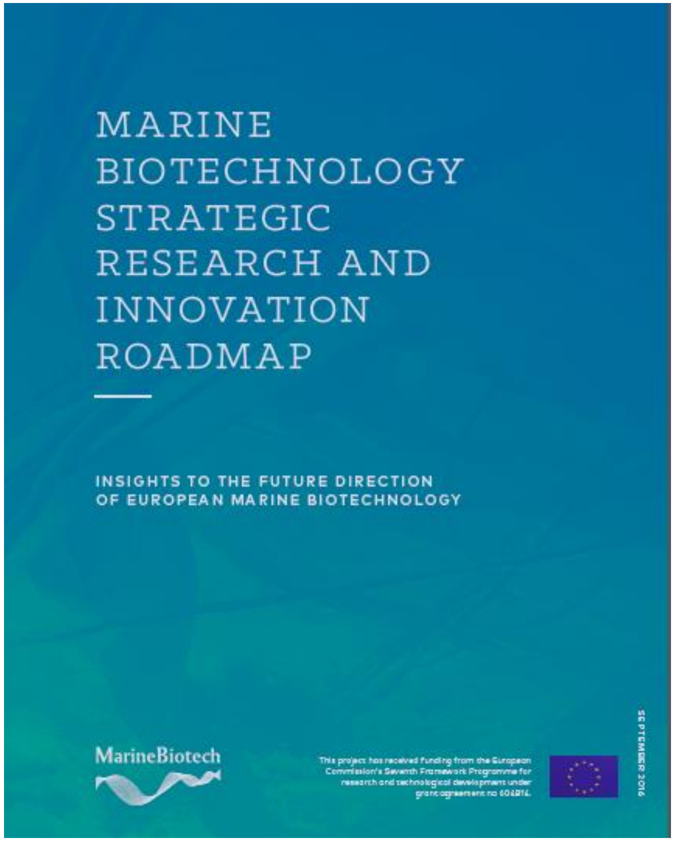
Realising the Potential of Marine Biotechnology Through International Collaboration



MARINE BIOTECHNOLOGY STRATEGIC RESEARCH AND INNOVATION ROADMAP

INSIGHTS TO THE FUTURE DIRECTION OF EUROPEAN MARINE BIOTECHNOLOGY

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This project has received funding from the European Commission's Seventh Framework Programme for research and technological development under grant agreement no 604814.

