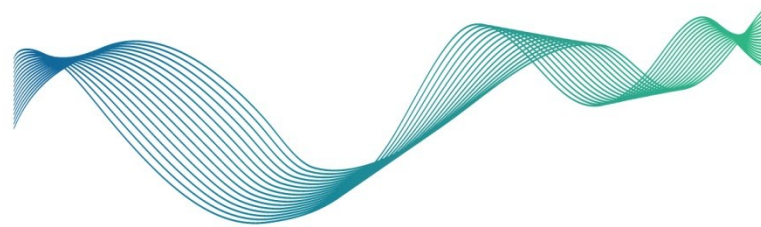


MarineBiotech



ERA-NET Preparatory Action in Marine Biotechnology



CSA (Coordinating) in Marine Biotechnology. MarineBiotech is funded under the European Commission's Seventh Framework Programme.
Contract number 289311. October 2011 - March 2013.

Mapping the Marine Biotechnology RTDI Landscape

2nd CSA MARINEBIOTECH Workshop
Hamburg, 8-9 October 2012

Jan-Bart Calewaert
Marine Board-ESF

Work Package Leader of WP3 CSA MarineBiotech



Presentation outline

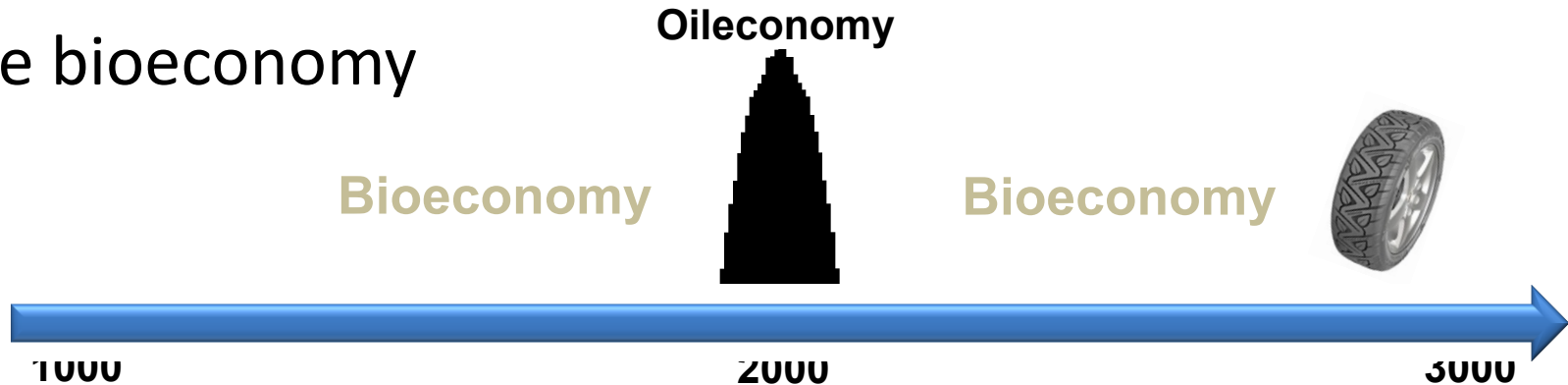
- I. Why profile Marine Biotech in Europe?
- II. Situating the mapping activities
 - Components
 - Preliminary analysis and discussion paper
- III. Inventory of Marine Biotechnology RTDI Strategies, Programmes and Initiatives in Europe
- IV. Preliminary observations

I. Why profile the landscape?



I. Why profile the landscape?

The bioeconomy



Biotechnology is recognised as key engine for developing the 'new' bio-economy as reflected in many foresight and policy documents such as...

- OECD The Bioeconomy to 2030 (2009)
- European Strategy: Innovating for sustainable growth: A bioeconomy for Europe (Feb. 2011)
- US National Bioeconomy Blueprint (April 2012)
- Etc. ...

