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Mapping of National Research and Policy Priorities on Marine Biotechnology of the ERA-MBT Partner Countries

D4.1: Update of CSA MBT mapping of national priorities

Work Package 4

Outreach to external activities

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EXECUTIVE SUMMARY

The Marine Biotechnology ERA-NET (ERA-MBT) recognises that Europe's marine ecosystems and organisms are largely unexplored, understudied and underutilized, in spite of Europe's access to an extensive and diverse set of marine ecosystems, supporting an enormous marine biodiversity. This resource, through the coordinated application of marine biotechnology, has the potential to provide a major contribution towards addressing some of the most pressing societal challenges including environmental degradation, human health and delivering sustainable supplies of food and energy, amongst others regarded as the Grand Challenges for our future. The ERA-MBT is therefore designed to deliver better coordination of relevant national and regional Research, Technology Development and Innovation (RTDI) programmes in Europe, reducing fragmentation and duplication, and paving the way for common programmes and cooperation in the provision and use of research infrastructures, which is a necessity to make sustainable use of this unique resource. ERA-MBT's 19 partners are working with stakeholders from industry and organisations to identify needs and gaps in the value chain from research and development, through optimising research results for proof of concept and industrial uptake and valorisation. At least three transnational calls address these challenges, and cooperation with complementing activities have been and will be explored to add value and power to enable the development of a horizontally applicable technology like marine biotechnology.

One task of the ERA-MBT to reach this is to link its activities with national, European and international activities and to reduce fragmentation of research efforts in MBT via better coordination and cooperation between relevant players. This task is addressed in the ERA-MBT description of work in work package 4 (Outreach to external activities). It is one aim to ensure complementarity and alignment of the ERA-MBT´s activities with the relevant regional, national and European Research agendas and programmes and to create synergies with these agendas and programmes by consideration of the range of policy, economic and commercial challenges and priorities being addressed. To reach this aim it is necessary to get an overview about the MBT activities in European and other MBT relevant countries. Therefore, already in the preparatory action to the ERA-MBT, the coordination and support action MBT (CSA-MBt; October 2011 – March 2013), an extensive mapping of national research and policy priorities was already prepared. But by developing a bioeconomy the R&D surrounding for MBT has changed in many countries inbetween. Hence an update of this mapping was done.

Because of the limited availability of country specific information via the world wide web (including language boundaries) the ERA-MBT partners agreed on an update limitation on the ERA-MBT partner country profiles. The country specific information was compiled and summarized by the single ERA-MBT partners as substance of this present deliverable report. The update of further country profiles within and outside Europe is foreseen for a further deliverable report at the end of the ERA-MBT project (D4.2, November 2017) on demand of the ERA-MBT consortium.

The present document is a compilation of the updated profiles on national MBT priorities of the ERA-MBT partner countries. It describes the more or less actual status and feeds directly into work package 6 (*Communication, information management and dissemination*) by delivering country

specific MBT information for the ERA-MBT *online Integrated Marine Information Tool* to inform ERA-MBT stakeholders or other persons with interests in MBT.

Further it can serve as a basis for further ERA-MBT strategic desk research in work package 2 (*Strategy for the marine biotechnology ERA-NET and beyond in the context of the European Bioeconomy*).

The country specific information is also available on the ERA-MBT homepage under: (http://www.marinebiotech.eu/wiki/Marine_Biotechnology_in_European_countries)

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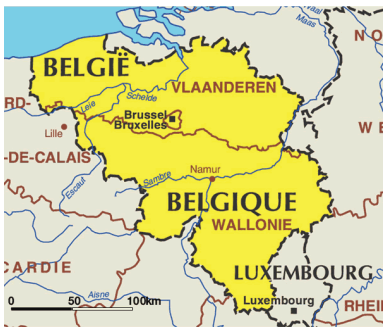
BELGIUM

(Update May 2015)

Overarching science strategies, plans and policies:



There are no specific Marine Biotechnology strategies, plans or policies in Belgium. Overarching Belgian Science & Technology Policy for the period 2014-2019 is described in different Policy documents, including

- **Annual Policy note** of the Belgian Federal Minister of Science Policy www.dekamer.be/flwb/pdf/54/0020/54K0020003.pdf
- **Policy note** of the Flemish Minister of Science Policy https://www.vlaanderen.be/nl/publicaties/detail/beleidsnota-2014-2019-werk-economie-wetenschap-en-innovatie

Research funding schemes and programmes:

There are no specific National Research Funding Programmes dedicated specifically to Marine Biotechnology, but marine biotech research activities may be funded under a wide range of federal and regional instruments. The main research funding organisations are the Department of Economy Science and Innovation (**EWI**) of the Flemish government, the Research Foundation - Flanders (**FWO**) and the Flemish government agency for Innovation by Science and Technology (**IWT**) in Flanders, the Walloon Research Foundation (**FNRS**) in Wallonia and the Belgian Science Policy Office (**Belspo**) at the Federal level.

- At the federal level, Marine Research is supported under the Science for a **Sustainable Development Programme (SSD)** (www.belspo.be/SSD) managed by the Belgian Science Policy Office (www.belspo.be). A database of funded projects is available at www.belspo.be/belspo/fedra/pres_en.stm. A description of the North Sea (sub)programme since 1970 is available at www.belspo.be/northsea.
- At the regional level, funding from organisations such as FWO and IWT in Flanders and FNRS in Wallonia is based on excellence with yearly competitive proposal submissions for personal grants and working funds. In most cases, funding is bottom up and for an innovation oriented agency like IWT valorisation of research is an important criterium.

Research priorities:

(FWO in principal supports all topics seen its bottom-up approach.)

- Metabolomics

- Bioprospecting
- Feed production and disease control (vaccines, probiotics, ...) in aquaculture
- Metagenomics, model organisms
- Biofuels from Algae
- Omega 3, lipids and chitosan as functional foods
- Biosensors

Strategic documents:

- A full comprehensive overview of science policy in Belgium at all levels (Federal, Regional and Communities) is provided in "**Belgian Report on Science, Technology and Innovation 2010**" http://www.belspo.be/belspo/home/publ/pub_ostc/BRISTI/Bristi_tome1_2010_en.pdf

Infrastructures and coordination and support capacities / initiatives:

- In Flanders there are a range of relevant networks and research institutes with relevant activities. The most important ones are:
    - **Vlaams Instituut voor Biotechnologie (VIB)** - VIB is a life sciences research institute in Flanders, Belgium. With more than 1200 scientists from over 60 countries, VIB performs basic research into the molecular foundations of life. VIB is an excellence-based entrepreneurial institute that focuses on translating basic scientific results into pharmaceutical, agricultural and industrial applications. VIB works in close partnership with four universities − UGent, K.U.Leuven, University of Antwerp and Vrije Universiteit Brussel and is funded by the Flemish government. There are a number of bio-incubators either linked to the universities or the VIB. www.vib.be
    - **Flemish Marine biotechnology Platform** 'Mariene Biotechnologie Platform Vlaanderen' is a multi-disciplinary collaboration between industry and academia in the field of marine biotechnology in the Flanders region, Belgium.
    - The network "Vlaams **Aquacultuurplatform**" provides a platform of researchers, industry representatives, ngo's and other stakeholders involved or interested in aquaculture research and commercialization. It can be considered as an independent advisory body for research and policy in the area of aquaculture in Belgium and Europe. http://www.aquacultuurvlaanderen.be/
    - **Flemish platform for Algae Research (Vlaams Algen Platform)** http://www.fi-sch.be/nl/programmas/micro-algen/vlaams-algen-platform/

- **Industrial Biotech Cluster Flanders (CINBIOS)** http://cinbios.be
- **Flanders strategic Initiative for Sustainable Chemistry (FISCH)** http://www.fi-sch.be/
- **Bio-based Europe** is an open innovation and education centre for the bio-based economy jointly supported by Flanders and The Netherlands. It offers state-of-the-art research and training facilities to speed up the economic growth, innovation capacity, and sustainable development of the economy. The Bio Base Europe Pilot Plant in Ghent (Belgium) offers the capability to use common research and pilot bio-refinery infrastructure, thus shortening development time and minimizing costs. http://www.bbeu.org

- There are a number of Technology parks installed in major cities such as Ghent, Leuven, Antwerp and Hasselt. While they are broader in scope they have important biotechnology activities including marine aspects.
  - The Belgian Science Policy Office (BELSPO) is funding and coordinating the "Belgian Co-ordinated Collections of Micro-organisms (BCCM™) (http://bccm.belspo.be/index.php) consisting of seven complementary research-based service culture collections among others diatoms and cyanobacteria collections. The BCCM™ consortium aims to share the biological material of its collections, related information, as well as its experience and know-how in the field of fundamental and applied (micro)biology, to the benefit of its partners and clients in the academic and industrial communities.
  - The Joint Experimental Molecular Unit (JEMU - http://jemu.myspecies.info/about-jemu) is an integrated research infrastructure funded by the Belgian Science Policy Office (BELSPO) and supported by the Royal Belgian Institute of Natural Sciences (RBINS, Brussels) and the Royal Museum for Central Africa (RMCA, Tervuren). JEMU aims at supporting scientific research on natural history collections in the fields of DNA barcoding, phylogeny reconstruction and archiving biological specimens.
  - In 2012, Belgium operates 1 local/coastal vessels of 36 m (Simon Stevin); 2 regional vessels of 49,55 (Ter Streep) and 50,90 m (Belgica, operated by MUMM – www.mumm.ac.be/NL/) and 1 oceanic vessel of 56,6 (Zeeleeuw, operated by VLIZ – www.vliz.be) registered at the European Research Vessels Infobase (www.eurocean.org).

In 2012, Belgium maintains about 3 large marine research equipments registered in the European large Exchangeable instruments database (www.eurocean.org).

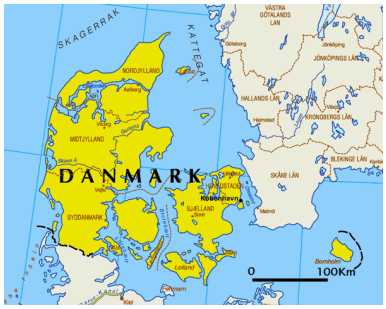
Major initiatives:

There are currently no overarching national initiatives on Marine Biotechnology. There are some thematic and cross-cutting coordination activities in Flanders (see above).

One of the most important recent initiatives at the Flemish level is the establishment, early 2012, of **the Flemish Marine biotechnology Platform** 'Mariene Biotechnologie Platform Vlaanderen'. This platform was initiated by Flanders Marine Institute (VLIZ), the Flemish Ministry of Science and Innovation (EWI), the Flemish Government to bring together researchers, industry, biodiversity users, policy makers/advisors and all other actors involved in marine biotech research in Flanders to discuss the opportunities and map the existing capacity and expertise in Flanders as well as the potential for the future. Members include relevant scientists and experts from all research performing organisations in Flanders (Universities, Flemish Institute for Biotechnology, Flemish Institute for Technological Research etc.) and two major research funding agencies (FWO Flanders and IWT) as well as private companies with an interest in marine biotechnology (ixX Pharma, Proviron, OVOLIFE, etc.). The platform aims to increase the visibility of marine biotechnology in Flanders which may contribute to the general recognition of the research, promote Interdisciplinarity and lead to improved cooperation with experts from the industry. A webportal is being developed and is expected to be accessible in 2013.

DENMARK

(Update April 2015)



Overarching science strategies, plans and policies:

- National Whitepaper: "**Research2020**" description of the focus areas for strategic research. The paper was published in 2013. http://ufm.dk/en/research-and-innovation/political-priority-areas/research2020

Research funding schemes and programmes:

- **Innovation Fund Denmark (IFD)** was established 1 April 2014 by a merger between the Danish Council for Strategic Research (DSF), the Danish Council for Technology and Innovation (RTI) and the Advanced Technology Foundation (Højteknologifonden). During 2014 the programmes operated by the three units were concluded, and as of 1 January 2015 a complete reorganisation is being instituted. After the reorganisation IFD offers support for three different project categories:
    - **Talents:** For undergraduates, recent graduates or postgraduate researchers aiming to become entrepreneurs or to secure a research career in the private sector.
    - **InnoBooster:** For small enterprises and entrepreneurs with sound development plans.
    - **Large scale projects:** For substantial investments and long-term projects/partnerships where the focus is on research, technology, experimental development and market development .
- In 2015 the Innovation Fund Denmark will invest just under DKK 1.6 bn in new initiatives to create growth and employment in Denmark.
- The **Danish Council for Independent Research (DFF)** funds specific research activities, within all scientific areas, that are based on the researchers' own initiatives and that improve the quality and internationalisation of Danish research. The Danish Council for Independent Research is comprised of a Board of Directors and five scientific research councils of which the following are relevant:
    - **Natural Sciences (FNU)** covers all aspects of research geared towards basic scientific issues within the natural sciences, computer science and mathematics.
    - **Technology and Production Sciences (FTP)** covers (among several others) these scientific fields: biotechnology, food sciences and use of natural resources.
- **The Market Development Fund (Markedsmodningsfonden)** is allocating DKK 405M for market maturation of novel and innovative products. Companies can apply for co-financing of testing and adaption of their products under reality-like conditions or co-financing of

guarantees for the end-user to mitigate the buyer's uncertainty about investing in novel technology.

- The Danish **Growth Fund (Vækstfonden)** is a state investment fund, which aims to create new growth companies by providing venture capital and competence.

Private funding mechanisms:

- The **Novo Nordisk Foundation awards** grants mainly for medical research but also considerable contributions to other scientific, humanitarian and social causes
- The **Carlsberg Foundation** provides support for basic scientific research in (among others) natural sciences.
- The **Villum Foundation** supports research activities in the natural and technical sciences. Grants are made for pioneering research, but the Foundation also supports the dissemination of scientific and technical research.

