicology, expert assessment and evaluation of environmental hazards

Risques AllEnvi task group, director of Research and expert assessment of environmental hazards department, Institute of radioprotection and nuclear safety

Pol GUENNOC

Marine geology,

Mer AllEnvi task group, AllEnvi Overseas France committee, BRGM

Yves-Marie PAULET

Marine biology

Mer AllEnvi task group, director of LabEx Mer, IUEM European institute for marine studies

Sylvie REBUFFAT

Chemistry-biochemistry

Professor, AllEnvi scientific steering committee, MNHN national museum of natural history

Thomas CHANGEUX

Hydrobiology (fish)

Mer AllEnvi task group, AllEnvi Overseas France committee, IRD

Scientific committee secretary

Marie-Hélène TUSSEAU-VUILLEMIN

Scientific director of Ifremer

Industrial and technical committee as of 31 December 2014

Jacqueline LECOURTIER

Chairwoman

Pierre QUINCHON

DCNS

Pierre BALIGUET

Sercel

Arnaud BOCQUET

Pierre Fabre

Maurice BOUTECA

IFPEN

Stéphane HIS

Technip, Paris

Marie-Christine HUAU

Véolia

Gérard JACQUIN

INRA

Bruno JARRY

Académie des Technologies

Jean-Claude LE BLEIS

NKE

Fabien NAPOLITANO

Ixblue

Valérie QUINIOU-RAMUS

Total

Vincent TRELUT

Eramet

Jean-Pierre VADET

ECA Robotics

Jean-Baptiste De FRANCQUEVILLE

Ministry of ecology, sustainable development and energy

Didier HOFFSCHIR

Ministry of higher education and research

Ifremer personnel directory

Ludovic DROUINEAU

CGT trade union representative

Christine CHOPIN

CFDT trade union representative

2014 research cruises

CNFH (national ocean-going fleet commission)

Vessel	Cruise name	Chief scientist	Organisation	Zones	Topic	Vehicles	Equipment
<i>Pourquoi pas?</i>	Antithesis	B. MARCAILLOU	University Antilles et Guyane (French West Indies and Guiana)	Atlantic Ocean	Seismogenesis and tectonic deformation of the Antilles margin: thermicity, structure and pressure of fluids in the deep margin. Consequences on the location of seismogenic zones, relationships with deformation partitioning		- SMT multitrace seismics -OBS
	Bicose	M.-A. CAMBON-BONAVITA	Ifremer	Atlantic Ocean	Ecosystems of hydrothermal sites in the Atlantic and outlying zones: characterisation of environments, biodiversity, ecophysiology of symbioses, connectivity and geobiological interactions	<i>Victor 6000</i>	
	Geovide	G. SARTHOU	Lemar	Atlantic Ocean	Coupling physical oceanography and biogeochemistry of trace elements and their isotopes in the northern Atlantic and the Labrador Sea		-CTD - ADCP - deployment of ARGO floats
	Momarsat	M. CANNAT	CNRS-IPGP	Atlantic Ocean	Annual maintenance of the ENSO Lucky Strike observatory for 2014-2015	<i>Victor 6000</i>	
	MarsiteCruise	L. GÉLI	Ifremer	Marmara Sea	Relationships between fluids and seismicity in Marmara Sea. Inherent relationships between the circulation of fluids and fault network dynamics	<i>Victor 6000</i>	-gravity corer. -OBS - piezometer
<i>L'Atalante</i>	AMOP	C. MAES	IRD	Pacific Ocean	Complete O ₂ budget of the Peru OMZ, including physical (advection/diffusion) and biogeochemical (O ₂ consumption by bacteria, zooplankton and particle degradation)		- ADCP - CTD
	Ptolémée	S. JORRY	Ifremer	Indian Ocean	Impact of global change (climate and sea level) on the sedimentary system of the Mozambique Channel		- multibeam echosounder - HR seismics - high-speed seismics
	Storm	A. BRIAIS	CNRS	Indian Ocean	Dynamics of the inner mantle and their interaction with the oceanic ridge at the boundary between two mantle reservoirs. Exploring new hydrothermal sites in the Southern Ocean.		- multibeam echosounder - dredging
<i>Thalassa</i>	AWA	P. BREHMER	IRD	Atlantic Ocean	Documenting the functioning of the West African ecosystem (Senegalese-Mauritanian upwelling) with respect to global change. Approach based on biological, physical and chemical measurements		- ADCP - pelagic trawl
	Camanoc	M. TRAVERS-TROLET	Ifremer	English Channel	Ecosystem-based approach to fisheries. Inventory and spatial distribution of epipelagic, demersal and benthic fauna. Impact of climate change on the benthos		- GOV trawl - pelagic trawl - SBE 19 CTD, Cufes) - mini ROV