Marine biotechnology contributions



Address the grand challenges of the 21st century

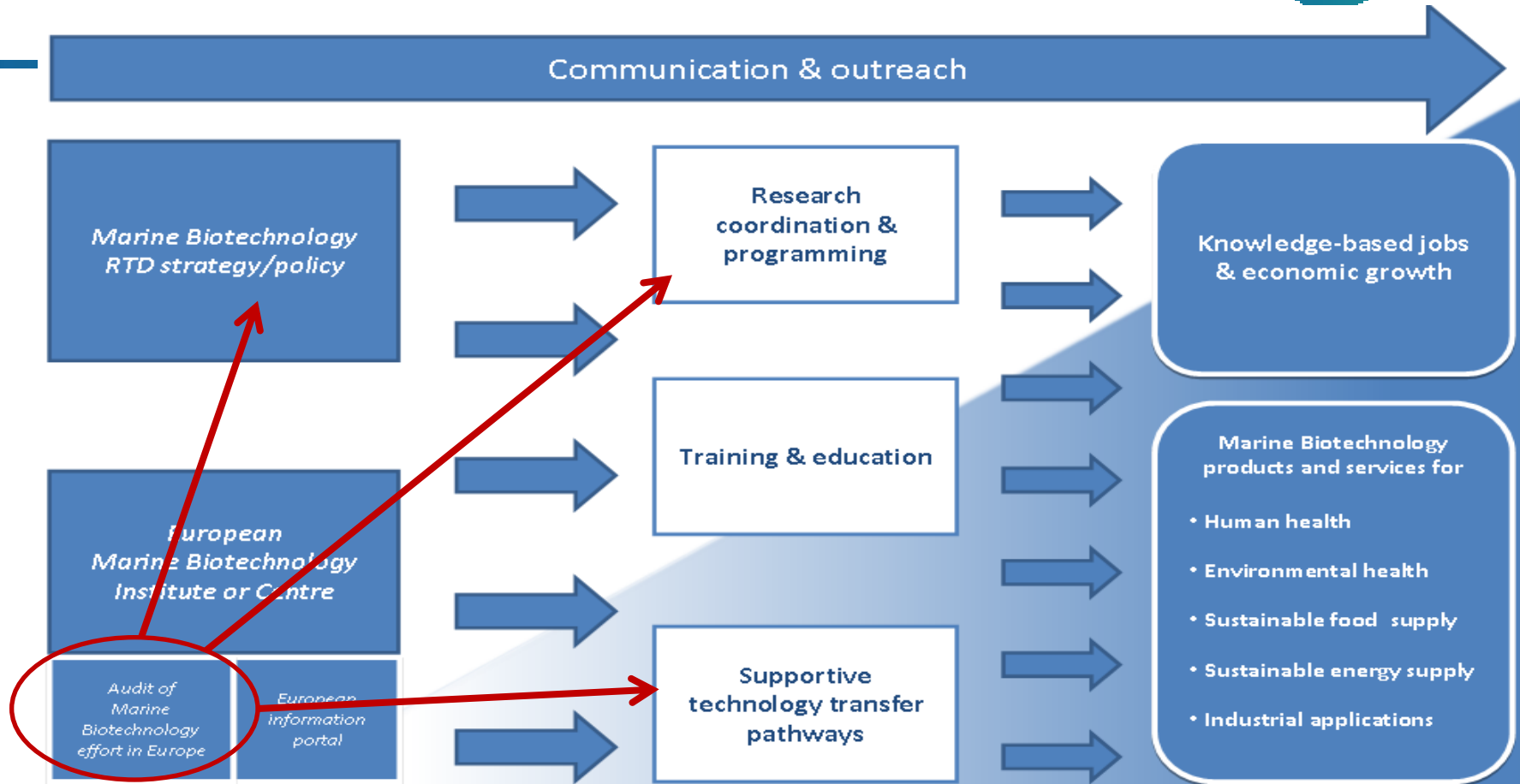
- Securing human **health and well-being**
- Sustainable supply of high quality and healthy **food**
- Sustainable alternative sources of **energy**
- Protection and management of the (marine) **environment**
- **Industrial** products and processes

Realize

- **A thriving global bioeconomy** - OECD Bioeconomy to 2030
- **EU Bioeconomy Strategy** and Fulfil the **Europe 2020 Strategy**



How?