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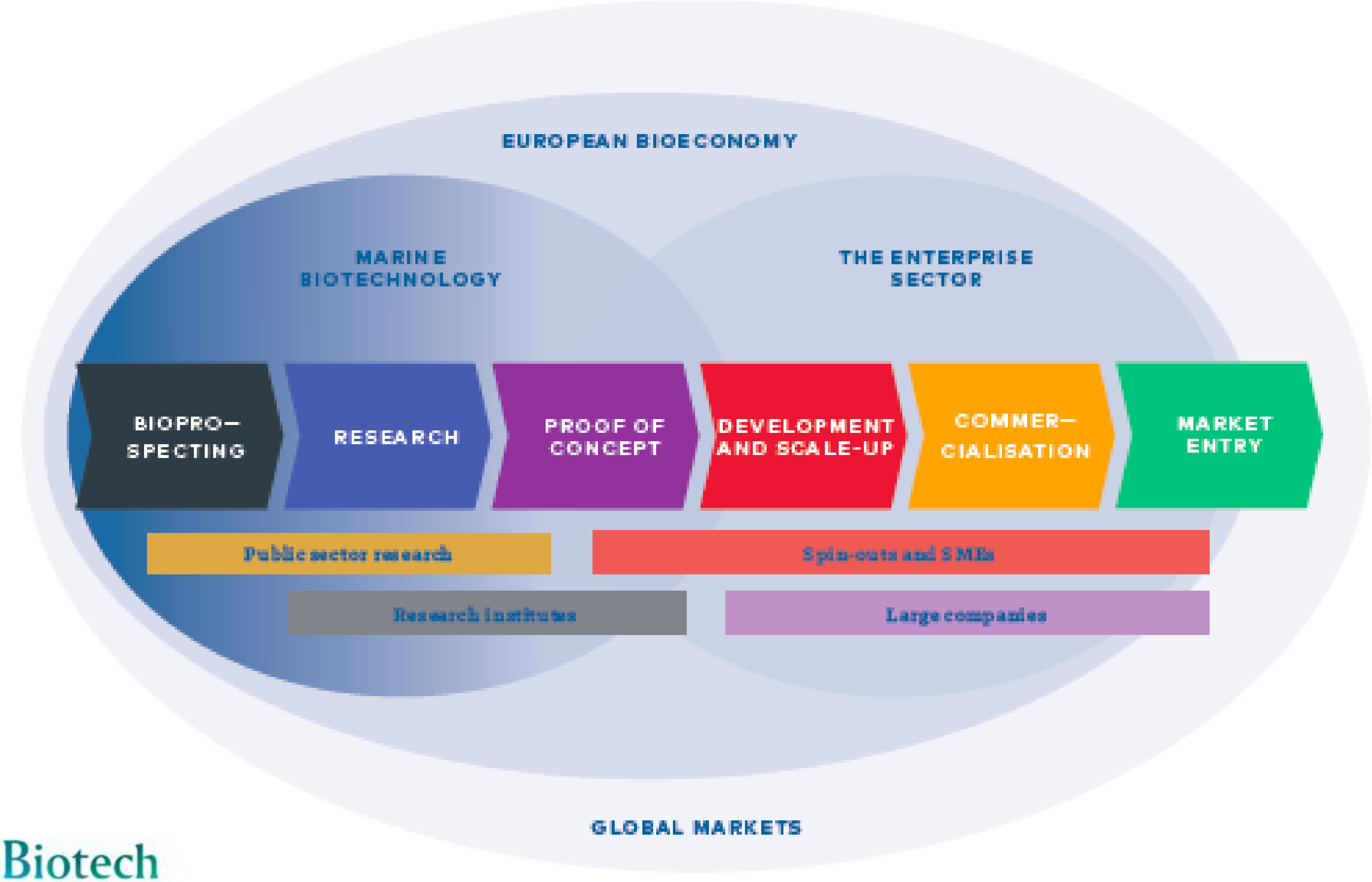
The contribution of Marine Biotechnology to the Bioeconomy and Global Markets


EUROPEAN BIOECONOMY

MARINE BIOTECHNOLOGY

THE ENTERPRISE SECTOR

BIOPRO–SPECTING

RESEARCH

PROOF OF CONCEPT