Research priorities for marine biotechnology research:

- In 2010 the Danish Ministry of Food, Agriculture and Fisheries published a report entitled **'Havet – en uudnyttet resource' (The Sea – an unexploited resource)**. It was a knowledge synthesis on Danish opportunities in marine biotechnology and other exploitation of the marine resources. The report identified six themes where focused, interdisciplinary research and development efforts are likely to generate significant economic results within shorter and longer perspectives:
    - Use of marine biomass (beyond traditional fisheries)
    - Cultivation of commodities in and from the sea
    - Health-promoting ingredients
    - Discovery of new substances, materials and biological activities and principles
    - Extraction of valuable biochemical substances
    - Biofilms

Infrastructures and coordination and support capacities / initiatives:

- The **Danish Centre for Marine Research** (http://www.danskhavforskning.net/Service/English) is initiated by the Danish academic community. The overall aim of the centre is
    - Administration of the funds to cover chartering of research ships
    - Coordinate and facilitate rental of research equipment between institutions
    - Facilitate international charter contracts of research vessels
- The **Scandinavian Culture Collection of Algae and Protozoa (SCCAP)** (http://www.sccap.dk) at the University of Copenhagen contains in particular marine nanoplankton flagellates, benthic marine brown and green algae, and a growing number of dinoflagellates. The SCCAP presently comprises more than 900 strains (c. 265 genera and

460 species) with representatives from most algal divisions. Nearly 700 are available to the public.

- The **Seaweed Network in Denmark (SND)** promote the production, application, communication and knowledge of seaweed, and also strengthen the national collaboration. SND consist of more than 200 members from industry, universities, authorities within the research, projects and product development range within the areas of utilization of the entire seaweed as food or feed, the biochemicals as nutraceuticals or other food (and feed) ingredients and residuals bioenergetically purposes as well as cultivation and breeding of seaweed.
- In 2012, Denmark operates 2 local/coastal vessels of 15m and 15,48 m (Genetica II, Ophelia); 1 global of 78,43m (Dana) and 1 oceanic vessel of 56,6 (Gunnar Thorson) registered at the European Research Vessels Infobase (www.eurocean.org).
- Key aquaculture experimental and research facilities in Denmark include
    - Experimental facilities at DTU Aqua
    - Experimental facility at SINTEF

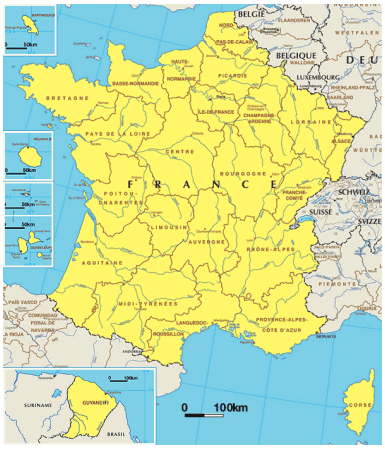
Major observations, trends and future prospects:

- Denmark has a long tradition for exploiting resources from the aquatic environment, which is reflected in ongoing research at universities and research institutes, and production in Danish industry. Research groups focusing on marine biotechnology are located at six universities and two technological research institutes.
- Among major industries having interest in marine biotechnology should be mentioned Novozymes, which are searching for new enzymes and exploitation of biological application of enzymes in the marine area. Further, several companies are producing ingredients from marine raw materials, of which could be mentioned CP Kelco, Danisco and Chr. Hansen. Within the pharmaceutical areas companies such as LeoPharma and GEA has expressed interest in products from the marine area. The company Hempel is a major producer of ship paints, and as such has a pronounced interest in understanding how biofilms are formed and how growth of organisms on submerged surfaces can be prevented.
- The association DanskBiotek, (www.danskbiotek.dk/uk/about-dansk-biotek) works for common interest of the biotechnology interests in Denmark.
- The Danish research councils have previously supported research in marine biotechnology with funds for operating a marine biotechnology research centre. Presently research support is given to individual projects applied for in completion with other projects in the biological, biochemical or technical areas. The Innovation Fund Denmark is participating in ERA-NET MarineBiotech and has granted EUR 1 M for the first call.

FRANCE

(Update March 2015)

Overarching science strategies, plans and policies:



There are no specific Marine Biotechnology strategies, plans or policies in France at the national level. Overarching French Science & Technology Policy is described in the National Programming Law for Research and in the National Research Strategy (SNRI)

National Programming Law for Research http://www.legifrance.gouv.fr/affichTexte.do?cidTexte=JORFTEXT000000426953

National Research Strategy (SNRI) http://www.enseignementsup-recherche.gouv.fr/pid24538/strategie-nationale-recherche-innovation-i.html

In 2009, the "National strategy for the sea and the oceans" Blue Book laid out France's maritime policy. The Blue Book reaffirmed France's ambition to know in depth, protect and manage its vast maritime area; a source of economic and ecological wealth.

- **Blue book - National strategy for the sea and the oceans** http://www.developpement-durable.gouv.fr/Le-Livre-Bleu-des-engagements-du.html The marine research component of the overarching Science & Technology Policy is further elaborated in the strategic policy document of the French marine science organisation Ifremer:
- **Exploring the sea to understand the Earth: contribution to a national research strategy for marine sciences for 2020** http://wwz.ifremer.fr/institut_eng/The-Institute/Reference-documents/Strategic-Plan Research funding schemes and programmes:

In France, there is no specific call for marine and biotechnological research (apart from the Seas-ERA call launched in March 2012). However, marine projects can be funded under thematic calls for competitive research proposals launched by the **French Research Council (ANR)** which operates thematic and blue skies programmes (http://www.agence-nationale-recherche.fr/). About 10% of the ANR annual budget is dedicated to marine research.

- The programming document **Orientations for the ANR Programming Cycle** describes each year the main priorities that are going to be addressed through dedicated calls in line with the National Strategy for Research and Innovation (SNRI)

The Work Programme comprises four interlinked components each with a specific budget and governance:

- Major societal challenges
- At the frontiers of research
- Building the European Research Area (ERA) and France's international attractiveness
- Economic impact of research and competitiveness

http://www.agence-nationale-recherche.fr/fileadmin/aap/2015/wp-anr-2015-generic-call.pdf

- Other National Research Funding Programmes which may be relevant for marine biotechnology research include:
- **ADEME** (The French Environment and Energy Management Agency) can launch calls that can be relevant for Marine sciences (climate change, micro-algal biomass for biofuels, …) http://www2.ademe.fr/servlet/getDoc?id=38480&m=3&cid=96
- **LITEAU** (National Programme Coastal Management) managed by Ministry for Ecology, Energy, Sustainable Development, Territory Planning (MEEDDAT)

  Since 1998, the LITEAU Programme aims at improving sea and coastal areas management by supporting science-based projects at the interface between land and sea, dealing with social-ecological systems through multidisciplinary approach and stakeholders' participation (e.g. pollutions, marine protected areas, coastal ecological engineering). www.developpement-durable.gouv.fr/index.php3
- **The LEFE Programme** (The planetary Fluid Envelopes and the Environment) is managed by INSU and is dedicated to support research on the understanding of the physical, physic-chemical and biogeochemical processes that control the dynamics and the variability of the ocean, the atmosphere and their interfaces. It is composed of 5 main actions: atmospheric chemistry; biogeochemical cycles, environment and resources; operational oceanography; interactions between atmosphere, ice and ocean; numerical methods.

  http://www.insu.cnrs.fr/lefe
  http://www.ifremer.fr/sismer/program/seasearch/htql/prj_edmerp.htql?CPRJ=LEFE
- **The EC2CO** Programme (Continental and Coastal Ecosphere) is coordinated by INSU. It supports interdisciplinary research on major environmental issues on the continental and coastal ecosphere through 4 actions: biogeochemistry, hydrology and ecosystem functioning; ecotoxicology and pollutants dynamics; environmental microbiology; dynamics of littoral interfaces
  http://www.insu.cnrs.fr/node/1497
  www.cnrs.fr/prg/PIR/programmes/ec2co.htm

Strategic documents:

In November 2012, upon demand by the secretaries of state of research and environment, the Alliance for the Environment (AllEnvi, a group of French research agencies) published an inventory and challenges of research and innovation in marine sciences under the title The Marine Programme. The Marine Program presents an inventory of French research on marine and coastal environments, their means of study and the technological developments they sustain, and identifies key issues in terms of knowledge and public policy.

- **The Marine Program: Inventory and challenges of research and innovation in marine sciences**
  http://www.developpement-durable.gouv.fr/Le-programme-mer-etat-des-lieux-et.html
- A **working group on marine biotechnology** was set up in the context of the cluster Europôle Mer, aiming at elaborating a position paper related to Marine biotechnology in the

West part of France (regions Bretagne and Pays de la Loire). This document that include recommendations and priorities for developing the Marine biotech sector shall be available on line in April-May 2015

Private funding mechanisms:

- **BPI France** is a public-sector institution dedicated to economic development and a key source of financing and other support for SMEs. http://www.bpifrance.fr/Bpifrance/Nos-metiers/International

Infrastructures and coordination and support capacities/initiatives:

- **ALLENVI Groupe Mer** – Working group of Association of Research Operators in Environment
  Programme Mer. ALLENVI published (end of 2012) strategic document "The Marine Program: Inventory and challenges of research and innovation in marine sciences" (see above)
  http://www.allenvi.fr/?page_id=335
- **Biogenouest** - the life science core facility network in Western France which comprises a Marine component which is open for all interested parties extending beyond the region http://www.biogenouest.org/index.php?pa=N100&la=en
- Regional Clusters
  - **CapBiotek** - Regional Cluster in Biotechnologies in Brittany http://www.capbiotek.fr/index.php/en
  - **Blue Cluster** - Regional Cluster in Biotechnologies in Pays de la Loire http://www.atlanpolebluecluster.eu/
  - **Pole Mer Bretagne Atlantique** - Global economic competitiveness cluster in Brittany http://www.pole-mer-bretagne-atlantique.com/en/
  - **Pole Mer PACA** - Global economic competitiveness cluster in Provence-Alpes-Côte d'Azur http://en.polemermediterranee.com/International/International-strategy
  - **Europole Mer "Blue Network"** - an informal coordination structure with about 20 members with one of the focal areas (Axe 1) on marine genomics and blue chemistry (related to biotech) http://www.europolemer.eu/en/what-is-europole-mer.php
- Currently, France operates 13 local/coastal vessels from 10m to 30m ; 1 regional vessel of 36m (Antea); 1 oceanic of 56 m (Le Suroit); and 5 global vessels from 65m to 120,5m managed by the French Oceanographic Fleet. These boats are registered at the European Research Vessels Infobase (www.eurocean.org).

- In 2014, France maintains about 12 large marine research equipments included manned submersibles and remote operated vehicles, and autonomous underwater vehicle registered in the European large Exchangeable instruments database (www.eurocean.org).
- Key aquaculture and marine experimental and research facilities in France include
    - **Ifremer Station experimentale d'Aquaculture**

      www.ifremer.fr
    - **Ifremer Laboratoire ARN**

      http://wwz.ifremer.fr/pfom/Organisation-et-personnel/ARN
    - **Station Biologique Roscoff**

      http://www.sb-roscoff.fr/roscoff-marine-station
    - **Observatoire Océanologique de Banyuls sur mer**

      http://www.obs-banyuls.fr/en/index.php
    - **Observartoire Océanologique de Villefranche sur mer**

      http://www.obs-vlfr.fr/
    - **Institut Universitaire Européen de la Mer**

      http://www-iuem.univ-brest.fr/
    - **Centre d'Océanologie de Marseille**

      http://www.com.univ-mrs.fr/

Major initiatives:

- R&D and Infrastructures projects funded in the frame of "**Investissements d'avenir**" ANR
    - **IDEALG** – Consortium of 18 different partners from the academic sector (CNRS, IFREMER, UEB, UBO, UBS, ENSCR, University ofNantes, INRA, AgroCampus), the industrial sector (C-WEED, Bezhin Rosko, Aleor, France Haliotis, DuPont) as well as a technical centre specialized in seaweeds (CEVA) in order to foster biotechnology applications within the seaweed field. Budget of € 10 Millions for 10 yearshttp://www.idealg.ueb.eu/ Contact: Philippe Potin (potin@sb-roscoff.fr) & Monique Ras (monique.ras@sb-roscoff.fr)
    - **OCEANOMICS** – Project providing scientific prolongation of the Tara-Oceans expedition with a budget of €8 Millions for ten years coordinated by Station Biologique de Roscoff http://oceans.taraexpeditions.org/ Contact: Colomban de Vargas (vargas@sb-roscoff.fr)
    - **EMBRC-Fr** -- French component of the European European Marine Biological Resource Centre (EMBRC), an ESFRI Roadmap Research Infrastructure with a budget of €16 Millions over 10 yearshttp://www.embrc-france.fr/fr

http://www.embrc.eu/ Contact : Ian Probert (probert@sb-roscoff.fr) & Anne-Emmanuelle Kervella (akervella@sb-roscoff.fr)

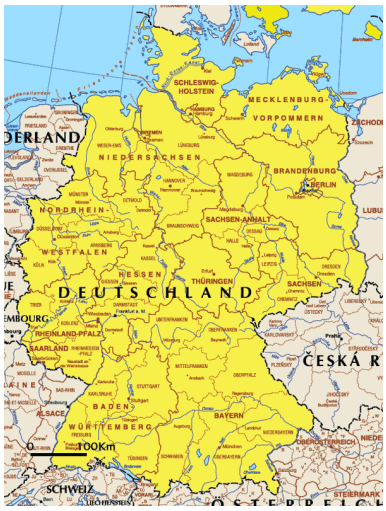
- LABEX Mer, Ocean in Change – Laboratory of Excellence in marine research with eight academic partners from west of France (Brest, Lorein, Nantes, http://www.labexmer.eu Contact: Yves-Marie Paulet (paulet@univ-brest.fr)

- **FRB Fondation pour la Recherche sur la Biodiversité** – Foundation for Biodiversity Research http://www.fondationbiodiversite.fr/
- **Company for the acceleration of the technology transfer (SATT) Ouest Valorisation** was officially created on 20 July 2012 with a regional remit covering the areas Brittany and Pays de la Loire. It is endowed with €66.5mn over 10 years to improve the results of public research through licenses, industrial partnerships, new business start-ups, or by facilitating the mobility of the researchers. It brings together research centers and higher education bodies (French acronym: PRES) from the European University of Brittany (27%) and the Nantes Angers Le Mans university (21%), CNRS (15%), Inserm (3%), IRD (1%) and the State via Caisse des Dépôts (33%) with a head office in Rennes and two secondary establishments in Brest and Nantes. Marine Biotechnology will be one of the 4-5 focal areas of the SATT (Website under construction).
- France has a wide range of marine resource and biotechnology companies ranging from small SME's to major multinationals. Some notable examples of companies with known marine biotechnology research activities, include major players such as SANOFI (pharmaceuticals), Laboratoire Pierre Fabre (pharmaceuticals, cosmetics, plant and innovation technology research), L'Oreal (Cosmetics, beauty producst and perfumes, Lallemand (yeast bacteria and specilalty ingredients) and more than 50 Innovative SMEs (from pharma to food and cosmetics).