Identity & profile of European Marine Biotechnology research



Reasons for optimism - Notable progress

- European coordination efforts ongoing
 - CSA, marine biotech portal, Euromarine, JPI Oceans
- Key research priorities are being addressed
 - Cultivation challenges, e.g. microorganisms (MaCUmba)
 - Legal and policy barriers (MicroB3, Pharmasea, Bluegenics, ...)
 - Biodiscovery challenges (pharmasea, bluegenics, ...)
- Infrastructures are being developed or improved
 - Research fleets (EUROFLEETS)
 - Access to marine model organisms and marine stations (ASSEMBLE, EMBRC)
- International recognition and driving forces (e.g. OECD initiative)
- Identity and visibility of marine biotech has greatly improved

Many challenges remain

- Aligning the various interests, strategies and programmes at different levels
- Positioning of bluebiotech in the complicated and dynamic landscape (projects, infrastructures, JPI Oceans, other ERA-NETs, etc.)
- Protection of the marine environment and MGR
- Techtransfer and industry/academic collaborative approaches – developing markets and businesses
- Multidisciplinary education and training

II. Mapping components in a nutshell

- Inventory of **European** Marine Biotechnology RTDI Strategies, Programmes and Initiatives
Task Leader: Marine Board-ESF
- A **Global** Perspective: High-level analysis of key trends and developments in global marine biotechnology RTDI
Task Leader: BioBridge
- **Analysis** of the European Marine Biotechnology RTDI Landscape **and scoping future cooperation**
Task Leader: Marine Board-ESF

Where does it lead to?

- **Task 4.1** Produce a discussion paper - *Task leader: Marine Board-ESF, Partner 7*
- **Task 4.3** Produce a scoping paper – *Task Leader: Research Council of Norway*
- **→ support the collaboration among funding agencies and programme managers towards an ERA-NET on Marine Biotechnology**
- **→ ultimate aim is improve coherent approach, developing MBt programmes and aligning them at various levels (including internationally) – not the ERA-NET itself**



III. Inventory of European Marine Biotechnology RTDI Strategy, Programmes and Initiatives



General approach:

- Three levels
 - countries
 - regional (European sea-basins)
 - pan-European
- High level essential information and complement with more details as information is gathered and made available
- Develop a strong visual concept to present the results → 2 pagers per country / region
- Finalise the time-shot report in Mo 13 (November 2012)
- Continues updating and elaboration online during and beyond the lifetime of the project

 <p>Belgium</p> <p>Overarching Research Strategy: - -</p> <p>Relevant Science Policies: - -</p> <p>Funding schemes: - -</p> <p>Research priorities:</p>	<p>Strategic documents: - - -</p> <p>Infrastructures and coordination and support capacities / initiatives: - - -</p> <p>Major Initiatives: - -</p> 
--	---



Norway



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



Research Funding Schemes and Programmes:

- The Research Council of Norway (RCN) funds research projects, innovation projects, industrial projects and infrastructure. Relevant research programmes includes:
 - o BIOTEK2021: A research financing program that finance applied academic research and industrial development of biotechnology.
<http://www.forskingsradet.no/servlet/Satellite?c=Page&pagename=biotek2021%2FHovedsidemal&cid=1253970728155&langvariant=en>
 - o Aquaculture- An industry in growth: A research financing program that finance applied academic research and industrial development on aquaculture and fisheries
<http://www.forskingsradet.no/servlet/Satellite?c=Page&pagename=havbruk%2FHovedsidemal&cid=1226994216892>
 - o 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.forskingsradet.no/servlet/Satellite?c=Page&cid=1226994156395&pagename=havkyst%2FHovedsidemal>
 - o 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.forskingsradet.no/servlet/Satellite?c=Page&pagename=bionær%2FHovedsidemal&cid=1253971968584&langvariant=en>
 - o Polar research: A research financing program that finance research on sustainable management and development of industries in the high north
<http://www.forskingsradet.no/servlet/Satellite?c=Page&pagename=polarforskning%2FHovedsidemal&cid=1231229969369&langvariant=en>
- Innovation Norway funds innovation projects with industry and infrastructure. Relevant programmes include:
 - o 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.innovasjon Norge.no/Finansiering/IFUOFU/>
 - o Entrepreneurial grant, where start-ups can be funded in an initial period of the company.
<http://www.innovasjon Norge.no/Finansiering/Etablerertiskudd1/>