DEVELOPMENT AND SCALE-UP

COMMER–CIALISATION

MARKET ENTRY

Public sector research

Spin-outs and SMEs

Research institutes

Large companies

GLOBAL MARKETS

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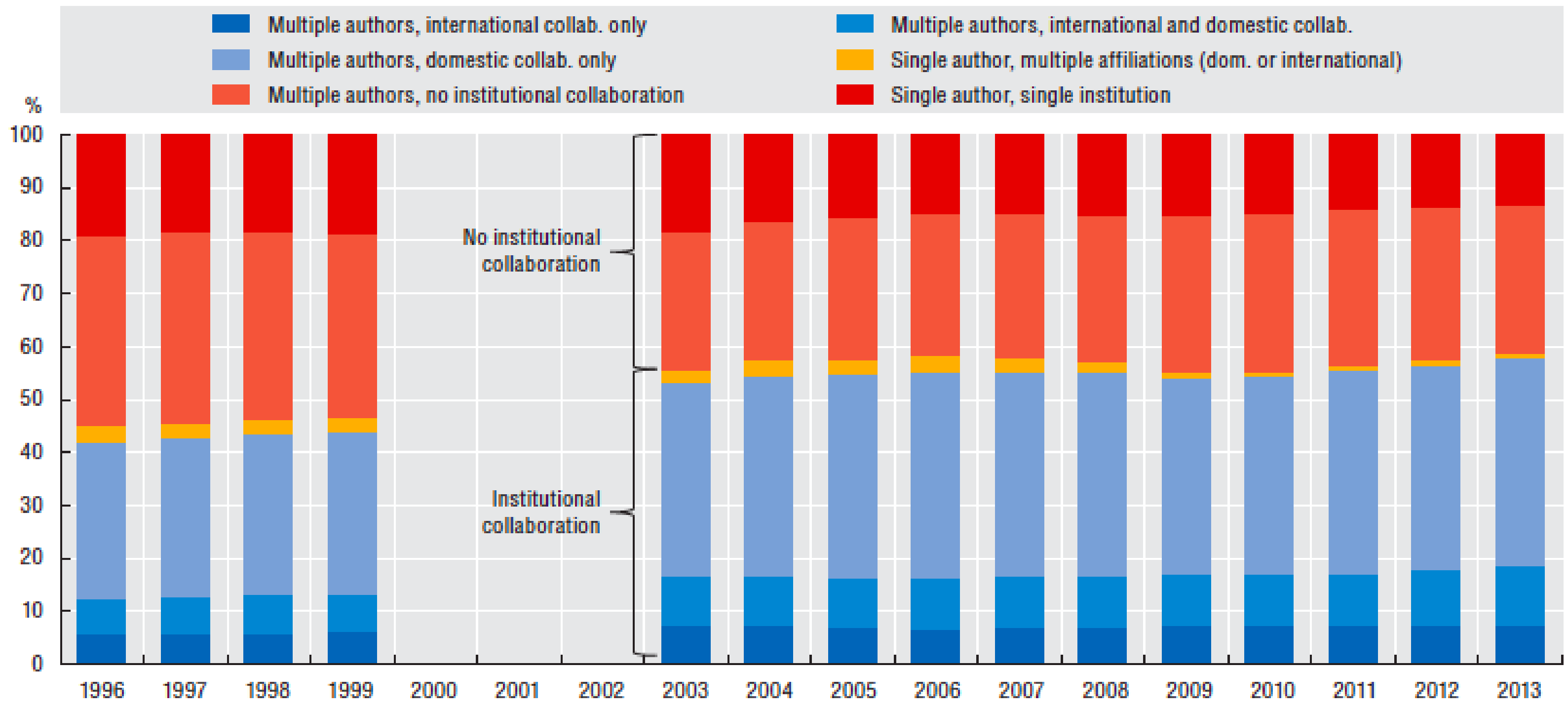
Global scientific collaboration trends, 1996-2013