GERMANY

(Update May 2015)

Overarching science strategies, plans and policies:



There are no specific Marine Biotechnology strategies, plans or policies in Germany (yet). Up to now, marine biotechnology is supported as part of more overarching bio-economy and marine/maritime research strategies as described in different documents, including

At the federal level:

- Federal Government adopted the "**National Research Strategy BioEconomy 2030 – Our Route towards a Biobased Economy**" (BMBF): http://www.bmbf.de/pub/Natinal_Research_Strategy_BioEconomy_2030.pdfand the "National Policy Strategy BioEconomy" (BMEL): http://www.google.de/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CCYQFjAA&url=http%3A%2F%2Fwww.bmel.de%2FSharedDocs%2FDownloads%2FEN%2FPublications%2FNatPolicyStrategyBioeconomy.pdf%3F__blob%3DpublicationFile&ei=64NkVbviA-Wy7QbAzIGwBg&usg=AFQjCNEP7QceMh4E5SH91ikPpx30CJXyEA
- **High-Tech-Strategy 2020** for Germany from German Federal Government http://www.hightech-strategie.de/de/The-new-High-Tech-Strategy-390.php
- **Technology Campaign (Innovationsstrategie)** of the Federal Ministry of Economics and Technology (BMWi) http://www.bmwi.de/English/Navigation/Service/publications,did=388738.html
- **Nationaler Masterplan Maritime Technologien (NMMT)** http://www.nmmt.de/
- "**Biotechnology2020+ - Next Generation of Biotechnological Processes**" http://www.biotechnologie2020plus.de/BIO2020/Navigation/DE/Vision/strategieprozess.html
- **Strategy of the German Agricultural Research Alliance** (dafa - Deutsche Agrarforschungsallianz) http://www.dafa.de/fileadmin/dam_uploads/images/Fachforen/FF_Aquakultur/DAFA-FF%20Aquakultur%20eng%20A4%20red.pdf
- **Framework Program Research for Sustainable Development (FONA),** a program of the Federal Ministry of Education and Research (BMBF) with strategic alignment; http://www.fona.de/

At the regional level:

- "**Sea or Future**" initiative of state Schleswig-Holstein http://www.schleswig-holstein.de/MWAVT/DE/Technologie/LandesinitiativeZukunftMeer/Ziele/Ziele_node.html
- A specific and regional development strategy **Masterplan Marine Biotechnology Schleswig-Holstein** has been developed in 2012, followed by animplementation plan in 2013.

Research funding schemes and programmes:

Marine Biotechnology research activities may be supported under various programmes including:

- **National Research Strategy BioEconomy 2030,** a program of the Federal Ministry of Education and Research (BMBF); https://www.ptj.de/bioeconomy
- **Health Research/Health Economy Framework Program,** a program of the Federal Ministry of Education and Research (BMBF); https://www.ptj.de/health-research
- **Marine Research,** a program of the Federal Ministry of Education and Research (BMBF) https://www.ptj.de/marine-research
- **Polar Research,** a program of the Federal Ministry of Education and Research (BMBF); https://www.ptj.de/polar-research
- **Research for Sustainable Development,** a program of the Federal Ministry of Education and Research (BMBF) http://www.ptj.de/index.php?index=633
- **Renewable Energy,** a program of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) as part of the Federal Government's 6th Energy Research Programme http://www.ptj.de/index.php?index=636

Private funding mechanisms:

- **Volkswagen Foundation** http://www.volkswagenstiftung.de/index.html?L=1
- **Fritz Thyssen Stiftung** http://www.fritz-thyssen-stiftung.de/home/?no_cache=1&L=1&cHash=117adf62f5979fb5992654769d2e7644
-

Research priorities for marine biotechnology research:

- Aquaculture
- Bio-based industries
- Industrial biotechnology
- Human health

Strategic documents (on regional level):

- **Masterplan Marine Biotechnology Schleswig-Holstein** – a regional development strategy http://www.lifesciencenord.de/fileadmin/norgenta/pdf/Sonstige/Masterplan_Marine_Biotechnologie_PDF_Version_mit_Submariner_2013-05-02_1_.pdf
- **Marine Biotechnologie in Schleswig-Holstein** – Implementation plan (Umsetzungskonzept) http://www.lifesciencenord.de/fileadmin/norgenta/pdf/Sonstige/Umsetzungskonzept_Masterplan_Marine_Biotechnologie.pdf
- **Nationaler Maritimer Masterplan** http://www.bmwi.de/BMWi/Redaktion/PDF/Publikationen/nationaler-masterplan-maritime-technologien,property=pdf,bereich=bmwi,sprache=de,rwb=true.pdf

Infrastructures and coordination and support capacities / initiatives:

- In 2015, Germany operates with a well-resourced fleet of 33 research vessels, registered in the European Research Vessel Infobase (http://www.rvinfobase.eurocean.org/index.jsp):
    - 6 global operating research vessels (Merian, Meteor ,Planet, Polarstern, Sonne, Sonne II; length 73 - 118 m);
    - 4 oceanic, 9 regional and 13 local/costal operating research vessels (length 12,50- 64,50 m)
- Further there are 3 autonomous underwater vehicles (3000-6000 depth), 4 remote operated vehicles, 1 manned submersible and 1 towed camera system in the database for European Large Exchangeable Equipments registered (http://www.lexiinfobase.eurocean.org/).
- Key aquaculture experimental and research facilities in Germany include
    - Leibniz Center for Tropical marine Ecology (MAREE; http://www.zmt-bremen.de)
    - Fraunhofer Research Institution for Marine Biotechnology (Fh-EMB; http://www.emb.fraunhofer.de/en.html)
    - Gesellschaft für Marine Aquakultur mbH (GMA; http://www.gma-buesum.de/index.php?contentID=1)
- **BIO Deutschland**: BIO Deutschland has set itself the objective of supporting and promoting the development of an innovative economic sector based on modern biosciences. http://www.biodeutschland.org/
- **Life Science Nord Management GmbH**: Life Science Nord Management GmbH is the project and service company of Hamburg and Schleswig-Holstein that supports life science activities in North Germany http://www.lifesciencenord.de/ueber-uns/clustermanagement/
- **BioCon Valley**: BioCon Valley is the initiative for Life Science and health economy of Mecklenburg-Vorpommern, Germany. http://www.ls.bcv.org/hosting/bcv/website_en.nsf/urlnames/bcv_index_EN?OpenDocument&mnu=bcv_index&submnu=
- **Fraunhofer Research Institution for Marine Biotechnology**: This Fraunhofer institution EMB in Lübeck is the first one especially for Marine Biotechnology within the Fraunhofer-

Gesellschaft.
http://www.emb.fraunhofer.de/en.html

- **Cyro-Brehm**: The „German cell bank for wildlife“ is a biomaterial bank specialized on the archival cryogenic storage of propagatable cell cultures from wildlife. http://www.emb.fraunhofer.de/en/Uebersichtsindex/cellbank_cryo-brehm.html
- **GEOMAR I Helmholtz Centre for Ocean Research Kiel**: GEOMAR is one of the world's leading institutes in the field of marine sciences. http://www.geomar.de/en/
- **Institute of Marine Biotechnology e.V. IMaB:** The IMaB is dedicated to support research and development in the field of marine biotechnology. http://www.marine-biotechnologie.de/marine/

Companies related to Marine Biotechnology

- Large Scale Industry: BASF, Evonik, Beiersdorf, Henkel, SternEnzym, Merck, AB Enzym, Symrise, Deutsche See,..
- SME: C-Lecta, Analyticon Discovery, B.R.A.I.N., Subitec, evocatal, BlueBioTech, Sea & Sun Technology …

Major initiatives:

- Cluster of Excellence "**The Future Ocean**" http://www.futureocean.org/en/index.php

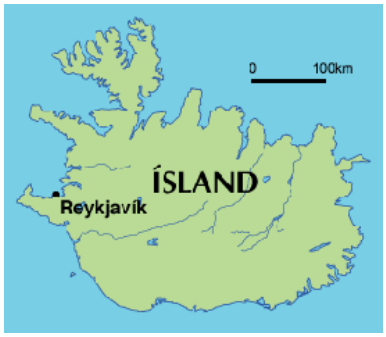
Major observations, trends and future prospects

In Germany there is a strong focus on Biotechnology, but very little is exclusively targeting marine biotechnology. This may change with the first specific regional development strategy for Marine Biotechnology: the **Masterplan Marine Biotechnology Schleswig-Holstein** (Nov 2012).

ICELAND

(Update June 2015)

Science strategies, plans and policies:



The Science and Technology Policy Council is responsible for setting public policy in matters of science and technology in Iceland. The role of the Science and Technology Policy Council is to support scientific research, science education and technological development in Iceland so as to strengthen the foundations of the Icelandic culture and increase the competitiveness of the economy. Science and Technology Policy and Action Plan for the period 2014 to 2016 is now in effect.

Iceland does not have a dedicated Marine Biotechnology policy, strategy or plan, but there are policy documents, which are partly relevant for biotechnology research issues:

Iceland 2020
Science and Technology Policy 2014-2016 from the Science and Technology Policy Council
Iceland Green Economy Policy

Research funding schemes and programmes:

The Ministry of Industries and Innovation - The Ministry of Fisheries merged in 2012 with the Ministry of Industry, Energy and Tourism and part of the Ministry of Economic Affairs to form the the Ministry of Industries and Innovation. It covers all sectors of ordinary business and economic activity, including biotechnology.

The Icelandic Centre for Research (Rannis) - RANNIS supports research, innovation, education and culture in Iceland. RANNIS cooperates closely with the Icelandic Science and Technology Policy Council and provides professional assistance in the preparation and implementation of the national science and technology policy.

Main funds administered by Rannis:

- **The Technology Development Fund** – Fund for applied research and innovation projects.
- **The Icelandic Research Fund** – Fund for basic research projects
- **Other National Research Funding Programmes** which have a significant marine research element include:
    - AVS - a Research fund for Marine and Fisheries with focus on applied research for value added marine products
    - Átak til atvinnusköpunar – Fund for applied research and innovation projects

Research priorities for marine biotechnology research:

- Value addition of underutilised materials
    - Processing by-products
    - New raw materials, such as seaweed
- Bioprospecting and bioactive ingredients
- Marine microorganisms
- Industrial biotechnology

Strategic documents:

- English versions of strategic documents regarding biotechnology in Iceland are being developed. Most are still only available in Icelandic. An English draft of the Icelandic Biotech Sector Assessment is available but out of date. A report from 2007 on Biotechnology research policy and effort in Iceland that came out of an FP6 project is available but needs to be updated. http://ec.europa.eu/research/biosociety/pdf/biopolis_iceland_en.pdf

Infrastructures and coordination and support capacities / initiatives:

The Marine Research Institute is a government institute under the auspices of the Ministry of Industries and Innovation. The Institute conducts research regarding marine organisms and provides scientific advice based on its research on marine resources and the environment. The Marine Institute operates two research vessels.

Matis is an independent research institute which strives toward innovation in the food industry, biotechnology and food security. Matis provides consultancy and services to companies in fisheries and agriculture as well as governmental agencies. Matis has participated in numerous international projects and is currently cooperating in a number of international projects, such as:

- SafeFishDish COFASP
- SeaBioTech FP7-KBBE-2012
- EnRichMar FP7-SME-2013
- BluePharmTrain FP7-PEOPLE-2013-ITN
- BlueGenics FP7-KBBE-2012
- Micro B3 FP7-OCEAN-2011
- MaCuMBA FP7-KBBE-2012
- DiscardLess H2020-SFS-2014-2 / RIA

The Iceland Ocean Cluster is an innovation network of marine industry companies and start-up companies

Association of Biotech companies defined by the Federations of Icelandic Industries

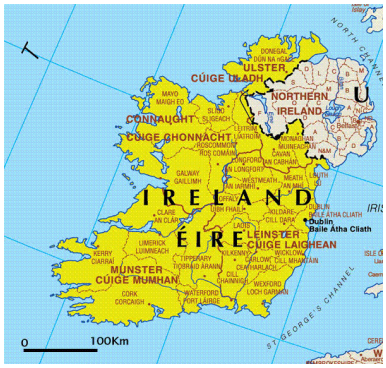
- **Universities**
    - University of Iceland– Life and environmental science, Food science and nutrition, Center for System biology researchers
    - University of Akureyri – Natural Resource Sciences
    - Hólar University Collage - Department of Aquaculture and Fish Biology

Major initiatives:

Together with the Nordic countries, Iceland is actively cooperating in bio-economy in general, with its main emphasis on marine biotechnology.