CNFH (national ocean-going fleet commission)

Vessel	Cruise name	Chief scientist	Organisation	Zones	Topic	Vehicles	Equipment
<i>Le Suroît</i>	MOB Pirata	B. BOURLÈS	IRD	Atlantic Ocean	Study on climate variability in the tropical Atlantic		- ADCP -Atlas buoys
	Pirata FR 24	B. BOURLÈS	IRD	Atlantic Ocean	Study on climate variability in the tropical Atlantic		- ADCP -Atlas buoys
	HydrosMomar	J. PERROT	UBO	Atlantic Ocean	Long-term monitoring of Momar zone seismicity on the regional scale: links between this seismicity and active hydrothermal processes on Momar sites		
	Moose	P. TESTOR	Locean	Mediterranean Sea	Time trend of distribution and characteristics of water masses (temperature, salinity, oxygen, CO ₂ , nutrients, biomasses)		ADCP

IPH (public interest cruise on sea-going vessel)

Vessel	Cruise name	Chief scientist	Organisation	Zones	Topic	Vehicles	Equipment
<i>Thalassa</i>	IBTS 14	Y. VERIN	Ifremer	Atlantic Ocean, Eastern English Channel, North Sea	Ecosystem-based approach to fisheries resource assessment.		- trawls - nets - CTD - CUFES
	Pelgas 14	M. DORAY	Ifremer	Atlantic Ocean: Bay of Biscay	Monitoring populations of exploited small pelagics		- trawls - WV9 and Thyborhon otter boards - CUFES - CTD - acoustics
	Evhoe 14	M. SALAÜN	Ifremer	Atlantic Ocean: Bay of Biscay, Celtic Sea	Assessment Fisheries resource assessment- Impact of fisheries on populations- Observatory of living resources	Scampi	- trawls - fishing echosounders - Scanmar system - SMFH fisheries multibeam echosounder

Institutional partners (SHOM/IEO)

Vessel	Cruise name	Chief scientist	Organisation	Zones	Topic	Vehicles	Equipment
<i>Pourquoi pas?</i>	BAC/MeditGIB	Atlantic oceanographic group - SHOM	French Navy	Atlantic Ocean	Cruise for the French Navy's hydrographic and oceanographic service (SHOM)		
	Mocosed	Atlantic oceanographic group - SHOM	French Navy	Atlantic Ocean	Cruise for the French Navy's hydrographic and oceanographic service (SHOM)		
<i>Thalassa</i>	IEO/Intercal	IEO	Ifremer	Atlantic Ocean	Intercalibration cruise		trawls

CRI (collaboration between research and industry)