As a percentage of all publications, fractional counts



Note: Results for 2000-02 not displayed because of incomplete indexation in the Scopus database of authors for publications in those years. Estimates based on available data would understate the true extent of scientific collaboration.
Source: OECD calculations based on *Scopus Custom Data*, Elsevier, Version 4.2015, July 2015. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933273347

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Business enterprise R&D funded from abroad, by source of funds, 2013

As a percentage of BRED

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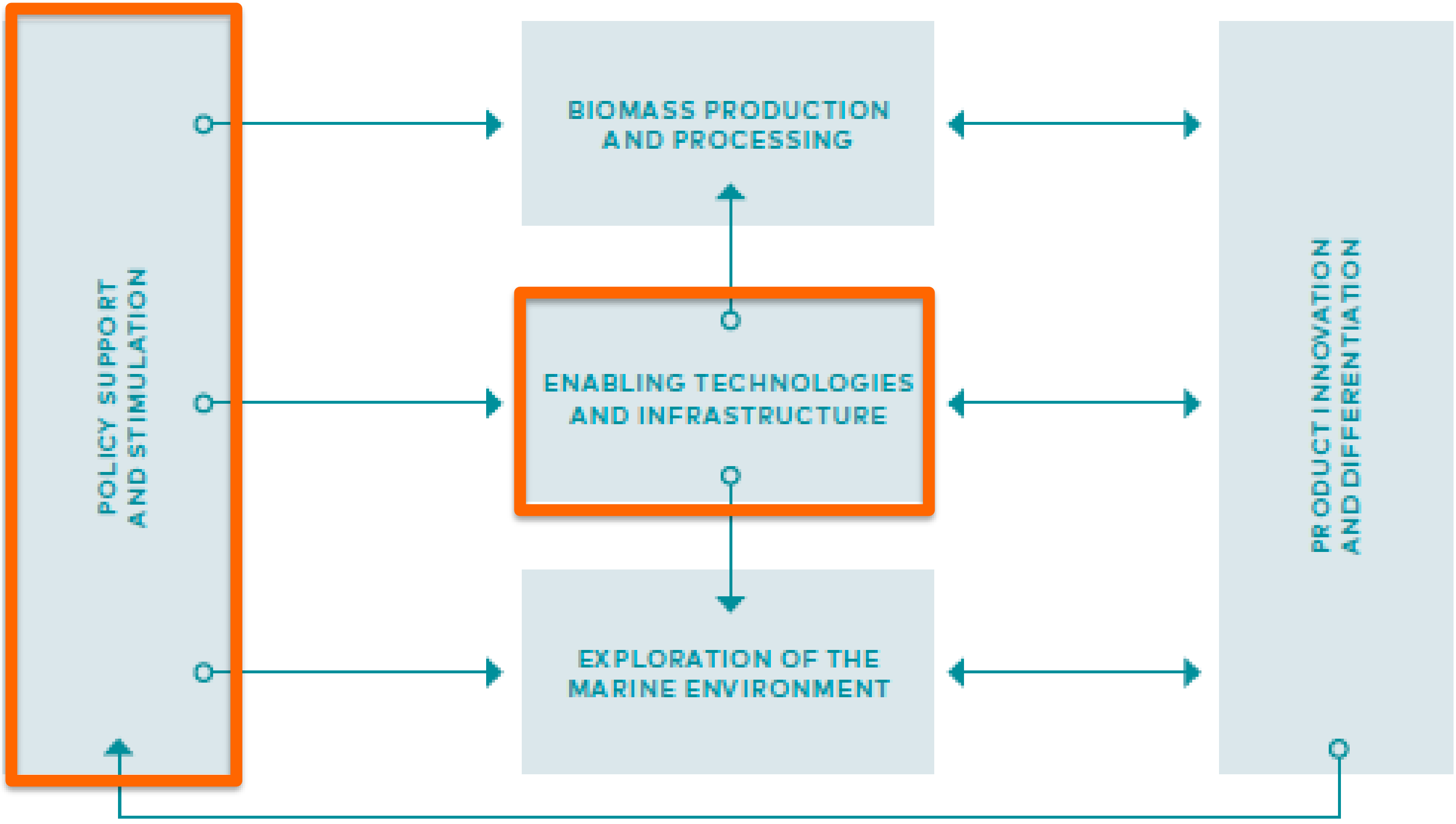
Source: OECD, *Research and Development Statistics Database*, www.oecd.org/sti/rds, June 2015. See chapter notes.