IRELAND

Overarching science strategies, plans and policies:



- Ireland's national research agenda is set-out in the **Strategy for Science, Technology and Innovation**, published in 2006. http://www.forfas.ie/media/asc060618_sti_strategy.pdf
- The major influence on Ireland's marine biotechnology strategy is ***Sea Change* – A Marine Knowledge, Research and Innovation Strategy for Ireland 2007- 2013**. Originally published in 2007, Sea Change remains influential in defining the strategic direction of Irish marine research. http://www.marine.ie/home/research/SeaChange
- Other related policy and national strategies include,
    - **Food Harvest 2020** is a plan for Ireland's food sector. This Department of Agriculture, Food and the Marine strategy sets the vision for Ireland's food sector, including marine foods and establishes performance targets. http://www.agriculture.gov.ie/media/migration/agri-foodindustry/foodharvest2020/2020FoodHarvestExeSummary240810.pdf
    - **Food Research Ireland** is the strategic research agenda which supports the goals of Food harvest 2020, including a dedicated strategic research agenda for marine origin food materials. http://www.agriculture.gov.ie/media/migration/research/FoodResearchIreland.pdf
    - The report from the **Research Prioritisation Steering Group**, defines national priority research areas. Marine biotechnology research is relevant to research themes in Food for Health, Sustainable Food Production and Processing, Therapeutics, Processing Technologies and Novel Materials http://www.forfas.ie/publications/featuredpublications/title,8958,en.php

Research funding schemes and programmes:

- No dedicated funding stream to support marine biotechnology research exists in Ireland. Different agencies provide funds for varying levels of research activity from basic to applied, all of which are awarded on the basis of open competition.
- **Science Foundation Ireland** implements a range of funding initiatives to support research at various levels. Possibilities exist for researchers in marine biotechnology related areas to apply for funds from SFI. http://www.sfi.ie/funding/funding-calls/open-calls/assets/templates/default_tpl/images/favicon.ico
- Specifically oriented to food research, including marine foods related research is the **Food Industry Research Measure (FIRM)** implemented by the Department of Agriculture, Food and the Marine. http://www.agriculture.gov.ie/research/foodinstitutionalresearchmeasurefirm

- **Enterprise Ireland** provides in-company research and development support for firms in most industry sectors. Significant emphasis on encouraging collaboration between industry and the higher education institutes is a feature of EI funding programmes. http://www.enterprise-ireland.com/en/funding-supports/
- The Marine Institute through its management of a national marine research funding programme established under a **National Development Plan** provided dedicated marine research support. http://www.marine.ie/home/funding/MarineNDP2007_2013
- The **Irish Research Council** operates research funding initiatives which support early stage researchers at Masters, Doctoral and Postdoctoral levels to engage in exploratory research. http://www.ircset.ie/
- The **Higher Education Authority** manages an array of programmes designed to enhance the research capabilities, capacity and infrastructure of Ireland's higher education institutions. http://www.hea.ie/en/research
- A database of funded projects is available at http://www.marine.ie/home/research/ProjectsDatabase/CurrentProjects/

Research priorities for marine biotechnology research:

- Objectives set within Sea Change provide insights to marine biotechnology related research priorities.
- Create a strong, interdisciplinary capability in the utilisation of marine biodiversity, using novel high-throughput techniques, for the development of drugs, therapies and biomaterials.
- Develop core research capabilities and teams in taxonomy, natural products chemistry, chemogenomics and bioinformatics.
- Develop capabilities for the isolation and identification of novel chemical compounds or proteins for use by the medical device industry (e.g. adhesives and biofilms).
- Create science-based capability to support development of opportunities in functional foods based on marine raw materials, and develop strong synergies with research and development programmes in the seafood, food and health sectors.
- Develop opportunities for participation in internationally funded programmes.
- Create a strong, interdisciplinary research capability in the identification and utilisation of marine biodiversity as a source of materials for use in functional foods.
- Develop capabilities to process marine based materials for use by the functional food sector.
- Create a new research capability in marine functional foods linking indigenous and multi-national food and pharmaceutical industries with researchers at state and third level research institutions.
- Develop a screening programme for potential seaweed products (including nutritional and biochemical analysis) across the range of candidate species.

Strategic documents:

Links to the main strategic documents are given above.

Infrastructures and coordination and support capacities / initiatives:

The **Marine Institute** is responsible for coordination and the provision of support, including policy advice, for marine biotechnology related research.

In respect of research infrastructure, the Marine Institute manages a fleet of research vessels (http://www.marine.ie/home/Research+Vessels.htm). Additionally, Irish universities and institutes of technologies as well as public research institutes maintain an array of research equipment, some of which is relevant to marine biotechnology. Institutions with significant marine biotechnology related research capabilities include University College, Dublin; the National University of Ireland, Galway; University College, Cork; Limerick University; Tralee Institute of Technology; Waterford Institute of Technology; Cork Institute of Technology; Limerick Institute of Technology and Letterkenny Institute of Technology. Links to each of these institutions are at http://www.hea.ie/en/AboutHEA#Universities. Teagasc Ireland's agriculture and food development authority, leads the NutraMara functional foods programme and maintains an extensive research infrastructure. http://www.teagasc.ie/

- In 2012, Ireland operates 2 local/coastal vessels from 15m to 31,4 m (R.V. Keary, Celtic Voyager) and 1 global vessel of 65,5mm (Celtic Explorer) registered at the European Research Vessels Infobase (www.eurocean.org).
- In 2012, Ireland maintains about 3 large marine research equipments registered in the European large Exchangeable instruments database (www.eurocean.org).
- Key aquaculture experimental and research facilities in Ireland include
    - Freshwater hatchery (Marine Institute)
    - Martin Ryan Institute Carna (National University of Ireland)
    - Daithi O'Murchu Marine Research Station
    - Aquaculture and Fisheries Development centre (University College Cork, department zoology, ecology and plant science)

Major Initiatives:

Major initiatives which incorporate, or have links to marine biotechnology based research include

NutraMara – a marine functional foods research programme http://www.marine.ie/home/research/ProjectsDatabase/CurrentProjects/MFFRI.htm

The Beaufort Marine Biodiscovery Project http://www.marine.ie/home/research/ProjectsDatabase/CurrentProjects/Marine+Biodiscovery.htm

The Beaufort Fish Population Genetics project http://www.marine.ie/home/research/ProjectsDatabase/CurrentProjects/Fish+Population+Genetics.htm

Food for Health Ireland http://www.fhi.ie/

Trends and observations

Strategy on Marine Biotechnology:

Ireland has a national strategy on marine biotechnology, as an element of an overall marine research strategy (Sea Change), focusing on biodiscovery and functional foods/neutraceuticals. A recent broader national research prioritization exercise includes marine functional foods as part of a 'Food for Health' priority and opportunities marine biodiscovery research within the 'Therapeutics' priority. Links between marine biotechnology and other priority areas also exist.

Programs on Marine biotechnology:

There is no distinct (i.e. 'ring-fenced') funding program for marine biotechnology, but marine biotechnology can be funded as part of the funding programmes of a number of funding agencies, ranging from the basic science (Science Foundation Ireland), to specific marine programmes (Marine Institute) and industry-focused programmes (Enterprise Ireland).

Funding:

The Marine Institute operates a national marine research funding programme. From a total annual budget of €8-10M for this programme, spending on marine biotechnology research (Marine Biodiscovery and Marine Functional Foods) accounts for approximately €1.5M/annum. Additional investments from other national funding agencies (e.g. Department of Agriculture, Food and marine; Science Foundation Ireland) amount to approximately €0.5M/annum.

Irish researchers are very active in FP7 funded marine biotechnology projects, including marine biofuels.

ITALY

(Update April 2015)

Programmes

- Italian National Research Programme: 2014-2020, 6,3 B€ to be approved (http://www.istruzione.it/allegati/2014/cs310114bis_all1.pdf)

- RITMARE is a five years (2012-2016), 250 M€ national flagship programme which promotes marine research, including Biotechnologies http://www.ritmare.it/en/index.php?option=com_content&view=featured&Itemid=101

National projects

PON01_02093 Studio di nuove tecnologie e piattaforme tecnologiche per il miglioramento di processi produttivi di principi attivi farmaceutici di interesse industriale e ricerca di nuove molecole bioattive da sorgenti naturali. Coordinato da Sanofi-Aventis http://www.ponrec.it/en/open-data/results/industrial-research/pon01_02093/

- PON - SEAPORT coordinated by Cons. di ric. per l'innovazione tecnolog., Sicilia Trasporti Navali, Commerciali e da Diporto scarl (Innovative technologies development for energetic and environmental sustainability of shipyard and harbour areas) PON02_00153_2939551. (2012-2016) http://www.ponrec.it/open-data/risultati/distretti-laboratori/pon02_00153_2939551/

- PON-STITAM coordinated by Cons. di ric. per l'innovazione tecnolog., Sicilia Trasporti Navali, Commerciali e da Diporto scarl"Sviluppo di Tecnologie Innovative per il trattamento dei rifiuti liquidi della navigazione finalizzate alla Tutela dell'Ambiente Marino" (Development of innovative technology in the maritime sectors for the marine environment protection) (STI-TAM) PON02_00153_2849085.(2012-2016) http://www.ponrec.it/open-data/risultati/distretti-laboratori/pon02_00153_2849085/

- PON01_0117 coordinated by Novartis Antigeni e adiuvanti per vaccini e immunoterapia (Antigens and adjuvants for vaccines and immunotherapy) http://www.ponrec.it/open-data/risultati/ricerca-industriale/pon01_00117/

- PON01_02782 coordinated by BIOGEM Nuove strategie nanotecnologiche per la messa a punto di farmaci e presidi diagnostici diretti verso cellule cancerose circolanti. (New nanotechnologies for pharmaceutical and diagnostic systems targeted to the cancer cells) http://www.ponrec.it/open-data/progetti/scheda-progetto?ProgettoID=5246

- PON02_00667 – PON02_00451_3362376 Valorizzazione Biomolecolare ed Energetica di biomasse residuali del settore Agroindustriale ed Ittico (Valorization of waste biomass from the fishery industry) (BIO4BIO) (2012-2015) http://www.ponrec.it/open-data/progetti/scheda-progetto?ProgettoID=5920

- PON01-02740 for the use of microalgae as source of energy and bio-products, including food ingredients, nutraceuticals and cosmetic components. http://www.ponrec.it/open-data/progetti/scheda-progetto?ProgettoID=5242

- PON02_00186_2937475 Clinical protocols and innovative technology for the production of functional foods identifier (2015). (http://www.ponrec.it/open-data/progetti/scheda-progetto?ProgettoID=5757)

MIUR (Ministry of Education,University and Research) Projects:

PRIN (Research project of National Interest) - projects focused

- Search of marine natural products with antitumor activity or as immunogenic compounds (2012-2014) ,

- Chemoecological study of marine biological invasions in the Mediterranean Sea (2012-2017),

- System Biology : role of hydrocarbon-degrading bacteria in the de-toxification of oil-polluted marine areas for the survival of macro-organisms, PRIN 2012-2011 (December 2015)

PNRA (National Program for Antarctic Research) projects titles

- Genome scanning and characterization of novel antifreeze proteins for industrial application (2013-2015)

- STRANGE bioremediation extreme environment Sistema integrato fisico-biologico-meccanico per il recupero ed il trattamento in emergenza di "Oil Spill" in Ambiente Antartico - Bando PNRA n. 417 dell'11 marzo 2013; (March 2016) National coordination IAMC-CNR

- SIAMO Sea-ice associated methylated osmolytes: biogenesis and contribution to the oceanic methane production. Bando PNRA n. 417 dell'11 marzo 2013 (2015)

- New drugs for Cystic Fibrosis opportunistic pathogens from Antarctic microrganisms.(2013-2015).

- Exploiting Antarctica biotechnological potential: metabolic modelling for optimization of bioactive molecules biosynthesis from Antarctic bacteria. (2013-2015)

Regional

POR Campania (Regional Projects with EU funds) - "Rete integrata per le Biotecnologie applicate a molecole ad attività Farmacologica" Biotechnology and Pharmacology (including marine molecules) (2015-2016).

POR-FSE 2007-13 Progetto CIP n. 19 “Eco.mar” Education: Strengthening of R&S system and creation of new Spin-Off in the frame of the Blue Growth (2015).

European Projects:

FP7-IEF Marie-Curie programme - Project "ChimicaMarinaaNapoli (2015-2017);

European Project MAS3-CT95-0034 (Marine Technology) “Microorganisms in deep sea vents and marine hot springs as sources of potentially valuable biochemicals”;

FP7 EU OCEAN 2013 BRAAVOO “Biosensors, Reporters and Algal Autonomous Vessels for Ocean Operation use of marine bacteria as bioreporters / biosensors for the monitoring of marine environment pollution” G.A. n°614010 (December 2016)

Horizon 2020 Blue Growth : INMARE Industrial Applications of Marine Enzymes: Innovative screening and expression platforms to discover and use the functional protein diversity from the sea (started on the 1th of April 2015)

FP7 EU Micro B3 Collaborative project "Marine Microbial Biodiversity, Bioinformatics and Biotechnology "- project ID 287589 (December 2015)

FP7 EU KillSpill Integrated Biotechnological Solutions for Combating Marine Oil Spill - GA No. 312139 (01/2013-12/2016)

FP7 EU PharmSea: Increasing Value and Flow in the Marine Biodiscovery Pipeline. Collaborative Project (large-scale integrating project targeted to SMEs) Project number 312184 (01/10/2012 to 01/10/2016)

Bilateral Projects:

Bilateral cooperation project Italy-Turkey MAE-TUBITAK, II Agreement 2012-2014 “Extremophiles for Next Generation Biofuels” M00192;

“Progetto di Grande Rilevanza” High Relevance Italy-Egypt “Biotechnological applications of marine sponge-associated microorganisms”, funded by Ministero degli Affari Esteri, Direzione Generale per la Promozione del Sistema Paese”, Italy, 2013-2016.

Bilateral Italy- France Galileo Project entitled “Discovering marine mycobiota: identification, characterization and preservation of fungi associated to algae for future biotechnological exploitation” between University of Turin and Technopole Brest-Iroise, Université de Brest. 2014.

Bilateral Italy- France Galileo Project entitled “Mediterranean marine fungi: a novel source of bioactive secondary metabolites” between University of Turin and Technopole Brest-Iroise, Université de Brest. 2014. Université Nice Sophia Antipolis. 2015-2016.

CNR (Department of Physical Sciences and financed program):

- EFOR on renewable energy that also includes the sea (2011-2015). http://www.dsftm.cnr.it/erc/

- Technology Transfer CNR Project: BIOTTASA-Department of Bio-Medicine, CNR, Italy. http://www.biottasa.it

Private Investments

Companies whose aim is related to environmental issues and also the identification of innovative natural origin (including marine) material :

- Biochemtex SpA www.biochemtex.com

- Beta-Renewables PROESA ® TECHNOLOGY

- Bio-On SpA

Investors interested also in biotech sector:

- X Capital SpA (http://x-capital.it)

- Innogest SGR http://www.innogest.it

- IAG – Italian Angels for Growth (http://www.italianangels.net)

- Sicilian venture philanthropy Foundation (http://www.fondazionesvp.it)

- Intesa SanPaolo Startup http://assobiotec.federchimica.it/eventi/eventi-associativi/2015/04/21/default-calendar/bioinitaly-investment-forum-intesa-sanpaolo-start-up-initiative-2015. Call for Enterprises, Startups and Projects in the Biotech Field.