Vessel	Cruise name	Chief scientist	Organisation	Zones	Topic	Vehicles	Equipment
<i>L'Atalante</i>	Salsa	D. ASLANIAN M. MOULIN	Ifremer	Atlantic Ocean	Study of passive margins (Jequitinonhas-Camamu Alagoas and Sergipe margins). These margins are interesting in that they are highly segmented, with short wavelength and a triple junction, between an aborted rift basin (Tucano) and the South Atlantic Ocean. The Salsa cruise was designed to supply key elements about the importance of the tectonic heritage compared to that of underlying thermal segmentation of the mantle in the morphology and segmentation of these passive margins		- multibeam echosounder - SMT multitrace seismics - OBS - core sampling
	Ptoleme 1	S. JORRY	Ifremer	Indian Ocean	Impact of global change (climate and sea level) on the sedimentary system of the Mozambique Channel		- multibeam echosounder - HR seismics - high-speed seismics
	Pamela 1	K. OLU	Ifremer	Indian Ocean	Impact of global change (climate and sea level) on the sedimentary system of the Mozambique Channel and associated ecosystems		- multibeam echosounder - Scampi
	Pamela 2	C. ROBIN	University of Rennes I	Indian Ocean	Impact of global change (climate and sea level) on the sedimentary system of the Mozambique Channel		- multibeam echosounder - high-speed seismics

MET (missions for technical trials)

Vessel	Cruise name	Chief scientist	Organisation	Zones	Topic	Vehicles	Equipment
<i>Pourquoi pas?</i>	Estime	L. DUSSUD	Ifremer	Mediterranean Sea	Technology trials for seafloor observatories : Penfeld penetrometer, coring, Seamon station, BOB, release system, etc.	<i>Victor 6000</i>	- Sysif - Penfeld
	Essnaut	P. TRIGER	Genavir	Mediterranean Sea	<i>Nautile</i> trials	<i>Nautile</i>	
	TV/EOP5	P. SIMEONI	Ifremer	Atlantic Ocean	Trials of new EOP cable on <i>Victor</i>	<i>Victor 6000</i>	

<i>L'Atalante</i>	TVSMT	H. LOSSOUARN	Genavir	Atlantic Ocean	Seismic trials		- SMT multitrace seismics
	Jouvinfo	A. RUÉ	Ifremer	Indian Ocean	Modernisation of shipboard information systems		

<i>Le Suroît</i>	ESSHROV	P. SIMEONI	Ifremer	Mediterranean Sea	HROV technical qualification trials following acceptance testing on land	HROV	
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LOG (logistics)

Vessel	Cruise name	Chief scientist	Organisation	Zones	Topic	Vehicles	Equipment
<i>L'Atalante</i>	EMBSMT	H. LOSSOUARN	Genavir	Atlantic Ocean	Loading of multitrace seismic equipment (SMT)		- SMT multitrace seismics
	DEBSMT	H. LOSSOUARN	Genavir	Atlantic Ocean	Unloading of multitrace seismic equipment (SMT)		- SMT multitrace seismics

AFF (chartering)

Vessel	Cruise name	Chief scientist	Organisation	Zones	Topic	Vehicles	Equipment
<i>Pourquoi pas?</i>	Manta	J. KARSTENSEN	Ifremer	Mediterranean Sea	Chartering		
<i>Thalassa</i>	MSM 40	H. LOSSOUARN	Geomar	Atlantic Ocean	Recovery of moorings for the German Geomar institute		

CNFC (national coastal fleet commission)

Vessel	Cruise name	Chief scientist	Organisation	Zones	Topic	Vehicles	Equipment
<i>Thalia</i>	Camelia-II	C. BRACH-PAPA	Ifremer	Loire estuary and Southern Brittany	Physics, chemistry and biochemistry: biochemical functioning of the Loire estuary; water samples by pumping and plankton samples taken		plankton nets
	Rebent	E. THIÉBAUT	Roscoff Biological Station, CNRS	Brittany	Biology and ecosystem: recurrent cruise in the framework of the Rebent programme, set up in 2003, for long-term observation of coastal benthic communities		grabs
	Brebent	S. ROCHETTE	Ifremer	north-east and east of Bréhat island	Biology and ecosystem: characterisation of the baseline state of benthic communities within the perimeter of wind turbine installation sites and along the track of the landfall cable running to shore		HD-video acquisition
	MGTS	G. BLANC	University of Bordeaux	Gironde estuary and coastal zone	Physics, chemistry and biogeochemistry: scientific analysis of the possibility of developing shellfish farming in the Gironde in a context of decreasing metal pollution		
	FEBBE-3	P. LAFFARGUE	Ifremer	Bay of Biscay	Biology and ecosystem/fisheries and stock assessment/physics, chemistry and biochemistry: structure of benthic populations and impact of bottom trawling in the zone		- trawling - grabs - MBE dredges
	FEBBE-4	P. LAFFARGUE	Ifremer	Bay of Biscay			