- 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=ff-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/biosciencesktn/articles/4/blogs/6374683?sessionId=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 Marin Bioprospecting: A strategy document formed by the RCN, Innovation Norway and SIVA on how to implement the national strategy for Marin Bioprospecting.
<http://www.forskingsradet.no/servlet/Satellite?c=Page&cid=1253953666626&pagename=fuge%2FHovedsidemal>
- The Arctic and Northern Areas Initiative (Forskning.nord.no): The Research Council of Norway's research strategy for the high north
<http://www.forskingsradet.no/servlet/Satellite?c=Nyhet&cid=1253968952749&lang=no&pagename=nord%2FHovedsidemal>
- A new program plan (Biotek2021) for biotechnology is under development.

Infrastructures and coordination and support capacities / initiatives:

- 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/>
- Biotech Forum: Norwegian Bioindustry Association (NBA) was established autumn 2001 by representatives for Norwegian biotechnological industries and the Confederation of Norwegian Business and Industry (NHO). The Association is an independent member organization with purpose to promote development of Norwegian biotechnological trade and research. http://www.biotekforum.no/About_us/
- 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.forskingsradet.no/servlet/Satellite?c=Page&cid=1226993578290&pagename=fuge%2FHovedsidemal>
- Mabcent-SFI: Center for research based innovation on bioprospecting in Tromsø where academic research groups and SMBs collaborate on defined research topics for innovation. <http://www0.nfh.uit.no/mabcent/>
- 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%20%20Gabrielsen_Marbank%20-%20A%20national%20collection%20of%20Arctic%20Marine%20Organisms.pdf

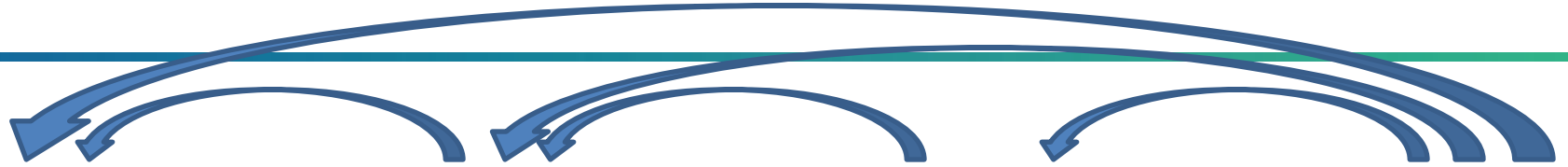
Major Initiatives:

- FUGE: The first targeted programme at The Research Council of Norway aimed at functional genomics. The program was in function from 2002 to 2011 and have financed research projects for about 1,7 billion kroner of which about 20 % are within marine biotechnology. The responsibility for fulfilling the national strategy for marine bioprospecting was part of the program. This is now continued within the BIOTEK2021 programme.
<http://www.forskingsradet.no/servlet/Satellite?c=Page&pagename=fuge%2FHovedsidemal&cid=1226993493126>

A. Regional and local level collaborations

- Where it needs to ‘happen’
- Growing importance of regional ‘bio’- and ‘marine/maritime’- innovation clusters (e.g. ScanBalt)
- Countries with a federal structure show strong(est) support for marine biotech activities at that level
- A growing number of experimental research infrastructures and pilot plants
- Importance of stakeholder communication/collaboration has been pointed out in some countries/regions (e.g Flanders)

B. National level – country profiles



Countries with a dedicated plan, programme or strong policy focus on marine biotech	Countries where marine biotech is supported via more wide-scope programmes and/or instruments	Countries where there is only limited marine biotech focus and activities	Countries with little or no information available (so far)
<ul style="list-style-type: none"> - Ireland - Denmark - Norway 	<ul style="list-style-type: none"> - Belgium - Portugal - Croatia - Finland? - France - Germany - Greece* - Iceland - The Netherlands - <u>Poland**</u> - Romania - Spain - Sweden - Turkey - UK* 		<ul style="list-style-type: none"> - Austria* - Bulgaria - Estonia - Greece* - Latvia - Lithuania - Malta - Slovenia - Switzerland - Ukraine