Research Priorities:

- The Smart Specialisation Strategy – RIS3 Sicilian Region (http://www.euroinfosicilia.it/programmazione-20142020/livello-regionale-po-sicilia-2014-2020/strategia-regionale-dellinnovazione-2014-2020/) includes action related to the Blue growth also with special attention to the Marine Biotechnology which was the results of collaborative action within a thematic table on Marine and Maritime Economy.

- Italian Consultation Board scoping paper SC2 Horizon 2020 Societal Challenge 'Food Security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research, and the Bioeconomy'– H2020 support to the Italian Delegation (working document) (Ministry of Education, University and Research MIUR).

Relevant Infrastructures:

- EMBRC (ESFRI Project) is a European infrastructure project with a strong Marine Biotechnology component. At the national level the Stazione Zoologica is trying to establish an Italian EMBRC network of institutes which will also have a strong marine biotechnology component.

- MIRRI (Microbial Resource Research Infrastructure) is an ESFRI Infrastructure (University of Turin leader in Italy) for the preservation , distribution and exploitation of any kind of microorganisms.

- National Committee for Biosafety, Biotechnology and Life Sciences (CNBBSV) http://www.governo.it/biotecnologie/organizzazione.html

- Cluster Applied Biotechnologies www.sardegnaricerche.it

- National Centre for Biological resources http://www.cnrb.it/

- Useful links for Italian research infrastructure and support initiatives for biotechnology research : http://www.biotechinitaly.com/web/Rubriche.aspx?rubrica=Links

- In 2015, Italy operates 12 local/coastal vessels from 10m to 42,40 m; 2 regional vessels of 35,3m and 44,8m (Universitatis, Dallaporta); 1 oceanic of 61,3m (Urania); and 2 global vessels of 72,63 and 130m (Italica, OGS-Explora) registered at the European Research Vessels Infobase http://www.rvinfobase.eurocean.org/).

- In 2015, Italy maintains about 3 large marine research equipments registered in the European large Exchangeable instruments database (http://rid.eurocean.org/).

- Rearing installations (Institute for Coastal Marine Environment IAMC-CNR)

- Marine Aquaculture and fisheries research centre (Salento University)

- ISPRA (http://www.isprambiente.gov.it/it/i-laboratori-ispra/risorse-acquatiche/acquacoltura-sperimentale).

- PON 2007-2013 PITAM - Technological Platform for Geophysical and Environmental Marine Surveys (IAMC-CNR) Private/Public partnership.

- Cluster Sicily NAVTEC Technological and Biotechnological solutions in maritime field (http://www.navtecsicilia.it).

- Cluster AGROBIOPESCA Fishery and Aquaculture (www.agrobiopesca.it/)

- Cluster Micro-Nano Systems S.C.A.R.L. (http://www.distrettomicronano.it)

- The Science and Technology Park of Sicily (PSTS) (http://www.pstsicilia.it)

HUBS -

- Spin-Off BIOSEArch (Stazione Zoologica di Napoli (SZN), Institute of Biomolecular Chemistry (CNR) Consorzio Italciotec) Center chemical analysis of primary and secondary metabolites with instruments of nuclear magnetic resonance, mass spectrometry, chromatography and spectroscopy.

- Spin-Off Ecoreach of the Polytechnic University of Marche works with private and public companies, non-governmental and non-profit organizations, mass media, stakeholders and decision makers.

- Spin-Off ABIEL Srl (IAMC-CNR) is a biotechnology company committed to R&D, production and marketing of innovative high quality lytic enzymes (including marine enzymes) for tissue dissociation in cell therapy and regenerative medicine applications.

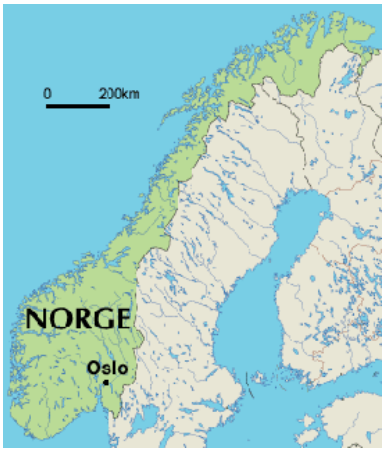
Major observations, trends and future prospects -

National strategies, plans and policies in the marine biotechnology sector in Italy are very fragmented. During the last year the Italian scientific community operating within Marine Biotechnology have been working on a new constituted National Marine Biotech Network participating to specific survey on the national priorities concerning the Blue Growth. In this context we have also involved a very active association ASSOBIOTEC (www.assobiotec.it) which supports the development of Biotechnologies in all its fields, also promoting the starting of collaborations between academy and industries, public and private stakeholders in multidisciplinary activities, one of these is the annual IFIB Italian forum for industrial Biotechnology which includes a Marine Biotech session.

NORWAY

(Update April 2015)

Overarching science strategies, plans and policies:



National Whitepaper: "**Climate for research**" describes the overall Norwegian government's research strategy. http://www.regjeringen.no/pages/2178785/PDFS/STM200820090030000DDDPDFS.pdf

National Whitepaper: "**Marine Bioprospecting- a source of new and sustainable wealth growth**" describes the Norwegian government's strategy for marine bioprospecting. http://www.regjeringen.no/upload/FKD/Vedlegg/Diverse/2009/Marin_bioprospektering_080909_lavoppl.pdf

National Whitepaper: "**National strategy for biotechnology**" describes the Norwegian government's strategy on biotechnology. http://www.regjeringen.no/upload/KD/Vedlegg/Forskning/Bioteknologistrategi.pdf

National White paper: "**Strategy for an Environmentally Sustainable Norwegian Aquaculture Industry**" describes the Norwegian government's strategy on aquaculture. http://www.regjeringen.no/upload/FKD/Vedlegg/Diverse/2009/strategy%20for%20an%20sustainable%20aquaculture.pdf

National White paper: "**Nordområdestrategien**" describes the Norwegian government's strategy for research in the high north. http://www.regjeringen.no/upload/FKD/Vedlegg/Diverse/2009/strategy%20for%20an%20sustainable%20aquaculture.pdf

National Whitepaper: **"Long-term plan for research and higher education 2015–2024"** describes the government's focus for 10 year s. https://www.regjeringen.no/en/dokumenter/meld.-st.-7-2014-2015/id2005541/?docId=STM201420150007000ENGEPIS&ch=1&q=

Research funding schemes and programmes:

- **The Research Council of Norway (RCN)** funds research projects, innovation projects, industrial projects and infrastructure. Relevant research programmes includes:
    - **BIOTEK2021**: A research financing program that finance applied academic research and industrial development of biotechnology. http://www.forskningsradet.no/servlet/Satellite?c=Page&pagename=biotek2021%2FHovedsidemal&cid=1253970728155&langvariant=en
    - **Aquaculture - An industry in growth**: A research financing program that finance applied academic research and industrial development on aquaculture and fisheries

http://www.forskningsradet.no/servlet/Satellite?c=Page&pagename=havbruk%2FHovedsidemal&cid=1226994216892

- **The ocean and the coast**: A research financing program that finance academic research and industrial development on eco systems and the marine environment http://www.forskningsradet.no/servlet/Satellite?c=Page&cid=1226994156395&pagename=havkyst%2FHovedsidemal
- **Sustainable Innovation in Food and Bio-based Industries**: A research financing program that finance applied academic research and industrial development of bio-based industries. http://www.forskningsradet.no/servlet/Satellite?c=Page&pagename=bionaer%2FHovedsidemal&cid=1253971968584&langvariant=en
- **Polar research**: A research financing program that finance research on sustainable management and development of industries in the high north http://www.forskningsradet.no/servlet/Satellite?c=Page&pagename=polarforskning%2FHovedsidemal&cid=1231229969369&langvariant=en
- Pre-industrial support: A funding program focused on technology transfer from academia to industry. http://www.forskningsradet.no/prognett-bia/Home_page/1226993636038
- Industrial support: A funding program supporting industrial developments. http://www.forskningsradet.no/prognett-bia/Home_page/1226993636038

- **Innovation Norway** funds innovation projects with industry and infrastructure. Relevant programmes include:
  - Public R&D contracts and Private R&D contracts, where SMBs can be funded with up to 35% in a collaboration project with either a public or private customer. http://www.innovasjonnorge.no/Finansiering/IFUOFU/
  - Entrepreneurial grant, where start-ups can be funded in an initial period of the company. http://www.innovasjonnorge.no/Finansiering/Etablerertilskudd1/
- **SIVA** funds infrastructures, such as laboratories and necessary housing for innovation centres. http://www.siva.no/internett/cms.nsf/pages/english?open
- Regional research foundations funds research projects, innovation projects, industrial projects and infrastructure. http://www.regionaleforskningsfond.no/servlet/Satellite?c=Page&pagename=rff-hovedside/Hovedsidemal&cid=1253954088866
- A collaboration effort exists between Innovation Norway, The research council of Norway, SIVA and equivalent research councils in the United Kingdom to fund innovation and applied research in marine biotechnology. https://connect.innovateuk.org/web/bioscienceskn/articles/-/blogs/6374683;jsessionid=E2F58BACA08C2F4ECA1F541C658C55B7.MekushUdbew4

Research priorities for marine biotechnology research:

- Bioprospecting / Biodiscovery, Aquaculture, Human and animal health
- Fisheries
- Polar research
- Industrial biotechnology
- Bio-based industries

Strategic documents:

- **Strategy plan for Marine Bioprospecting**: A strategy document formed by the RCN, Innovation Norway and SIVA on how to implement the national strategy for Marin Bioprospecting.
  http://www.forskningsradet.no/servlet/Satellite?c=Page&cid=1253953666626&pagename=fuge%2FHovedsidemal
- **The Arctic and Northern Areas Initiative (Forskning.nord.to)**: The Research Council of Norway's research strategy for the high north
  http://www.forskningsradet.no/servlet/Satellite?c=Nyhet&cid=1253968952749&lang=no&pagename=nord%2FHovedsidemal
- **HAV21**: The marine strategy for Norway

  http://www.hav21.no/servlet/Satellite?blobcol=urldata&blobheader=application%2Fpdf&blobheadername1=Content-Disposition%3A&blobheadervalue1=+attachment%3B+filename%3D%22HAV21ENGWEB100dpi.pdf%22&blobkey=id&blobtable=MungoBlobs&blobwhere=1274502425446&ssbinary=true

Infrastructures and coordination and support capacities / initiatives:

- In 2012, Norway operates 9 local/coastal vessels from 12,2m to 31,25 m; 1 regional vessels of 47,24m (Hakon Mosby); 4 oceanic from 56,80m to 64,40; and 3 global vessels from 66,65m to 102,8m registered at the European Research Vessels Infobase (www.eurocean.org).
- In 2012, Norway maintains about 11 large marine research equipments registered in the European large Exchangeable instruments database (www.eurocean.org).
- Key aquaculture experimental and research facilities in Norway include
  - Breeding facilities (Aqua Gen AS)
  - Skretting, Marine Harvest (Center for Aquaculture Competence AS)
  - Trial farms (Ewos Innovation AS)

- Comercial sea based facilities (Fjord Forsøksstasjon Helgeland AS)
- Grow out sea based facilities(GIFAS - Gildeskål Forskningsstasjon)
- Cod Breeding Centre Nofima Marin
- Grow out sea based facilities (NIVA)
- SEALAB(SINTEF)
- Aquaculture research station (Havbruksstasjonen)
- Grow out unit (Val Akva)
- Grow out sea based facilities (VESO Vikan Akvavet)
- Cod Farm and Miljølaks (Villa AS)
- IMR - Flødevigen Research Station (Institute of Marine Research)
- IMR - Matre Research Station (Institute of Marine Research)
- CodTech laboratory (NTNU)
- IMR - Austevoll Research Station (Institute of Marine Research)

- **Biotech North**: BioTech North is the network organisation for the development of biotechnology in the Tromsø region in North Norway. http://biotechnorth.no/biotech-north-2/
- **10 biotechnology platforms**: These technology platforms have been built up during the course of the FUGE programme. They offer service in different high tech niches to academic researchers and industry. http://www.forskningsradet.no/servlet/Satellite?c=Page&cid=1226993591957&pagename=fuge%2FHovedsidemal
- **MarBank:** A national marine biobank organising the collection, and structuring of the marine biodiversity for research and industrial development. http://www.imr.no/barentshavet/tokt/toktdagbok_2006/dagbok/marbank http://www.noruega.org.pt/PageFiles/575028/7%20Kjersti%20L%20Gabrielsen_Marbank%20-%20A%20national%20collection%20of%20Arctic%20Marine%20Organisms.pdf

Major Initiatives:

The two major initiatives within marine sciences are the **Aquaculture** program and the **BIOTEK2021** program mentioned above.

PORTUGAL

(UPDATED July 2015)

National strategies, plans and policies

Portugal has a National strategy for the Sea (ENM) for the period 2013-2012 (ENM_PT) http://www.dgpm.mam.gov.pt/Documents/ENM.pdf)

This strategy is a public policy instrument that presents a new development model for the ocean and offshores (blue growth) that points to a long-term, intelligent, sustainable and inclusive growth path, that intends to prepare Portugal to tackle the challenges brought by the growth, promotion and competitiveness of the Sea Economy, at both European and International levels.

This strategy lists a series of concrete measures and actions and one of the main intervention domains deals with the sustainable exploitation of living resources where it is expected that biotechnology will be a major instrument, in the sea food processing including fisheries and aquaculture, in the valorisation of biomass and rest raw materials, leading to an impact in numerous industrial applications, such as food and feed, pharmaceutical, cosmeceutical, and others.

Recently "The Research & Innovation smart specialization strategy" (2014) (ENEI_PT) https://www.fct.pt/esp_inteligente/index.phtml.en, written by FCT following the European Cohesion fund requirement, as a condition to be able to receive the EU structural 2014-2020 grants, reinforces these intentions, and identifies the Sea economy as one of the main priorities for Portugal.

Direcção geral da política do mar (DGPM)

http://www.dgpm.mam.gov.pt/Pages/eea_grants_quem_somos.aspx#4

DGPM mission is to develop, evaluate and update the National Strategy for the Sea, to elaborate, and propose political measures, to plan and regulate the maritime space in his different uses and activities, to follow-up and participate in the Maritime policy integrated in the EU and promote the national and international cooperation in maritime affairs.