CNFC (National Commission of the Coastal fleet)

Vessel	Cruise name	Chief scientist	Organisation	Zones	Topic	Vehicles	Equipment
<i>Thalia</i>	Rocchsed14	J.-F. CHIFFOLEAU	Ifremer	Bay of Biscay	Physics, chemistry and biochemistry: chemical contamination of coastal sediments in the Bay of Biscay. Grab and core samples		- Schipeck grab - (small Reineck) corer
	ETAL2040	A. PACAULT	Ifremer	Brest bay	Technology: perfecting the sub-bottom profiler and calibration of multibeam echosounder		
	Sisplateau	Y. THOMAS	Ifremer	Brest bay	Technology: trials of Sparker (electric source) seismic equipment and multi-sensor receivers along short profiles		
	Carmolit 14	L. QUÉMÉNER	Ifremer	Bay of Vilaine	Technology: recovering and cleaning buoy in La Turballe harbour for winter storage		
	Nurse13	A. BRIND'AMOUR	Ifremer	Bay of Biscay	Biology and ecosystem/fisheries and stock assessments : monitoring and understanding of how nurseries function		trawls

<i>L'Europe</i>	LFSHROV	E. RAUGEL	Ifremer	Toulon	Technology: sea trials for deployment of winch/cable/HROV depressor ballast		
	Divacou7	M. DROGOU	Ifremer	Toulon	Technology/acoustic tests		
	Stepiv	R. APPRIOUAL	Ifremer	Nice	Geosciences and paleoclimatology: piezometers recovered, reconditioned and redeployed		
	Dynasfar	O. PEDEN	Ifremer	Toulon	Technology: deployment and recovery of moorings and autonomous instruments		
	ESSAUV14	J. OPDERBECKE	Ifremer	Toulon	Technology: AUV dives ; validation of new fins, MBES antennas and fine-tuning synchronization		AUV
	Bathycor	M.-C. FABRI	Ifremer	Toulon/ Marseille	Biology and ecosystems, geosciences and paleoclimatology, physics, chemistry and biogeochemistry: detailed acoustic mapping of canyon sides/cold water corals		AUV

CNFC (National Commission of the Coastal fleet)

Vessel	Cruise name	Chief scientist	Organisation	Zones	Topic	Vehicles	Equipment
<i>Haliotis</i>	Estusom14-01 and Estusom14-02	S. LE BOT	University of Rouen	Manche Est	Geosciences and paleoclimatology: characterisation of sediment transfers between offshore and the shoreline		
	Pock&Ploops	A. BALTZER	University of Caen	baie de Concarneau	Geosciences and paleoclimatology: seeking to highlight the factor triggering pockmarks: the tide		
	Geomeloine	A. EHRHOLD	Ifremer	Roscoff, Bloscon	Biology and ecosystems, geosciences and paleoclimatology: study focusing on the La Méloine rocky plateau separating the two physiographic domains; the Bay of Morlaix to the west and Bay of Lannion to the east		
	Fissel	A. HÉNAFF	CNRS UMR 6538 ocean domains	Sud Finistère	Geosciences and paleoclimatology: quantification of coupling processes between various geospheres		
	Splashalot01 and Splashalot02	G. MAILLET	University of Angers	site 1 : Saint-Jean-de-Luz site 2 : Le Tréport	Geosciences and paleoclimatology : improving knowledge about retrograding cliffs in order to construct a reliable model for this process		
	Sedbush_Normandie	B. TESSIER	CNRS laboratory/service: UMR 6143 M2C	Le Havre	Geosciences and paleoclimatology: simultaneous acquisition of seismic data (stock volumes) and sonar imaging data (seabed type, morphology) with the perspective of managing shoreline modifications and natural hazards		
	Sedbush_Nord	A. TRENTESAUX	University of Lille	Calais or Dunkerque			
	Bieroc_LaMondrée	D. CLIQUET	UMR Rennes I/ archeology service	Port Lévi / Cherbourg	Geosciences and paleoclimatology: analysis of human occupations in the Pleistocene of the current coastal shelf of the English Channel in relation to the variation in sea level governed by successive interglacial/glacial cycles		