National strategic documents with an identifiable focus on marine biotech



- **Ireland 2007** : <http://www.marine.ie/home/SeaChange.htm>
 - *“**Sea Change** - A Marine Knowledge, Research & Innovation Strategy for Ireland 2007-2013”*
 - Marine Biotechnology, Marine Technology, Marine Functional Food and Renewable Ocean Energy
- **Norway 2009**
 - *“A strategy for **Marine Bioprospecting** – a source of new and viable wealth creation”*
 - Encourage use of marine resources, biobanks, international collaboration, innovation – develop value chain
- **Denmark 2010**
 - *“**The Ocean** – a underutilised resource”*
 - Better use of marine biomass, healthy diet, bioprospecting for new biological principles and compounds, biofilm

C. Macro-regional level – Growing interest

- Baltic Sea basin
 - Development of a macro-regional marine biotech strategy
 - Aims to position itself as a model region for marine biotech strategic coordination and support
- Mediterranean sea basin - CIESM
 - 22-state organisation - non-European members include Egypt, Israel, Morocco, Syria, Tunisia, Turkey, [Algeria]
 - ‘unite in protecting the economic interests of the Mediterranean against the risk of massive exploitation of their marine genetic resources by foreign companies’
 - Blue Biotech meeting La Spezia 12 April 2011
 - ‘Blog’ forum on Blue Biotech at <http://www.ciesmseaforum.org/category/blue-biotech/>

D. Pan-European

- There is no coherent marine biotechnology policy/approach supported by dedicated programme(s) (yet)
- BUT there is a strong strategic basis and preliminary complementarity mapping, in particular by
 - **2009 EC KBBE-NET Coordinated Working Group on MBt**
 - **2010 Position Paper 15 from Marine Board-ESF**
- These are based on a long list of incremental science policy analysis and recommendations including
 - 2006 EC background paper no. 10 on Marine Biotechnology
 - 2007 “The Bremen meeting”. MB experts meet, hosted by German presidency
 - 2008 “Blue Book”. EC-US task force on Biotech (marine genomics), Monaco
 - 2008 EC launched “European Strategy for Marine and Maritime Research”

IV. Main observations (1) - General

- Disparity between approaches, focus and mechanisms by which various European countries (and regions) support marine biotechnology research activities
 - Only few dedicated strategies, research plans and/or programmes focusing specifically on marine biotechnology
 - Vast majority supports marine biotech research under wider biotechnology or marine science plans and programmes or both
 - Limited number of dedicated strategies & funding programmes (most is not ring-fenced for MBt), complicates inter-country comparisons
- The preliminary results confirm the high level of fragmentation of activities and infrastructures, already highlighted by many previous strategic exercises.



IV. Main observations (2) – Up in all levels

- While dedicated strategies and programmes at **national level** are often lacking, several interviewees indicated that these are ‘in the making’
- Macro-regional and sub-national **regional** interest is growing
- Countries with a federal structure, show strong engagement to support marine biotech research at the regional level
- At **pan-European level**, MBPP15 and CWG-MB scoping document provide the vision, strategy, research priorities and first set of areas of common interest among a number of European Countries. What is needed is no more new planning but action/implementation.

IV. Main observations (3) - Priorities

- Priorities identified largely confirm the high level areas of common interest which were already defined during the EC KBBE-NET Collaborative Working Group on Marine Biotechnology. These are:
 - Marine bioprospecting/biodiscovery (in particular for Health)
 - Development of robust, biotechnology-based state of the art R&D tools and infrastructures tailored for marine biotechnology
 - Molecular aquaculture
 - Biomass production for bioenergy and fine chemicals
- Additional area that also seems to be re-appearing is the interest in marine environmental applications and bio-sensors (e.g. in the framework of MSFD)