COTEC Portugal (http://www.cotecportugal.pt/) a business association for innovation has the mission to «promote the competitiveness of companies established in Portugal. COTEC led the elaboration of a document "Blue growth for Portugal" that analysis in detail the current state and perspectives for the six main maritime areas: 1.Food/feed from marine resources, 2.Offshore energy,

3.Equipment, repair and shipbuilding, 4. Leisure, tourism and recreation, 5.New uses and bioresources from the sea, 6. Ports and Maritime transport (see: Blue growth for Portugal)

Research funding schemes and programmes:

EU structural 2014-2020 grants

Out of the 15 EU grant Funding channels, one will be exclusively devoted to the Sea https://www.portugal2020.pt/Portal2020/Media/Default/Docs/Programas%20Operacionais/PO%20Mar%202020.pdf, with a focus on the promotion of competitive fisheries, aquaculture, aiming to an increase in commercialization and job creation.

Additionally, funding for marine Biotechnology will be transversal to many other regional and thematic funding programmes, currently or soon to open, under Portugal 2020 (for example, COMPETE 2020 - http://www.pofc.qren.pt/, other regional programmes including the islands Azores and Madeira or bilateral funding)

(https://www.portugal2020.pt/Portal2020/programas-operacionais-portugal-2020-2)

Research Funding in Portugal

The funding of the Portuguese research system is mainly conducted under the authority of the **Ministry of Education and Science**, namely through its **Foundation for Science and Technology (FCT)**. FCT is funding research via an anual non-thematic research programme which funds all research areas through competitive calls for proposals. The total funding budget for FCT is about 500 M EUR per year, with about € 0.5 - 1 M EUR being spent on marine biotechnology.

Others research funding organisations

Centro de C&T da Madeira - CITMA (language: Portuguese)

Calouste Gulbenkian Foundation - FCG

Fundação Oriente

General Directorate of Fisheries and Aquaculture of the Azores (language: Portuguese)

Luso-American Foundation - FLAD

Regional Directorate for Science and Technology - DRCT (language: Portuguese)

Private funding mechanisms

There is no specific private funding exclusive to Marine Biotechnology, however Portugal has a venture capital market duly established that is capable of financing companies that bet on emerging sectors such as marine Biotechnology. The type of funds available include: seed, start-up, expansion and internationalization, tourism, sector specific and regional. Portugal Ventures http://www.portugalventures.pt/ is a Venture Capital Company, manages several Venture Capital & Private Equity funds with a total capital of around € 600 million. Its portfolio is made up of approximately 180 companies from a number of different industries. The aim is to improve the

competitiveness of the Portuguese economy by investing in cutting edge industries and technologies, as well as in companies geared toward global markets.

Other entrepreneurship/innovation associations

- Associação Portuguesa de Business Angels: http://www.apba.pt
- Associação Portuguesa de Capital de Risco e de Desenvolvimento: http://www.apcri.pt
- Agency for Innovation http://www.adi.pt/
- Agency for Innovation and Competitiveness – IAPMEI http://www.iapmei.pt/

Forum / Clusters

Forum Empresarial da Economia do Mar (FEM)

Entrepreneurial Forum for the Economy of the Sea

The Business Forum of the Economy of the Sea (www.fem.pt), is a business association: "Sea Economic Hypercluster", with the following objectives: a) contribute to the taking of the maritime economy as a national goal, in order to affirm Portugal as relevant maritime actor at the global level; b) contribute to the sustainable development of sea and appreciate its importance as a major economic resources, projecting it as the great engine of economic development of the country; c) promote a common and integrated strategy of the activities related to the maritime economy, and create the conditions to promote good business practices, and cooperation between national strategic actors for the development of the Portuguese economy and the production of collective wealth in all business sectors related to the maritime economy.
FEM launches a monthly newsletter - http://feemar.weebly.com/publicadas.html

Oceano XXI – Cluster do conhecimento da Economia do Mar

Association for the Knowledge and Economy of the Sea

Oceano XXI – www.oceano21.org - is a private non-profit corporate body, created in 2009 by the initiative of two regional associations IDCEM (Instituto para o Desenvolvimento do Conhecimento e Economia do Mar) and AFM (Associação Fórum Mar Centro). The Association has more than 60 members, from different sectors of activity of the Sea Economy, between companies and business associations, R&D Centres, higher education institutions, local authorities and other associative organizations. Oceano XXI mission: To foster the "Sea Knowledge and Economy Cluster" through the intersection of knowledge and support for innovation, internationalization and entrepreneurship contributing in sustainability conditions for the country's competitiveness.

BlueBio Alliance

The BlueBio Alliance is a networking initiative that aims to accelerate the development of the whole value chain connected to Marine Biotechnology in Portugal including all relevant stakeholders. The Bluebio alliance wants to act in collaboration with other relevant and broader scope initiatives such as Oceano XXI.

LAW FIRMS, specialized in maritime affairs:

-Vieira de Almeida & Associados (VdA)

http://www.vda.pt/en/what-we-do/sectors/Economy-of-the-Sea/9520/

VdA strives to deepen Portugal's knowledge and know-how on the Economy of the Sea and also to be able to mobilize other "maritime nations" of the world. VdA has created a specific multidisciplinary team providing specialised legal services in a number of matters of this innovative economy, such as: Business investment projects,Business plan structuring, Corporate and contractual relationships, Structuring supply and distribution models , Mergers, acquisitions, Regulatory and Public Procurement, Instruments of national maritime space planning, Conflicts between uses and activities developed in national maritime space, Shared uses of national maritime space, Privative uses of national maritime space (concessions, licences and authorizations), Environmental issues, Financing activities in the national maritime space, Intellectual property rights

- Miranda Correia Amendoeira & Associadas http://www.mirandalawfirm.com/?lang=pt

Portals / Platforms

Portal do Mar - https://www.portaldomar.pt/PortaldoMar/index.htm and Portal Maroceano http://www.maroceano.pt/component/content/article/2037-blue-growth-for-portugal are portals that dedicate to constantly update and release maritime related news and online services.

- Plataforma Tecnologia do Mar de aveiro (PTUA) http://www.ua.pt/ptmar/
  This platform intends to promote collaborations between university and SMEs, with the intention to facilitate technology transfer, leading to an increase in business competitiveness.

Infrastructures and coordination and support capacities / initiatives:

- Portugal operates eight local/coastal vessels ranging from 11m to 31,40m (Águas Vivas, Arquipelago, Diplodus, NRP "Andromeda", NRP "Auriga", Puntazzo, Tellina and Ziphius); one regional vessels of 47,50m (Noruega); and two global vessels of 68,20m and 68,50m (NRP "Almirante Gago Coutinho" and NRP "D. Carlos I") registered in the European Research Vessels Infobase

- Portugal maintains about 25 large marine research equipments registered in the European large Exchangeable instruments database

- Key aquaculture experimental and research facilities in Portugal include:
  - Experimental Research Facilities CIIMAR Portugal Land based facilities
  - Specialised Laboratories IPIMAR Portugal
  - Marine aquaculture station of Ramalhete University of Algarve Portugal
  - Any other Research facilities of relevance to Marine Biotech:
  - Algarve Centre of Marine Sciences, University of Algarve
  - Centre of IMAR at Department of Oceanography and Fisheries at the University of the Azores

(For a complete description of the Portuguese Marine research infrastructures see: http://www.eurocean.org/np4/20

Research Centres / Capabilities

Government Laboratories:
Department of Marine Geology - INETI (language: Portuguese)
Fisheries and Sea Research Institute - IPIMAR (language: Portuguese)
Hydrographic Institute - IH (language: Portuguese)
National Laboratory of Civil Engineering - LNEC
Meteorological Institute

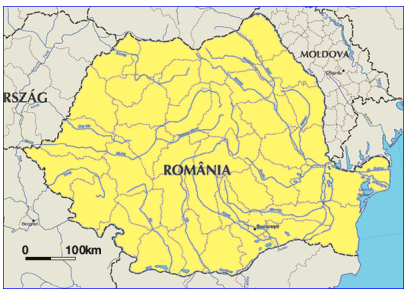
Associated Laboratories:
Centre for Environmental and Marine Studies - CESAM
Centre of Marine and Environmental Research - CIMAR
Institute for Systems and Robotics - IS

R&D Units In Portugal
Biogeochemistry Group - IMAR
Centre for the Study of Hydrosystems - CEHIDRO
Centre for Ecological Modelling - IMAR
Centre of Marine Environment and Technology - MARETEC
Centre of Marine Sciences of Algarve - CCMAR (language: Portuguese)
Centro de Recursos Minerais, Mineralogia e Cristalografia - CREMINER
Centro de Investigação Marinha e Ambiental da Universidade do Algarve
Department of Oceanography and Fisheries of the University of Azores - DOP
Eco-Ethology Research Unit
Guia Marine Laboratory of Lisbon University - IMAR
Interdisciplinary Centre of Coimbra - IMAR
Institute of Marine Research - IMAR
Institute of Oceanography - IO
Wave Energy Centre
Underwater Systems and Technology Laboratory - Porto University

Collaboration with European Initiatives

- FCT is partner in the following European initiatives
    - JPI Oceans www.jpi-oceans.eu
    - COFASP http://www.cofasp.eu/
    - OCEAN ERA NET http://www.oceaneranet.eu/pages/new-page-5.html
    - CSA MarineBiotech www.marinebiotech.eu
    - EurOcean www.eurocean.org/

ROMANIA



Overarching science strategies, plans and policies:

There is currently no national strategy or plan specifically for Marine Biotechnology research. Relevant research is considered under a much wider scoped plan and strategy:

- The **National Plan for Research, Development and Innovation** (RDI) 2007-2013 (PN II) and **National Research, Development and Innovation Strategy** from the National Authority for Scientific Research (ANCS) www.ancs.ro

Research funding schemes and programmes:

- The **Executive Agency for Higher Education, Research, Development and Innovation Funding (UEFISCDI)** (http://uefiscdi.gov.ro/) implements five out of the six programmes of the National Plan for Research, Development and Innovation 2007-2013 (PN II)
    - Human Resources (exploratory research)
    - Ideas (exploratory research)
    - Partnerships in Priority Areas (applied research)
    - Innovation (innovation and technology transfer)
    - Capacities (R&D infrastructure)

- The R&D Programme **Partnerships in Priority Areas** does not refer explicitly to marine biotechnology; the research support is structured in nine thematic areas, similar to FP7:
    - Information and communication technology (10%)
    - Energy (10%)
    - Environment (10%)
    - Health (14%)
    - Agriculture, food safety and security (14%)
    - Biotechnologies (12%)
    - Innovative materials (7%)
    - Processes and products (15%)
    - Space and security (8%)
    - Socio-economic and humanistic research (10%)

Infrastructures and coordination and support capacities / initiatives:

- In 2012, Romania operates 2 local/coastal vessels of 25,8 and 31,86m (Istros, Steaua de Mare 1); and 1 global vessels from 66m to 82,20m (Mare Nigrum) registered at the European Research Vessels Infobase (www.eurocean.org).
- In 2012Romania maintains about 1 large marine research equipments registered in the European large Exchangeable instruments database (www.eurocean.org).

- Key aquaculture experimental and research facilities in Romania includes a long-line system (National Institute for Marine Research and Development Grigore Antipa).
-

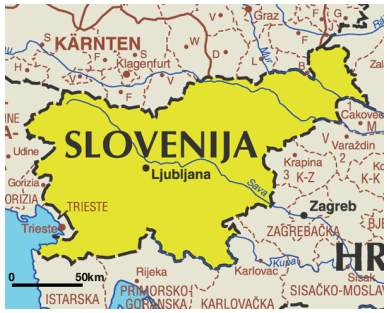
Trends and developments:

The national plan for RDI that ends in December 2013 comprises nine research areas, similar to the Seventh European Framework Programme (FP7). At this stage, development of a new national plan for RDI is being initiated. While the details of the new plan are not yet know, it is very likely the priorities will echo the ones elaborated under Horizon2020. It is expected that marine biotechnology research priorities will be considered but perhaps not reflected in an official document for RDI.

SLOVENIA

(Updated Aprl 2016)

Overarching science strategies, plans and policies:



The Ministry of Education, Science, and Sport (MIZS) and particularly the Science division as part of the Directorate for Science, defines the expert bases for the adoption of political documents in the field of research policy and plans the required financial resources for research. There are no specific Marine Biotechnology strategies, plans or policies being implemented in Slovenia. The Research and Innovation Strategy of Slovenia (RISS) is the key strategic and political document of the Slovenian policy on research and innovation. It is currently being implemented in collaboration with the Ministry of Economic Development and Technology and other relevant stakeholders, who have contributed to the development of the program. RISS is complemented by the National Industrial Policy, and the Smart Specialisation Strategy. Biotechnology holds a strategic place in all national documents currently being implemented.

Research funding schemes and programmes

The funding of research activities is mainly implemented through the Slovenian Research Agency (ARRS). The main instruments are research programs (long term, 5-year projects), basic and applied research projects, targeted research programs, the young researcher program, research infrastructures and international cooperation. Closer to market activities are funded by the Public Agency for Entrepreneurship, Internationalization, Foreign Investments and Technology or through different calls funded through European Structural Funds. The latter will also be used in synergy with different Horizon 2020 programs.

Research priorities for marine biotechnology research

The Research and Innovation Strategy of Slovenia (RISS) defines the R&D priorities for the 2011 – 2020 period. They priorities also being followed by the Slovenian Research Agency (ARRS) when it issues calls for basic or/and applied research projects. The priorities relevant to biotechnology include: modern (new) synthetic metal and non-metal materials and nanotechnologies, complex systems and innovative technologies, technologies for a sustainable economy, and health and life sciences. **The Slovenian Industrial Policy** aims at supporting key emerging technologies, including biotechnology. **The Smart Specialisation strategy** includes Natural and traditional resources for the future as a priority area, allowing for the transition to circular economy, which will among other require technologies for sustainable biomass transformation and new biobased materials.

Strategic documents

There are no documents devoted to Marine Biotechnology.