IPC (public interest cruises on inshore vessels)

Vessel	Cruise name	Chief scientist	Organisation	Zones	Topic	Vehicles	Equipment
<i>Thalia</i>	Morcaux	C. ABERNOT	Ifremer	between Dieppe and Le Tréport	Biology and ecosystems, geosciences and paleoclimatology. Monitoring programme related to the operation of the Penly nuclear power plant		Sidescan sonar
	Comor43	E. FOUCHER	Ifremer	Seine bay	Fisheries and stock assessments. Dredging operations. Samples taken of water, plankton, macro-benthos and flesh of edible animals for contaminant analyses		King scallop dredges
	COSB	S. FIFAS	Ifremer	Bay of Saint-Brieuc	Fisheries and stock assessments. Scallop dredging		King scallop dredges
<i>Gwen-Drez</i>	CGFS	F. COPPIN	Ifremer	English Channel	Fisheries and stock assessments		Trawl
<i>L'Europe</i>	Medits13	A. JADAUT	Ifremer	Mediterranean Sea	Fisheries and stock assessments. Bottom trawling. Stock assessments		
	Pelmed13	J.-L. BIGOT	Ifremer	Mediterranean Sea	Biology and ecosystems - Fisheries and stock assessments. Assessment of small pelagic stocks in the Mediterranean		

MET (missions for technical trials)

Vessel	Cruise name	Chief scientist	Organisation	Zones	Topic	Vehicles	Equipment
<i>Thalia</i>	Esstech-14-TH	H. LOSSOUARN	Ifremer	Brest bay	Technical trials. Calibration and validation of acquisitions along reference profiles		- multibeam echosounder - towed sub-bottom profiler
<i>Haliotis</i>	Esstech-14-HA	H. LOSSOUARN	Genavir	Brest	Technical trials		
<i>L'Europe</i>	Esstech-14-EU	H. LOSSOUARN	Genavir	Toulon	Technical trials		

MAFF (chartering mission)

Vessel	Cruise name	Chief scientist	Organisation	Zones	Topic	Vehicles	Equipment
<i>Thalia</i>	AFF1	S. FIFAS	Ifremer	Bay of Saint-Brieuc	Prospecting for offshore wind farm zone		King scallop dredges