StatLink http://dx.doi.org/10.1787/888933273920

The five thematic areas of the strategic research and innovation roadmap



POLICY SUPPORT AND STIMULATION

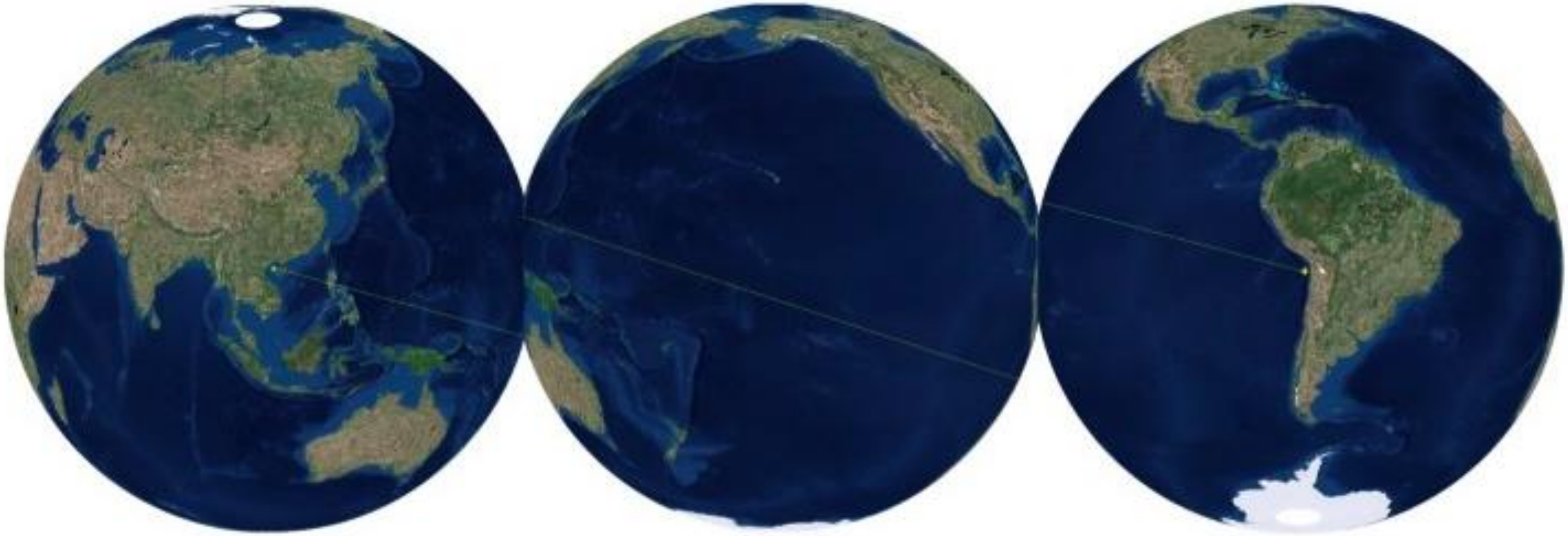
BIOMASS PRODUCTION AND PROCESSING

ENABLING TECHNOLOGIES AND INFRASTRUCTURE

EXPLORATION OF THE MARINE ENVIRONMENT

PRODUCT INNOVATION AND DIFFERENTIATION

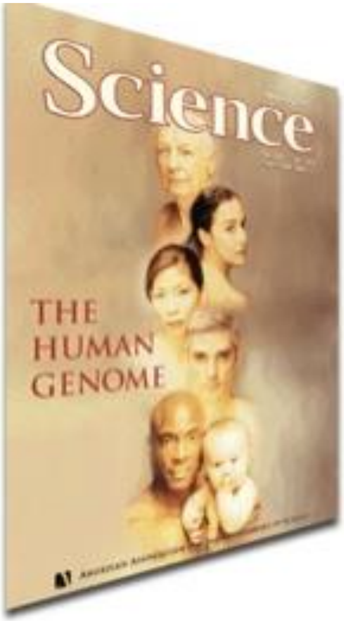
The ocean

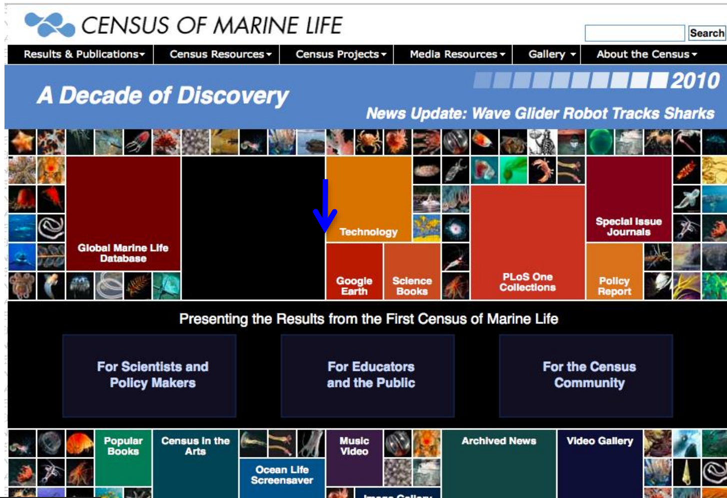


>70% of planet
>90% of biosphere
Immense diversity

International Collaboration

- To tackle large or complex problems




CENSUS OF MARINE LIFE

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A Decade of Discovery

2010

News Update: Wave Glider Robot Tracks Sharks

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Technology

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PLoS One Collections

Special Issue Journals

Policy Report

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For Scientists and Policy Makers

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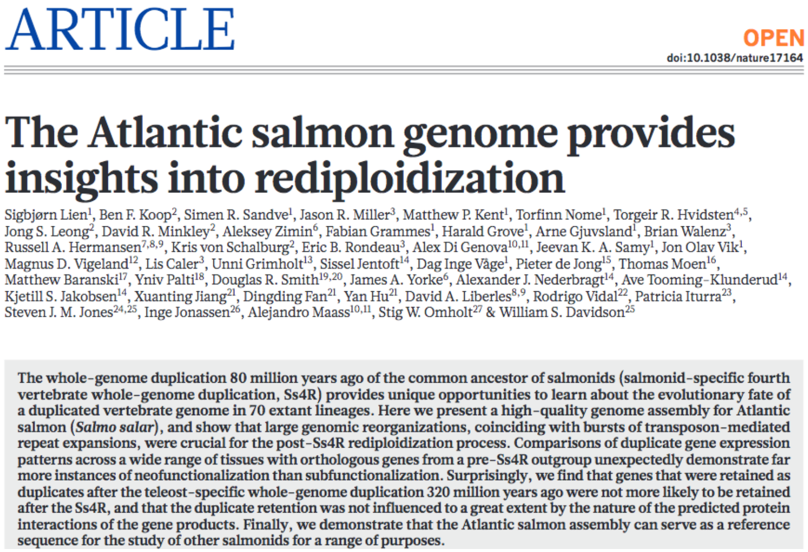
International Collaboration