Infrastructures and coordination and support capacities / initiatives

- Slovenia operates 1 local/coastal vessels of 11,98m (Sagita), with a dry and wet lab and associated field equipment, registered at the European Research Vessels Infobase [1],
- A 7m long working boat
- A salt water laboratory aquarium with lab to sea interflow capability
- Marine Biology Station Piran of the National Institute of biology (MBP, NIB) - The Marine Biology Station is currently the only research group in Slovenia devoted to maritime scientific research and professional work. Collaborating with high calibre foreign marine research centres, it represents a national focal point for development in the area of marine research. There are 35 people routinely employed at the MBS, comprising of 19 researchers, 8 young researchers and 8 technical and administrative collaborators. The research work is periodically augmented by students and trainee postgraduate and postdoctoral fellows with various disciplines. The infrastructure of the Marine Biology Station Piran includes:
- Research laboratories (biological, chemical, microbiological etc)
- A salt water laboratory aquarium with lab to sea interflow capability
- A diving base with workshop
- A 12m long research vessel, with a dry and wet lab and associated field equipment and a 7m long working boat
- The Laboratory of Catalysis and Chemical Reaction Engineering of the National Institute of Chemistry, focuses on process and product modelling of reaction kinetics, transport phenomena and fluid mechanics, sensitivity analysis, optimisation, intensification, economical valorisation relating to cultivation and growth of microalgae under different conditions, that is light intensity, nutrient concentration, and process conditions such as temperature, pH, aeration, CO2 content, flow conditions, etc. Infrastructures and coordination and support capacities / initiatives include:
- Bioreactors: batch, semi-batch, continuous, etc.
- Downstream processing: extraction, distillation, absorption, etc.
- Analytics: temperature, pH, redox potential, nutrient concentration, cell number, chlorophyll, oxygen, lipid content, lipid fatty acid profile
- Biodiesel, biogas, pyrolysis, gasification and combustion equipment

Major initiatives

Slovenian participation in the Marine Biotechnology ERA-NET

MIZS participates in the Marine Biotechnology ERA-NET (ERA-MBT). MIZS has participated in the first ERA-MBT joint transnational call for research proposals. Six Slovenian participants participated in consortia that applied to the call, covering the following topics:

microalgae, photobioreactors, extraction, downstream, pufas, carotenouds, sterols, protein isolation, protein hydrolysis, enzyme activity assays, membrane filtration, expanded bed adsorption, extraction using green solvents, activity testing, NMR
aquaculture waste stream, recycling, bioactive compounds, fermentation
algae diatoms, natural extracts, food additives, biomaterials, high-added value products, harmful algae bloom, environment, sustainability, alternative protein, fatty acids, EPA, DHA, carbohydrates, biomedicine
Extraction, high value products, enzymes in processing steps, reduced energy consumption
Bio-products; biosynthetic pathways; cyanobacteria; CyanoCoreReactor; genomics; genetic tools; integrated solution; metabolic pathway modeling; natural mutants; photobioreactors; pyrosequencing; secondary metabolites; synthetic cyanobacteria
enzyme, whole cell, biocatalysis, aroma, cytochrome P450 monooxygenase, ionic liquid, supercritical fluid extraction, microfluidic system, microbioreactor.

The MAR3BIO project (Biorefinery and biotechnological exploitation of marine biomasses), with the National institute of Chemistry being the Slovenian beneficiary, was funded through the first call.

MIZS also participates in the second ERA-MBT joint transnational call for research proposals, again receiving six applications with Slovenian participants.

FP7 projects in the marine with Slovene participation

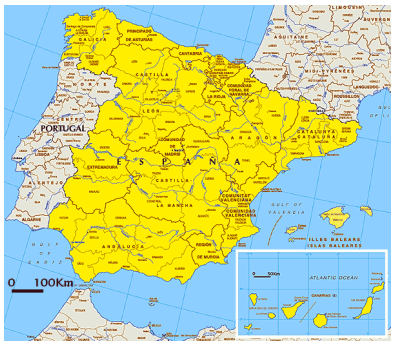
Project	Slovenian Participant
MAREX: Exploring Marine Resources for Bioactive Compounds: From Discovery to Sustainable Production and Industrial Applications	University of Ljubljana – Faculty of Pharmacy
VECTORS: Vectors of Change in Oceans and Seas Marine Life, Impact on Economic Sectors	University of Ljubljana, Faculty of Maritime Studies and Transport
SMS: Sensing toxicants in Marine waters makes Sense using biosensors	National Institute of Biology, Marine Biology Station
KILL-SPILL: Integrated Biotechnological Solutions for Combating Marine Oil Spills	Institute for Microbial Sciences and Technologies

ECSAFESEAFOOD: Priority environmental contaminants in seafood: safety assessment, impact and public perception	University of Maribor, Medical Faculty, Faculty of Agriculture and Life Sciences
CODE: Curing polyester resins on demand	Elan Marine d.o.o., Institute of Metals and Technology

Relevant Research projects by Marine Biology Station Piran (MBP, NIB)

- Research program P1-0237 Coastal Sea Research (1.1.2009 - 31.12.2013)
- ECO/10/277396/SI2.601543 (Eco-Innovation 2010) Marine debris removal and preventing further litter entry – Marine Clean
- EU FP7-KBBE-2010-4 _RADAR Rationally Designed Aquatic Receptors integrated in label-free - - biosensor platforms for remote surveillance of toxins and pollutants (2011-2013)
- EU FP7 IP PERSEUS
- Marine Strategy Framework directive (Directive2008/56/EC)
- Slovenian - Croatian bilateral (2012-2013): Enclosed marine systems as laboratory for biological phenomena
- Slovenian - Argentinean research cooperation project (2012-2014): Jellyfish blooms and the possibilities for commercial use
- Slovenian - Japanese joint project (2012-2014): Slovenian - Japan cooperative studies on problematic jellyfish blooms: mechanisms and mitigation
- EU FP6_ECASA, 006540_Ecosystem Approach for Sustainable Aquaculture
- CREICO, NSF, ZDA - Cooperative Research on Ecological Interactions in the Coastal Oceans program in the North Adriatic sea: Collaborative international research on gelatinous zooplankton in the Adriatic Sea, Role of bacteria in production and decomposition of colloidal organic matter in the Northern Adriatic

SPAIN



(Update June 2015)

Strategy: Spanish Strategy for Science and Technology and Innovation
Website: http://www.idi.mineco.gob.es/
Leading Authority: Ministry of Economy and Competitiveness (MINECO)
Website: http://www.mineco.gob.es/
Implementing body: Secretariat of state for research, development and innovation (SEIDI)
Website: http://www.idi.mineco.gob.es/
Time frame: 2013-2020

The Ministry of Economy and Competitiveness (MINECO), through the Secretariat of State for Research, Development and Innovation, is the department of the General State Administration responsible for elaborating and implementing government policies on scientific research, technological development and innovation in all sectors, as well as for coordinating state-owned research institutions.

In particular, MINECO is responsible for the proposal, management, monitoring and evaluation of the State programmes and strategic actions of the State Plan for Scientific and Technical Research and for Innovation 2013-2016, in line with the Spanish Strategy of Science, Technology and Innovation 2013-2020.

The strategy is under the leading authority of Ministry of Economy and Competitiveness (MINECO) through the Secretariat of state for research, development and innovation. The main objectives of the Spanish Strategy for Science and Technology and Innovation are:

1. The **Recognition and promotion of talent in RDI and its employability**. This is aimed at increasing the training capacities in RDI of the System, encouraging job placement and the employability of trained resources, both in the public and business sectors, and facilitating their temporary mobility among the public institutions and between these and the private sector for the implementation of RDI activities.

2. The **Promotion of scientific and technical research of excellence**. This aims to promote the generation of knowledge, increase the scientific leadership of the country and its institutions and to encourage the generation of new opportunities which may trigger the future development of highly competitive technological and business capacities.

3. The **Promotion of business leadership in RDI**. The objective is to increase the competitiveness of the production network by increasing RDI activities in all areas and, particularly, in those sectors which are strategic for growth and the creation of jobs in the Spanish economy and the Autonomous Regions.

4. The **Promotion of RDI activities aimed at addressing global societal challenges** and in particular at those affecting the Spanish society. This objective addresses the need to encourage the

scientific and innovative potential of the country towards areas which respond to the numerous problems faced by our society and which require major effort as regards RDI. These challenges, given their nature and complexity, require that the generation of new knowledge be combined with its application to technologies, products and services that may in the future contribute to the scientific, technological and business leadership of the country.
The strategy is implemented through the Spanish National Plan for Scientific and Technical Research and Innovation.

National Plan for Scientific and Technical Research and Innovation
Programme: National Plan of Scientific and Technological Research and Innovation 2013-2016
Leading authority and implementing agency/organization: Spanish Ministry of Economy and Competitiveness (MINECO)
Website: www.mineco.es
Time frame: 2013- 2016
Document:
http://www.idi.mineco.gob.es/stfls/MICINN/Investigacion/FICHEROS/Spanish_RDTI_Plan_2013-2016.pdf

The **NATIONAL PLAN** is a document designed to develop and fund Central Government actions in the area of RDI to enable achievement of the objectives and priorities of the SPANISH STRATEGY ON SCIENCE, TECHNOLOGY AND INNOVATION. In addition, the document has been drafted as a funding instrument of the *Spanish Science, Technology and Innovation System* into account by designing actions and funding mechanisms that will increase the scientific and technological leadership of its stakeholders, both public and private; drive the abilities of our productive community through the country's RDI; foster talent in RDI by defining mechanisms to facilitate successful insertion in the job market; and guide RDI activities towards the challenges facing society.

Thus, the actions of Central Government contained in the **NATIONAL PLAN** are set out in four **NATIONAL PROGRAMMES** which correspond to the STRATEGY objectives. These PROGRAMMES enable the development of specific objectives linked to implementation and development of the **PLAN** itself, which are linked, in turn, to the corresponding indicators of the impact of the results.

The specific objectives of the **NATIONAL PLAN** are:

1. Strengthen training and employment of human resources in RDI activities in both the public and private sectors.
2. Improve the quality of scientific and technical research to achieve the highest level of excellence and impact, contributing international scientific and technological leadership of all the stakeholders from the *Spanish Science, Technology and Innovation System.*
3. Strengthen the capacities and international leadership of institutions, centres and scientific and technical research performers.

4. Facilitate access to scientific and technological infrastructures and to scientific equipment, with special reference to large national and international scientific and technical facilities.
5. Drive entrepreneurial leadership in RDI by strengthening the RDI capacities of companies and incorporating SMEs in the innovation process.
6. Encourage the creation and growth of technology based companies and the promotion of efficient networks of investors that give access to new methods of funding RDI activities.
7. Increase collaboration in RDI between the public sector and the business sector.
8. Stimulate RDI oriented to respond to societal challenges.
9. Drive internationalisation of RDI activities of stakeholders in the Spanish Science, Technology and Innovation System and its active participation in the European Research Area.
10. Foster a scientific, technological and innovative culture in Spanish society and dissemination of the results of scientific-technical research and innovation financed with public funds.
11. Explore RDI policies based on demand

The Spanish National Plan is focussed on research and innovation and it has been developed to implement the National Strategy.

The **PLAN** sets out the scientific-technical societal and economic priorities established by National Government to encourage RDI which are equally subject to strict principles of competition and evaluation in accordance with internationally established criteria.

The priorities of the **NATIONAL PLAN** are: (a) the generation of knowledge, in any field of research, which contributes to encouraging excellence and international leadership of the *Spanish System of Science, Technology and Innovation*, and (b) the scientific and social priorities integrated in the **NATIONAL RDI PROGRAMME AIMED AT THE CHALLENGES OF SOCIETY** guiding scientific and technical research and business development in RDI to the major challenges faced by Spanish society.

RDI AIMED AT THE CHALLENGES OF SOCIETY include: (1) Health, demographic change and well-being, (2) Food safety and quality, productive and sustainable farming, natural resources, marine and maritime research, (3) Safe, efficient and clean energy, (4) Smart, sustainable and integrated transport (5) Action on climate change and efficient use of resources and raw materials, (6) Changes and social innovations, (7) Digital society and economy (8) Safety, protection and defense.

Grants under the **NATIONAL PLAN** are awarded by means of competitive procedures, as foreseen in the General Law 38/2003, of 17 November 2003, on Grants, open procedures, and are only in exceptional cases awarded under other direct mechanisms in accordance with article 22.2 of the aforementioned Law. In addition, grants may be a combination of funds from different sources 15 including funds from the European Union, other governments, public-private co-financing and any others.

The following are considered stakeholders suitable for participation in the actions financed under the **NATIONAL PLAN**:

- In**dividuals**

- **Public research agencies** according to the characteristics outlined in article 47 of Law 14/2011 of 1 June, on Science, Technology and Innovation.

- **Universities**. Public universities, their university departments and institutes, and private universities with an ability and proven activity in R&D, as provided for in Organic Law 6/2001 on Universities, modified by Organic Law 4/2007, of 12 April.

- **Other public R&D centres**. Public bodies and centres with their own legal personality, dependent on or linked to the State Administration, and those dependent on or linked to the territorial public administrations and their agencies, regardless of the legal nature, whose purpose and business purpose comprises the direct execution of scientific and technical research activities, or others of a complementary nature which are necessary if society is to make the appropriate scientific and technological progress. Included in this concept are the consortia created by cooperation agreements between the State and the Autonomous Regions.

- **Public and private health organisations and institutions** linked to or associated with the National Health System, which carry out research activity.

- **Health Research Institutes** accredited as set out in Royal Decree 339/2004, of 27 February, and additional regulations.

- **Public and private non profit-making organisations** which carry out and/or manage R&D activities, generate scientific or technological knowledge, facilitate their application and transfer or provide services to support innovation for business entities.

- **Companies**, whatever their legal form, which perform an economic activity and which are validly incorporated at the time the request for help is presented. Included under this heading are public trading companies, public business organisations and individual entrepreneurs. Within the companies heading, small and medium-sized enterprises (SME) are considered differently.

- **State technology centres**. Non profit-making organisations, legally incorporated and resident in Spain, which have their own legal personality and were created with the aim of contributing to the general benefit of society and to improving the competitiveness of companies by generating technological knowledge, carrying out RRDI activities and developing the application thereof.

- **State-wide centres to support technological innovation**. Non profit-making organisations, legally incorporated and resident in Spain, which have their own legal personality and were created with the aim of making it easier to apply the knowledge generated in universities and research bodies, including technology centres, by acting as intermediary between the latter and the companies, providing services to support innovation.