IV. Main observations (4) - Infrastructures

- Long tradition in marine and biotech research in many countries (but not always connected) is associated with world class infrastructures, including research vessels, offshore equipment, coastal and offshore stations as well as cutting edge biotechnology facilities
- Great amount of experimental and aquaculture facilities
- Facilities usually from aquaculture industry, universities and research institutes
- Growing international interest for pooling infrastructure resources, e.g. screening platforms

IV. Main observations (5) - Major activities and research initiatives



- While countries with a long tradition in marine activities and research are more developed in terms of frameworks, there are good examples of less obvious countries (e.g. landlocked) that have very well developed (albeit very focused) activities in the area of marine biotechnology (e.g. Austrian company sealifepharma)
- The wide range of (fragmented) markets, global value chains and application areas also mean that key stakeholders are often less obvious or less visible



New ways to map: Knowledge capture mechanisms studies as a tool to facilitate (European) Blue Biotech analysis



Muséum national d'Histoire naturelle



Daniel Pardo, CNRS/MNHN, France

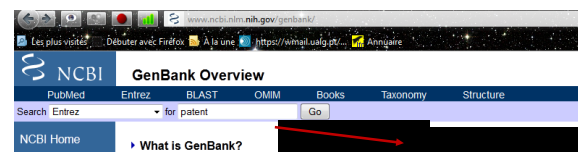
In collaboration with Sophie Arnaud-Haond (Ifremer France),

Jesus M.Arrieta (CSIC-UIB Spain), Antoine Schoen and Patricia Laurens

(Université Paris-Est, IFRIS, France).

PATENT CLAIMS FOR A GENE OF MARINE ORIGIN WITH SOURCE	
Country	Marine organism patent claims
USA	199
Germany	149
Japan	128
France	34
United Kingdom	33
Denmark	24
Belgium	17
Netherland	13
Switzerland	11
Norway	9

Patents Screening (Sophie Arnaud et al)

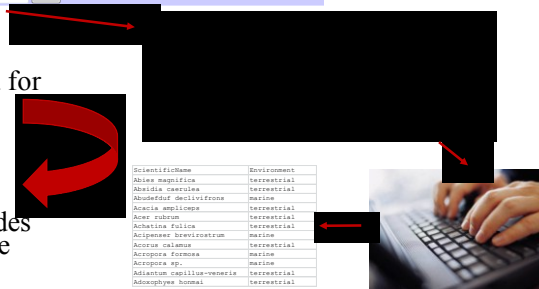


• GenBank Patent Database (GenPAT)

• Annotated by hand for marine sp.

• Base de donnée de brevets associés à des séquences d'origine marine

• Origin of patents claims traced using Patentscope (World Intellectual Property Office database)