- To tackle large or complex problems

International Cooperation to Sequence the Atlantic Salmon Genome (ICSASG)

3 countries
$10M USD



ARTICLE

OPEN

doi:10.1038/nature17164

The Atlantic salmon genome provides insights into rediploidization

Sigbjørn Lien[1], Ben F. Koop[2], Simen R. Sandve[1], Jason R. Miller[3], Matthew P. Kent[1], Torfinn Nome[1], Torgeir R. Hvidsten[4,5], Jong S. Leong[2], David R. Minkley[2], Aleksey Zimin[6], Fabian Grammes[1], Harald Grove[1], Arne Gjuvsland[1], Brian Walenz[3], Russell A. Hermansen[7,8,9], Kris von Schalburg[2], Eric B. Rondeau[3], Alex Di Genova[10,11], Jeevan K. A. Samy[1], Jon Olav Vik[1], Magnus D. Vigeland[12], Lis Caler[3], Unni Grimholt[13], Sissel Jentoft[14], Dag Inge Våge[1], Pieter de Jong[15], Thomas Moen[16], Matthew Baranski[17], Yniv Palti[18], Douglas R. Smith[19,20], James A. Yorke[6], Alexander J. Nederbragt[14], Ave Tooming-Klunderud[14], Kjetill S. Jakobsen[14], Xuanting Jiang[21], Dingding Fan[21], Yan Hu[21], David A. Liberles[8,9], Rodrigo Vidal[22], Patricia Iturra[23], Steven J. M. Jones[24,25], Inge Jonassen[26], Alejandro Maass[10,11], Stig W. Omholt[27] & William S. Davidson[25]

The whole-genome duplication 80 million years ago of the common ancestor of salmonids (salmonid-specific fourth vertebrate whole-genome duplication, Ss4R) provides unique opportunities to learn about the evolutionary fate of a duplicated vertebrate genome in 70 extant lineages. Here we present a high-quality genome assembly for Atlantic salmon (*Salmo salar*), and show that large genomic reorganizations, coinciding with bursts of transposon-mediated repeat expansions, were crucial for the post-Ss4R rediploidization process. Comparisons of duplicate gene expression patterns across a wide range of tissues with orthologous genes from a pre-Ss4R outgroup unexpectedly demonstrate far more instances of neofunctionalization than subfunctionalization. Surprisingly, we find that genes that were retained as duplicates after the teleost-specific whole-genome duplication 320 million years ago were not more likely to be retained after the Ss4R, and that the duplicate retention was not influenced to a great extent by the nature of the predicted protein interactions of the gene products. Finally, we demonstrate that the Atlantic salmon assembly can serve as a reference sequence for the study of other salmonids for a range of purposes.

www.faasg.org

15 countries
$??M USD

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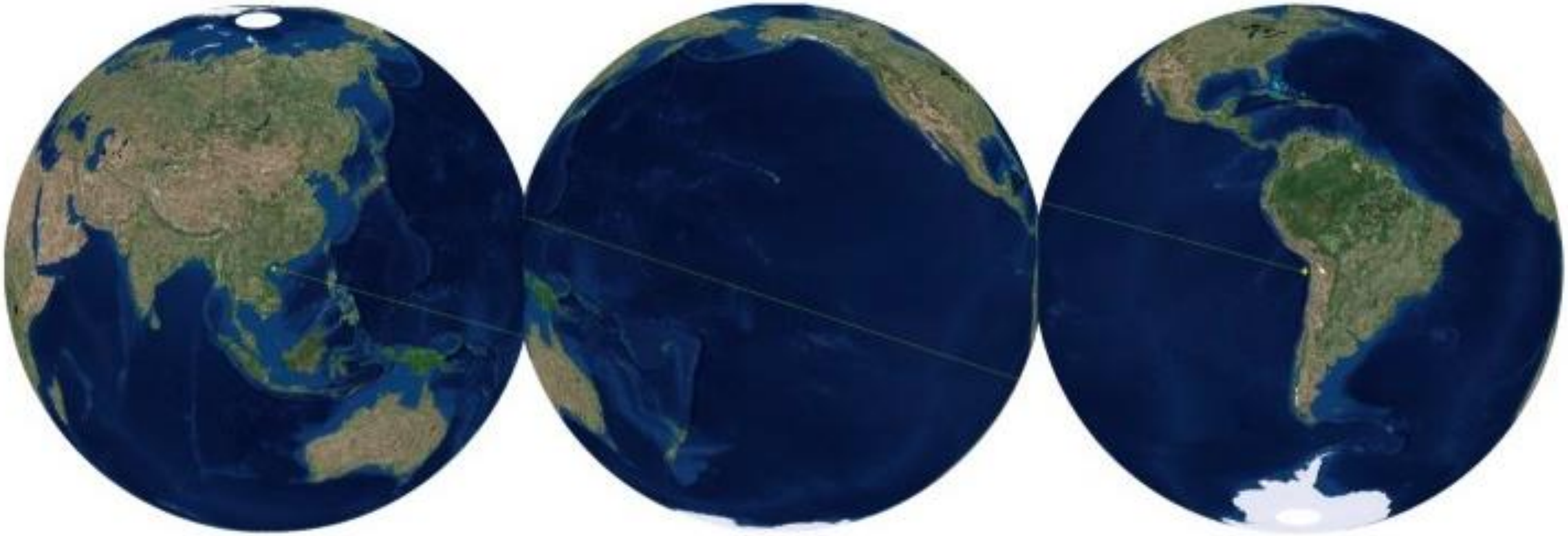
The Future



