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# Definition of Marine biotechnology as a subset of biotechnology in general

Work Package 3

Interactions with industry

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# TABLE OF CONTENTS

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TABLE OF CONTENTS ..... **ERROR! BOOKMARK NOT DEFINED.**

MARINE BIOTECHNOLOGY AS A SUBSET OF BIOTECHNOLOGY IN GENERAL  
..... **ERROR! BOOKMARK NOT DEFINED.**

Marine biotechnology as a subset of biotechnology in general ..... 2

# MARINE BIOTECHNOLOGY AS A SUBSET OF BIOTECHNOLOGY IN GENERAL

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Marine biotechnology is a subset of biotechnology and, in line with the OECD definition of biotechnology<sup>1</sup>, can be defined as:

*‘The application of science and technology to living organisms from marine resources, as well as parts, products and models thereof, to alter living or non-living materials for the production of knowledge, goods and services.’*

This broad definition incorporating both modern and traditional activities ranging from conventional biological applications, like welfare and food production, as well as applications at the biomolecular and genomic level. The fast growing modern biotechnology provides new and improved utilisation where the enabling technology harnesses biomolecular processes for the development of knowledge and products such as food improvements, biofuels and biologics with better social and environmental benefits.

## MARINE BIOTECHNOLOGY AS A SUBSET OF BIOTECHNOLOGY IN GENERAL

Marine biotechnology has the same basic characteristics as biotechnology in general, but the focus is restricted to utilizing the technology in relation to the marine environment. Several documents have scoped and defined the area of marine biotechnology such as the ESF Position Paper 15 on marine biotechnology (2010)<sup>2</sup> and the scoping paper of the Collaborative Working Group on Marine Biotechnology (EC CWG-MB; 2009)<sup>3</sup>.

The notion “marine biotechnology” therefore incorporates the use of marine bioresources either as a target or source where biotechnology is the enabling technology. This can range from off the shelf use of “-omics” methods in marine related R&D projects by academia and industry, through applications in products and processes in the industry, to the intricate developments of the technology and knowledge itself for the benefit to heal, protect and improve the society and the environment.

As such the use of:

- natural marine organisms and biological components from marine organisms,
- bioengineered marine organisms with non-marine organism's genetic information or
- bioengineered terrestrial organisms with genetic information from marine organism,

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<sup>1</sup> <http://stats.oecd.org/glossary/detail.asp?ID=219>

<sup>2</sup> [http://www.esf.org/fileadmin/Public\\_documents/Publications/marine\\_biotechnology\\_01.pdf](http://www.esf.org/fileadmin/Public_documents/Publications/marine_biotechnology_01.pdf)

<sup>3</sup> [http://ec.europa.eu/research/bioeconomy/pdf/cwg-mb\\_to\\_kbbenet\\_report\\_final.pdf](http://ec.europa.eu/research/bioeconomy/pdf/cwg-mb_to_kbbenet_report_final.pdf)

for developing or producing novel products or knowledge with biotechnical applications, would all fall within the definition of marine biotechnology. As well as the use of terrestrial organism for product development or manufacturing for the marine bio-environment such as for monitoring (biosensors) and bio-remediation. In addition, applying terrestrial or marine organisms and/or their biological components (e.g. enzymes) on raw materials from the marine environment (living or non-living) also falls into the scope of marine biotechnology.

Marine biotechnology has the potential to become an innovative tool of significant importance in the Bioeconomy on a global scale, where it can be used to both produce renewable biological resources and/or convert them into food, feed, pharmaceuticals, consumer product ingredients, fine chemicals, bio-based products and bioenergy.

The concept of marine biotechnology is very relevant and important as the marine environment has until recently been quite unexplored in relation to biotechnology as an enabler for exploration and exploitation. Several reports (e.g. the ESF Position Paper and the EC CWG-MB report) have identified areas where development of toolkits and knowledge for marine biotechnology is of high priority, such as:

- Marine bioprospecting/biodiscovery for commercial developments of novel products, including for the food, feed, pharma, personal care and fine chemical industry.
- Genomics in production and model organisms, including the exploitation of microbial metagenomics.
- Molecular biology applied to aquaculture (molecular aquaculture).
- Biomass production; development and application of new effective systems for biomass production, use and transformation.
- Development of new innovative effective methods to convert marine biomass (new or underutilized) into products of high value and market appeal.
- Development of marine model organisms or “-omics” tools for studies of the marine environment, biodiscovery, process technologies, etc.
- Cultivation of marine organisms, such as development technologies for culture and isolation of uncultivated microorganisms or develop innovative culture methods adapted to vertebrate or invertebrate primorphs, cell lines or marine micro- and macroalgae for production of active compounds.
- Bio-engineering of marine organism. Promote research on the biorefinery approach based on invertebrates, micro- and macroalgae production to develop a long-term alternative to other chemical processes and products.