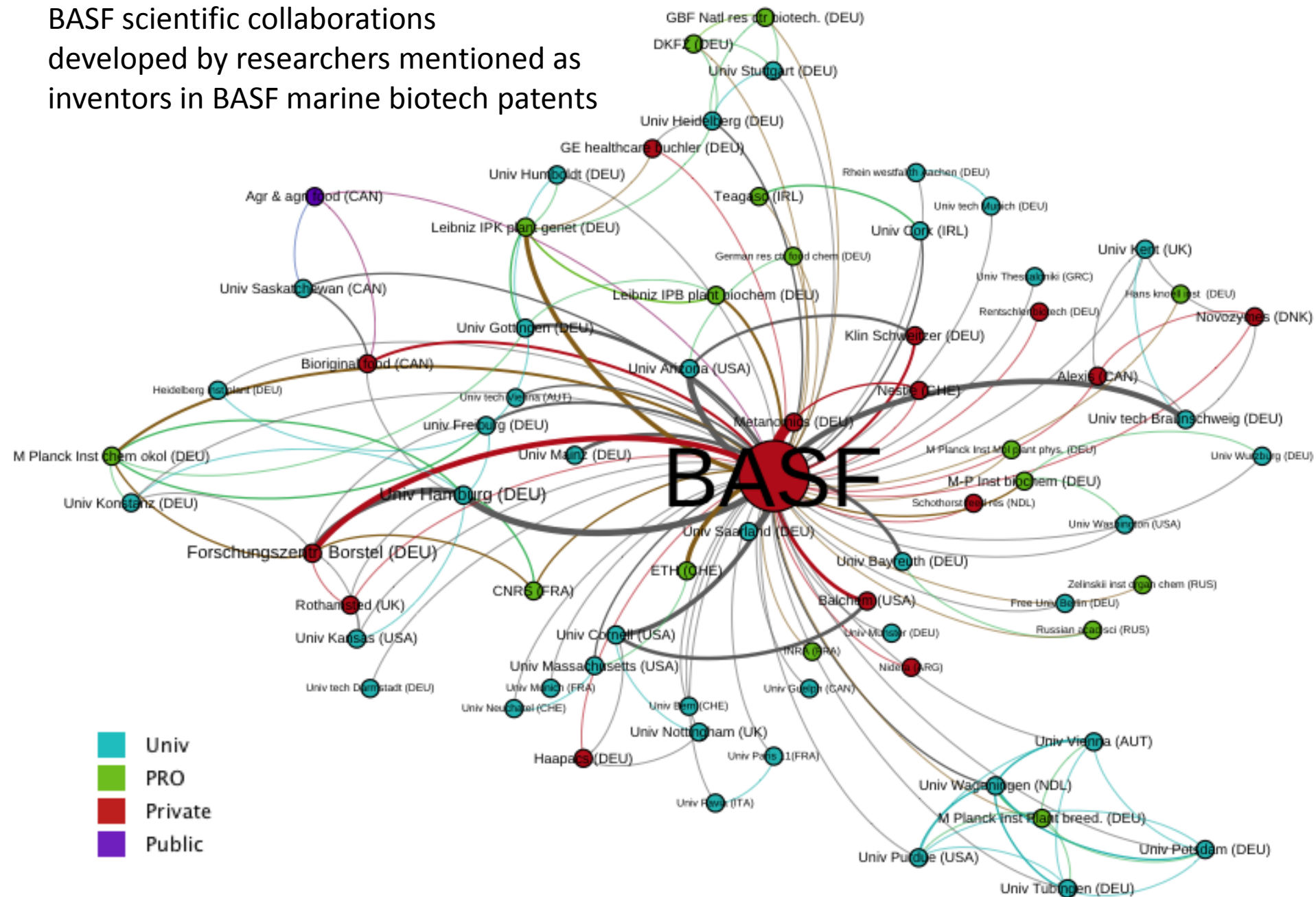


Daniel Pardo.Kiel Submariner 9 May 2012

1. Arnaud-Haond S, Arrieta JM, Duarte CM (2011) Marine Biodiversity and Gene Patents. Science 331: 1521-1522.

2. Arrieta JM, Arnaud-Haond S, Duarte CM (2010) What lies underneath: conserving the oceans' genetic resources. Proc Natl Acad Sci U S A 107: 18318-18324.

BASF scientific collaborations developed by researchers mentioned as inventors in BASF marine biotech patents



And now?



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Portal:Marine Biotechnology

Marine Biotechnology

Marine biotechnology explores and uses marine bioresources as the target for or origin of technological applications, which are used for the production of products and services.

In the context of a global economic downturn, we are now facing complex and difficult challenges such as the sustainable supply of food and energy, climate change and environmental degradation, human health and ageing populations. Yet concurrently, the seas represent one of the most abundant sources of food and energy production on the planet, as well as containing the potential for countless innovations in drug production, industrial process development, ecosystem management and other related fields. Marine Biotechnology can make an increasingly important contribution towards meeting these societal challenges and supporting economic recovery and growth, by delivering new knowledge, products and services.

Estimates predict an annual growth in the sector of up to 10-12% in the coming years, revealing the huge potential and high expectations for further development of the Marine Biotechnology sector at a global scale.^[2]

Show new selections

Research Area Priorities

Developments in life science technologies are one of the key drivers of Marine Biotechnology research. Previous advances in molecular biology, genomics and -omics have contributed to Marine Biotechnology developments.

There are further challenges in developing and optimising an appropriate biotechnology toolbox for innovations using marine bioresources. These include tailored -omics techniques, in situ measurement, sampling and monitoring, improvements in the cultivation of microorganisms and the use of marine model organisms. An improved and well-adapted toolbox is expected to have a large impact on future progress in marine biotechnology.