- More complexity
- Increased multi-national collaboration
- Increased interdisciplinary work

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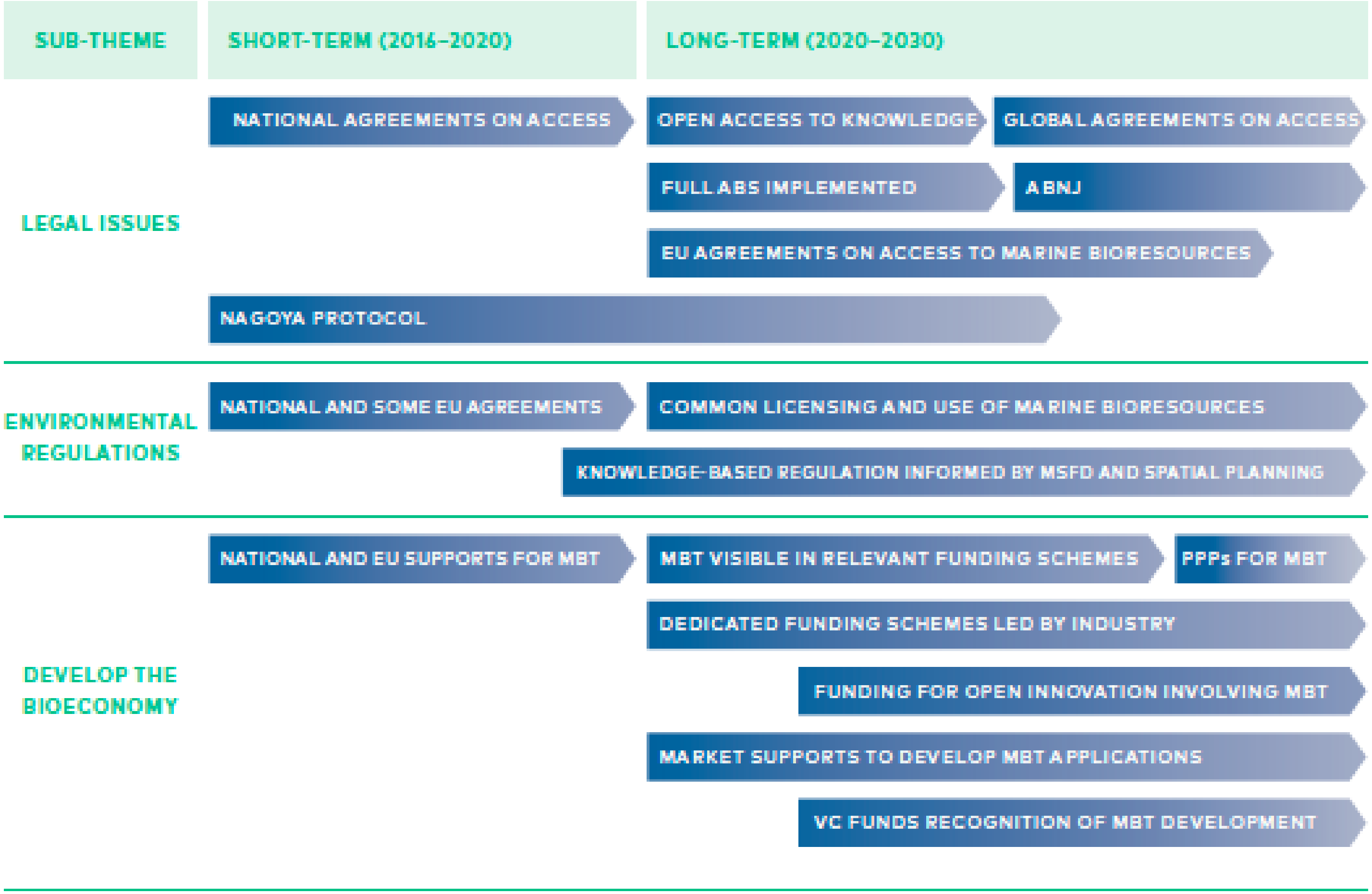
Policy Support and Stimulation