Les implantations de l'Ifremer

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Acronyms and abbreviations

AAMP	Agency for marine protected areas
AERMC	Rhone Mediterranean Corsica water agency
AllEnvi	National environmental research alliance
Ancre	National energy research coordination alliance
ANR	French national research agency
Anses	French agency for food, environmental and occupational health safety
ARS	Regional health agency
AUV	Autonomous Underwater Vehicle
BRGM	Geological and mining research bureau
CCSTI	centre for scientific and technical culture
CFP	Common Fisheries Policy
CGDD	General commission for sustainable development
CGPM	general fisheries commission for the Mediterranean
CIOM	Inter-ministry council for overseas France
Cirad	Centre for international cooperation in agricultural research for development
CNES	National space research centre
CNPMEM	national marine fisheries and mariculture committee
CNR	national research council (Italy)
CNRDPA	Algerian national research centre for fisheries and aquaculture development
CNRS	National centre for scientific research
Comue	community of universities and institutions
COST	European Cooperation in Science and Technology
CRAAG	research centre for astronomy, astrophysics and geophysics
CSIC	National Research Council (Spain)
DEAL	Environment, planning and housing directorate
DGAL	Directorate-general for food
DGRI	General directorate of research and innovation
DGRSDT	General directorate of scientific research and technological development (Algeria)
DMSOI	marine office for southern Indian Ocean
DOI	Digital Object Identifier
DPMA	maritime fisheries and aquaculture division
DREAL	regional division for spatial planning, environment and housing
Edrome	Sustainable exploration and exploitation of mineral and energy resources in oceans
EIG	Economic interest group
EIO	Environmental Investment Organisation
EIP	European Innovation Partnership
EMFF	European Maritime and Fisheries Fund
EMODnet	European Marine Observation and Data Network
ENSTA	Graduate engineering school for advanced techniques in Brittany
ERA-Net/Seas-ERA	European Research Area Network/Towards Integrated Marine Research Strategy and Programmes
ERDF-CPER	European Regional Development Fund-French state-region plan contract
ERIC	European Research Infrastructure Consortium
FFP	fishing sector association
FP RD	Framework Programme for Research and Development
GDR	Research group
GHG	greenhouse gas
HDR	Accreditation to direct research
HROV	Hybrid Remotely Operated Vehicle
ICCAT	International Commission for the Conservation of Atlantic Tuna
ICES	International Council for the Exploration of the Sea
IDEX	Initiative of excellence

Ifpen	French institute of petroleum-New energies
Ifsttar	French institute of science and technology for transport development and networks
IGN	National institute of geographical and forestry information
IMO	International Maritime Organization
INA	National audiovisual institute
INRA	National agronomic research institute
INSU	National institute of sciences of the universe
IOC	Intergovernmental Oceanographic Commission
IODP	International Ocean Drilling Program
IPEV	Paul-Émile Victor polar institute
IRD	Institute of research for development
Irstea	National institute for scientific and technological research for the environment
i-SITE	Initiatives-science innovation territories economy
Ismar-CNR	Institute of Marine Science-National Research Council (Italy)
ITE	Institute for energy transition
IUEM	European university institute for the sea
Jamstec	Japan Agency for Marine-Earth Science and Technology
JPI	Joint Programming Initiative
JRC	Joint Research Centre
Kiost	Korea Institute of Ocean Science and Technology
Koeri	Kandilli Observatory and Earthquake Research Institute
LSRI	Large-scale Research Infrastructure
MCTI	Ministry of Science, Technology and Innovation (Brazil)
MEDDE	Ministry of ecology, sustainable development and energy
Met Office	United Kingdom's national weather service
MEXT	Ministry of Education, Science, Sports, Science and Technology (Japan)
MNHN	National museum of natural history
MoU	Memorandum of Understanding
MSFD	Marine Strategy Framework Directive
MSFD	Marine Strategy Framework Directive
MTA	General directorate of mineral research and exploration (Turkey)
NAOS	Novel Argo Ocean Observing System
NIC	National Ice Center
NOAA	National Oceanic and Atmospheric Administration
OFEG	Ocean Facilities Exchange Group
Onema	national office for water and aquatic environments
ONR	Office of Naval Research
Pamela	Passive Margins Exploratory Laboratories
PIA	Programme of investments for the future
RIEM	international network of eco-explorers of the sea
RNMR	Reunion island marine nature reserve
ROV	Remotely Operated Vehicle
RSL	lagoon monitoring network
SCSP	subsidy for public service charges
Secirm	interministerial commission for marine resources (Brazil)
SHOM	Hydrographic and Oceanographic Service of the French Navy
SMOS	Soil Moisture and Ocean Salinity
TAAF	French southern and Antarctic lands
TEI	traces elements and isotopes
UBL	University of Brittany-Loire
UBO	University of western Brittany
UBS	University of southern Brittany
UEM	University Eduardo Mondlane (Mozambique)
UMR	joint research unit
UMS	joint service unit
UPMC	Pierre & Marie Curie University
VSC	civilian service volunteer
WFD	Water Framework Directive
WOS	Web of Science



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