Content

What is Marine Biotechnology?

Key Marine Biotechnology application areas [show]

Examples of Marine Biotechnology successes [show]

Marine Biotechnology key tools and technologies [show]

Strategies, Policies and Programmes [show]

Glossary

[Links to more general information](#)

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Strategies, Policies and Programmes

- Pan-European
- European sea basins
 - Atlantic, Celtic Sea, Bay of Biscay and the Iberian Coast
 - Baltic Sea basin
 - Mediterranean and Black Sea basins
 - North Sea basin
- European countries
 - Croatia
 - Denmark
 - Ireland
 - Norway
- Afrika
- Asia
- Australia Pacific
- America's

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CSA (Coordinating) in Marine Biotechnology. MarineBiotech is funded under the European Commission's Seventh Framework Programme. Contract number 289311. October 2011 - March 2013.

Website developed and maintained by VLIZ

And now?



A screenshot of a web browser window displaying the "Croatia - CSA MarineBiotech Wiki" page. The browser's address bar shows the URL "http://www.marinebiotech.eu/wiki/Croatia". The page header features the MarineBiotech logo and the title "ERA-NET Preparatory Action in Marine Biotechnology". A navigation menu includes links for Home, About us, Our events, News, Library, MarineBiotech Registers, Infopages, Calendar, Contact, and Login. The main content area is titled "Croatia" and includes a table of contents with sections like "Overarching science strategies, plans and policies", "Research Funding Schemes and Programmes", and "Research priorities". A map of Croatia is also visible on the right side of the page. The browser's status bar at the bottom indicates the system is charged and the date is Monday, 0:38.



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Croatia

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- 2 Research Funding Schemes and Programmes
- 3 Research priorities
- 4 Strategic documents
- 5 Infrastructures and coordination and support capacities / initiatives
- 6 References
- 7 Disclaimer



Overarching science strategies, plans and policies

- Ministry of Science, Education and Sports: "**Strategic plan 2012-2014**" describes the overall Croatian strategic short-term measures in education, science and sports.^[1]
- Ministry of Agriculture, Fisheries and Rural regions: "**Strategic plan 2012-2014**" describes the overall Croatian short-term measures in agriculture, fisheries and aquaculture, including biotechnology issues.^[2]
- "**Marine strategy**", currently under development, but being obligatory act in future (details defined by governmental "Act on establishing a framework for protecting the environment of the Republic of Croatia"^[3]).

Research Funding Schemes and Programmes

- **Ministry of Science, Education and Sports** funds research and innovation projects, all research topics. ^[4]
- **Croatian Foundation for Science** funds research and innovation projects, all research topics.^[5]
- The **Business Innovation Centre of Croatia (BICRO)**, central institution in the national innovation system for supporting innovation and technology advancement.^[6]
- **IPA program (Instruments for Pre-accession Assistance)** has different funding lines: for Adriatic cross-board cooperation^[7], operative competitiveness ^[8], IPARD. ^[9]
- Other EU Cohesive Funds, will be available from 2014 (if Croatia enters the EU).
- As part of the stabilisation process and Croatia's accession to the European Union, the Government is promoting a shift to a knowledge-based economy. Croatia has established a national **Science and Technology Action plan** for 2006-20104. Biotechnology (agri-food / healthcare / industrial) has been recognised as one of the priorities which will contribute to the development of Croatian society. Currently, 55 biotechnology projects are funded by the Government.^[10]

Research priorities

Thank you!



**Thank you for your attention
and your future contribution to success**



Acknowledgements

This presentation is based on the work of the Marine Board-ESF Working Group on Marine Biotechnology, CSA MARINEBIOTECH and contributions from Antje Labes, Kathleen D'Hondt, Teodoro Ramirez, Willem Demoor, Imke Schneemann, Adrianna Ianora, Joel Querellou, Rocardo Santos, Meredith Lloyd-Evans, Steinar Bergseth, Torger Børresen, Catherine Boyen, Carlo Heip, Daniel Pardo, Cristina Leandro, Ed Hill and many more