SUB-THEME	SHORT-TERM (2016–2020)	LONG-TERM (2020–2030)
LEGAL ISSUES	NATIONAL AGREEMENTS ON ACCESS	OPEN ACCESS TO KNOWLEDGE GLOBAL AGREEMENTS ON ACCESS
		FULL ABS IMPLEMENTED ABNJ
		EU AGREEMENTS ON ACCESS TO MARINE BIORESOURCES
	NAGOYA PROTOCOL	NAGOYA PROTOCOL
ENVIRONMENTAL REGULATIONS	NATIONAL AND SOME EU AGREEMENTS	COMMON LICENSING AND USE OF MARINE BIORESOURCES
	KNOWLEDGE-BASED REGULATION INFORMED BY MSFD AND SPATIAL PLANNING	KNOWLEDGE-BASED REGULATION INFORMED BY MSFD AND SPATIAL PLANNING
DEVELOP THE BIOECONOMY	NATIONAL AND EU SUPPORTS FOR MBT	MBT VISIBLE IN RELEVANT FUNDING SCHEMES PPPs FOR MBT
		DEDICATED FUNDING SCHEMES LED BY INDUSTRY
		FUNDING FOR OPEN INNOVATION INVOLVING MBT
		MARKET SUPPORTS TO DEVELOP MBT APPLICATIONS
		VC FUNDS RECOGNITION OF MBT DEVELOPMENT

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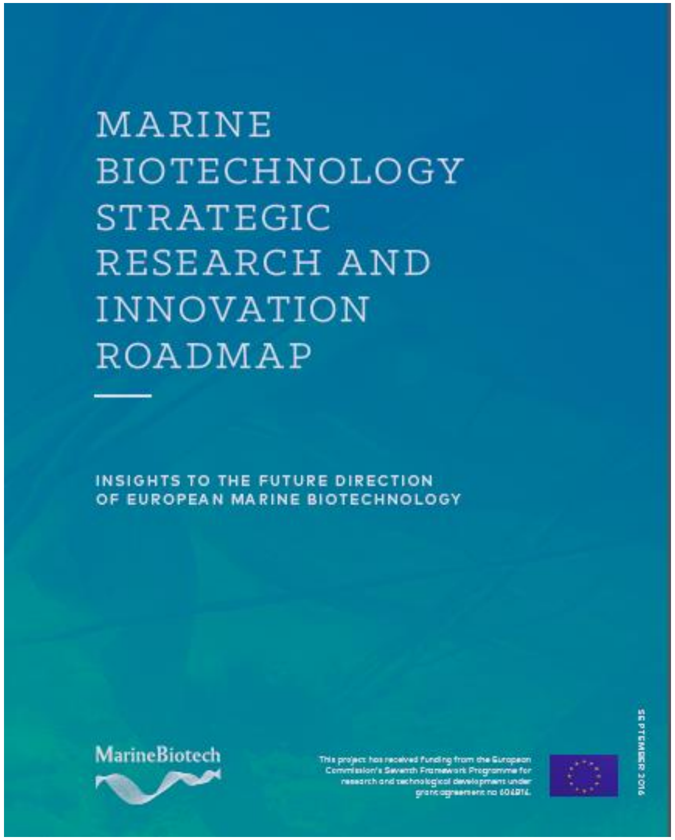

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