- **Business groupings or associations** which include: joint ventures (JV); economic interest groupings, formed by companies or companies with other entities (EIG); Non profit-making sectoral business associations whose activities include projects and R&D actions for their sector.

- **Innovative business groupings** and **technological platforms**. Groups constituted by independent organisations — companies, small, medium-sized and large research bodies — which are active in sectors and specific regions, whose objective is to contribute effectively to technology transfer, the creation of networks and the divulgation of information between the companies forming the grouping.

- **Organisations supporting technology transfer, technology and scientific dissemination and dissemination and which include science and technology parks, technology transfer** offices, offices transferring results of research, CEIs and innovation and technology centres.

National Programmes

These actions are set out in four National Programmes. The National Programme for RDI oriented to the Societal Challenges fosters the participation of Spanish research groups in international cooperative projects, through the International Joint Programming Actions.

Although there is not a specific programme on "Marine Biotechnology", the marine and maritime RTD and innovation activities are included in the societal challenges "Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the Bioeconomy" and "Climate action, environment, resource efficiency and raw materials".

Main Marine Research-Performing Institutions/Universities in Spain

The list of research institutions/universities within Spain provided below has been collected from the inputs provided through the survey conducted by CSA Oceans in 2013 through the national research funding agencies and ministries.

National public research institutions

- Spanish Institute of Oceanography (IEO) (Instituto Español de Oceanografía) (www.ieo.es)
- Spanish National Research Council (CSIC) (Consejo Superior de Investigaciones Científicas) (www.csic.es)
- State Ports (PUERTOS) (Puertos del Estado) (www.puertos.es)
- Centre for Studies and Experimentation of Public Works (Centro de Estudios y Experimentación de Obras Públicas)CEDEX (www.cedex.es)
- Geological and Mining Institute (Instituto Geológico yMinero) (IGME) (www.igme.es)

Universities

- University of Cádiz (UCA) (www.uca.es)
- University of Vigo (UVigo) (www.uvigo.es)
- University of La Laguna (ULL) (www.ull.es)
- University of Las Palmas (ULGC) (www.ulgc.es)
- University of Balearic Islands (UIB) (www.uib.es)
- University of Alicante (UA) (www.ua.es)

- University of Barcelona (UB) (www.ub.edu)
- University of Oviedo (UNIOVI) (www.uniovi.es)
- University of Cantabria (UNICAN) (www.unican.es)
- University of Malaga (UMA) (www.uma.es)
- University of Santiago de Compostela (USC) (www.usc.es)
- Unviersity of Coruña (UDC) (www.udc.es)
- University of the Basque Country (EHU) (www.ehu.es)
- Universitat Politecnica de Catalunya (UPC) (www.upc.edu)
- University of Valencia (UV) (www.uv.es)

Other research centres

- AZTI-TECNALIA www.azti.es
- Technological Centre of the Sea (Centro Tecnológico del Mar) (CETMAR) www.cetmar.es

Research centres attached to marine research infrastructures (ICTS)

- Balearic Island Coastal Observing System (Sistema de Observación Costero de les Illes Balears) (SOCIB) www.socib.es
- Oceanic Platform of the Canary Islands (Plataforma Oceánica de Canarias) (PLOCAN) www.plocan.eu

R&D&I Work Programme

The R&D&i Work Programme is drawn up on an annual basis and, once approved, it functions as a tool for programming short-term science and technology policies, for coordinating the actions of the General State Administration and as a platform for presenting the integrated activities of the General State Administration and the Autonomous Community Administrations for Science, Technology and Innovation

The Work Programme mainly includes information on the planned calendar of public announcements, stating the terms for presenting and ruling on the different procedures, distributing the annual budget by priority area and programme, assigning the managing bodies for each of the activities and the types of beneficiaries and sectors eligible for grant aid.

Infrastructures and coordination and support capacities / initiatives:

Spain has a National Programme for Science and Technology Infrastructures to implement priorities of its National R&D&I Plan. The Programme for Science and Technology Infrastructures which aim is to improve the existing RTD infrastructures, their maintenance and optimize their use. The Programme also foresees the design, building, maintenance,

operation and upgrade of ICTS (Unique Scientific and Technological Infrastructures) and GIC (Large Scientific Infrastructures) with a national and EU dimension. Contribute to the development of the Regions to promote the territorial cohesion.

http://www.idi.mineco.gob.es/portal/site/MICINN/menuitem.8ce192e94ba842bea3bc811001432ea0/?vgnextoid=872470761ea22210VgnVCM1000001d04140aRCRD&vgnextchannel=3c4fa7e4e90e2210VgnVCM1000001d04140aRCRD

In 2012, Spain operates 9 local/coastal vessels from 12m to 30,46 m; 6 regional vessels from 36,5m to 53m; and 4 global vessels from 66,7m to 82,5m registered at the European Research Vessels Infobase (www.eurocean.org).

- In 2012, Spain maintains about 7 large marine research equipments registered in the European large Exchangeable instruments database (www.eurocean.org).
- Marine research activities are also supported by the Secretary of State for Research through two Research Performing Organisations, Spanish National Research Council (CSIC) and Spanish Oceanographic Institute (IEO), that generate more than 50% of the scientific output in the marine sciences in the country. http://www.csic.es/web/guest/presentacion and http://www.ieo.es/version_eng/indexingles.htm
- The ICTS (Unique Scientific and Technical Infrastructures) Spanish Roadmap was firstly approved in 2007, to develop 24 new large scientific infrastructures which would join the 30 already in operation. The Council of Scientific, Technological and Innovation Policy (CPCTI) approved the update of the ICTS map in October 2014, taking into account the scientific evaluation of the Advisory Committee for Unique Infrastructures (CAIS). The ICTS map in force is currently composed of 29 ICTS (set up by 59 infrastructures of which, 56 are operative and 3 are under construction). Among them there are some included in the "Life, Sea and Earth Science Area"; The Marine Infrastructures Network (RIM), the Spanish Oceanographic Fleet and the Spanish Antartic Stations are included.
    - RIM is composed by SOCIB (operative) and PLOCAN (in construction) infrastructures.
    - The Spanish Oceanographic Fleet (operative) is a distributed ICTS that includes the Hespérides Oceanographic Research Vessel, as well as the FLOTPOL Oceanographic Research Vessels (Sarmiento de Gamboa, Ramón Margalef, Angeles Alvariño, García del Cid, Mytilus, Lura, Francisco de Paula Navarro, Jose Mª Navaz y SOCIB).
    - The Spanish Antartic Stations is a distributed ICTS that comprises the Juan Carlos I Antarctic Station and the Gabriel de Castilla Antarctic Station.
- Key aquaculture experimental and research facilities in Spain include
    - 2 Experimental Research Facilities (IFAPA)
    - Aquaculture Pilot Plant (Centro tecnologico Gallego de Acuicultura CETGA)
    - 5 Experimental Research Facilities and Specialised Laboratories (Instituto Español de Oceanografía IEO)

- An inland infrastructure for bluefin tuna aquaculture research is being built by IEO. It consists of 4 large capacity inland tanks (7000 m^3) for experimental research on bluefin tuna. The project started at the end of 2011 and it is under development.
- Experimental Research Facilities and Specialised Laboratories (Consejo Superior de Investigaciones Científicas CSIC)
- Experimental Research Facilities (Instituto Canario de Ciencias Marinas ICCM)
- Experimental Sea based facility (Instituto Gallego de Formación en Acuicultura. Xunta de Galicia IGFA)
- Experimental Facilities (Instituto Murciano de Investigación y Desarrollo Agrario y Alimentario IMIDA)
- Experimental Research Facilities (Instituto de Investigación y Tecnología Agraria-IRTA)
- Experimental Research Facilities (Centro de Investigaciones Marinas -CIMA)

Major initiatives:

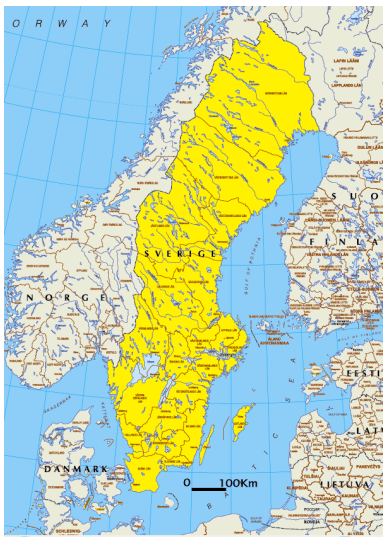
- The **Marine Biotechnology Centre of the ULPGC** (**CBM**) is a research centreof the ULPGC and comprises the **Applied Algology** (**GAA**) and the **Biological Oceanography** (**GOB**) research groups, which work closely with researchers in other groups in Spain and abroad. This cooperation between the two research groups is currently focused on developing new lines of work that apply the knowledge and techniques developed in eco-physiological and biotechnical studies to marine producers and vegetation.
- The Spanish Bank of Algae (BEA-Banco Español de Algas) is a service of the Marine Biotechnology Center (CBM-Centro de Biotecnología Marina) of the University of Las Palmas de Gran Canaria (ULPGC), which objectives are the isolation, identification, characterization, conservation and provisioning of microalgae and cyanobacteria.
- **Spanish Biomass Technology Platform** One the priorities of the Strategic Plan of this platform is the production of biofuel from microalgae. http://www.bioplat.org/ .
- **PTEPA** is the Spanish Platform for Fisheries and Aquaculture Research. This platform has develop a SRA http://ptepa.org/images/stories/PDFs/agenda_estrategica_ptepa.pdf
- **Genoma Spain** is a government-supported public foundation devoted to promoting technology development, knowledge transfer and innovative practices, chiefly in the biotechnology sector. http://www.gen-es.org/en/index.cfm

Industry:

- Spain is host to **Pharmamar,** one of the most successful companies dedicated specifically to marine biotechnology in the world (http://www.pharmamar.com/). Pharmamar is specialised in development of antitumor drugs of marine origin.

- AlgaEnergy is a technology-based company specialising in the field of microalgae biotechnology which, with substantial R&D programmes costing millions of Euros (both public and in-house funding), is managed by a team of entrepreneurs and scientists with solid financial backing and extensive experience within this field. http://www.algaenergy.es
- CEAMSA, manufactures and supplies a comprehensive range of high quality carrageenan and pectin products to the global food industry. http://www.ceamsa.com/
- BioFuel Systems. A company specialized in the production of biofuel from marine microalgae. http://www.biopetroleo.com
- ANFACO-CECOPESCA it is a large company that conducts research in a number of fields related with marine biotechnologies and their use in aquaculture and seafood processing, http://www.anfaco.es
- Seaweed Canarias Seaweed Canarias creates and provides integral sustainable high technology solutions through the industrial use of active principles present in algae. Seaweed Canarias has its own patents and develop highly innovative uses in fields as diverse as agriculture, cosmetics and human and animal nutrition. http://www.seaweedcanarias.com
- AQUASOLUTIONS BIOTECH it is a technology company based that offers a wide range of services in RTD to the aquaculture sector, they conduct RTD on genetics, molecular biology, microbilogy, physionlogy, nutrition and zootechnology. http://www.aquasolutionsbiotech.es/index.php

SWEDEN



Overarching science strategies, plans and policies:

There is currently no dedicated Marine Biotechnology policy or strategy in Sweden. Overarching research priorities of the Swedish government for the period 2013-2016 are determined by the Swedish Research and Innovation Bill.

- **Swedish Government's Research and Innovation Bill** http://www.government.se/sb/d/16288
- **Swedish biotechnology policy** http://www.regeringen.se/content/1/c4/11/10/08e3ecb4.pdf

Research funding schemes and programmes:

The Ministry for Education and Science is responsible for the overall co-ordination of research policy activities and for direct research funding via the Swedish Research Council. The ministry is also responsible for the design of framework conditions for the National Science and Innovation System with a focus on basic research and university education.

- **Vinnova** has a programme dedicated to industrial biotechnology. It aims to stimulate research and development and the implementation of industrial biotechnology in various sectors in order to promote more environmentally friendly processes linked to economic growth. SEK 50million was granted in the first call as project support in 2008. Mats Jarekrans is in charge of the programme. www.vinnova.se/In-English/Activities/Biotechnology
- VINNOVA also runs a programme named "**VINNVÄXT**" which in June 2008 granted SEK 13million to Processum Biorefinery Initiative for a project called "The future biorefinery http://www.vinnova.se/In-English/Activities/Strong-research-and-innovation-environments/VINNVAXT/
- **Mistra7 (The Foundation for Strategic Environmental Research)** funds a programme called Greenchem – Specialty Chemicals from Renewable Resources8. The program runs from 2003 to2010 with Lund University as the main contractor. The Mistra support is SEK 71,4 million. A groupof 8 industries which represent renewable raw material providers as well as producers and users of chemicals participate in the programme. http://www.greenchem.lu.se/

Strategic documents:

- State of art of Swedish biotech http://www.iva.se/upload/Verksamhet/Projekt/Svensk%20bioteknik/Swedish%20biotechnology%20-%20web-1.pdf

- Europabio report on Swedish industrial biotechnology http://www.bio-economy.net/bioeconomy/member_states/sweden/files/report_sweden_final01.pdf

Infrastructures and coordination and support capacities / initiatives:

- In 2012, Sweden operates 6 local/coastal vessels from 11,8m to 24 m; 4 regional vessels from 38m to 46m; 1 oceanic of 61,17m (Argos), and 1 global vessels of 107,8m (Oden) registered at the European Research Vessels Infobase (www.eurocean.org).
- In 2012, Sweden maintains about 2 large marine research equipments registered in the European large Exchangeable instruments database (www.eurocean.org).
- Key aquaculture experimental and research facilities in Sweden include
    - Specialised Laboratories (Swedish University of Agricultural Science)
    - Salmon and trout experimental lab / Norrfors lab (department of Wildlife, fish and Environmental studies)

Major initiatives:

- FP6 AQUAFUNC - **Integrated knowledge on functional genomics in sustainable aquaculture**
  Project website: http://genomics.aquacultureeurope.org/ Coordinator: Dr Sundell Kristina UNIVERSITY OF GOTEBORG— Sweden

- FP7 ASSEMBLE - **Association of European marine biological laboratories**
  Project website: http://www.assemblemarine.org/ Coordinator: Margareta AHLQWIST, GOETEBORGS UNIVERSITET - SWEDEN