



European Marine Board Expert Working Group

Biomolecular approaches for the observation and management of marine life

Terms of Reference

February 2025

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1. *Background and Rationale*

Biomolecular methods are important tools to study the genetic material (i.e. DNA and RNA), proteins and metabolic products of marine organisms. These include genomic¹, transcriptomic², proteomic³, metabolomic⁴, and epigenomic⁵ (collectively known as -omics) technologies. These approaches can be used to analyse samples from a single organism or from environmental DNA (eDNA)⁶, and can also be combined into multi-omic approaches. Driven by the huge reduction in costs over the last decade and the increased power of computational approaches for analysing extremely large data sets, the use of these tools to study marine life holds increasing potential to advance our understanding of biodiversity and ecosystem function. Their use has the capacity to assess and monitor changes in biodiversity and ecosystems at higher resolution, and to better understand and manage human uses of the Ocean. The use of molecular methods on eDNA samples furthermore offers a non-destructive and cost-effective way to collect samples for environmental assessment and conservation. -Omics technologies also make an important contribution to biological Ocean observation infrastructure, contributing to the European Ocean Observing System (EOOS⁷), and the Global Ocean Observation System (GOOS⁸).

Molecular tools can be used for numerous applications, including for planning and evaluating marine protected areas (MPAs), fisheries management, assessing mitigation and adaption solutions to the impacts of climate change, assessing marine ecosystem health, and bioprospecting for new medical compounds. At a European level, -omics technologies are used in the implementation of policies including the Marine Strategy Framework Directive (MSFD), the 2030 Biodiversity Strategy and potentially also for the new Nature Restoration Law. At an international level, the use of molecular techniques is recognised and encouraged as important for conservation efforts in the Convention on Biological Diversity (CBD)⁹ and the Kunming-Montreal Global Biodiversity Framework¹⁰. Molecular tools are also relevant for efforts towards Sustainable Development Goal 14 'Life Below Water' and the Biodiversity Beyond National Jurisdiction (BBNJ) agreement.

Examples of the use of biomolecular tools in marine science and policy include accelerating species discoveries; biodiversity assessment and monitoring; monitoring harmful algal blooms; assessing ecosystem structure and function, population genetics and connectivity; designating representative marine protected area networks; fisheries management; understanding and predicting responses to climate change and other stressors; bioprospecting (i.e. develop compounds or other products of commercial interest for medical applications and other industries such as biotechnology, cosmetics and

¹ Genomics is the study of all genes (DNA) within a cell, tissue, organism, or ecosystem (i.e. its genome) and their interactions with each other and with the environment.

² Transcriptomics is the study of all transcripts (mRNA) of a cell, tissue, or organism across a variety of different biological conditions, which provides information on gene expression.

³ Proteomics is the study of all proteins produced by a single cell, tissue or organism.

⁴ Metabolomics is the study of all the metabolites or small molecules present in an organism, cell or tissue under certain conditions.

⁵ Epigenomics is the study of DNA modifications that regulate gene expression (e.g. DNA methylation).

⁶ Environmental DNA is genetic material obtained from environmental samples such as soil, sediment and water, without any obvious signs of biological source material, and used as a proxy for the presence of species.

⁷ <https://www.eoos-ocean.eu/>

⁸ <https://goosocean.org/>

⁹ <https://www.cbd.int/>

¹⁰ <https://www.cbd.int/gbf>

nutraceuticals); and pollution control. All these examples highlight the huge potential of biomolecular methods in contributing to achieving policy objectives, and thus of understanding and using these methods more widely.

Rationale for the Working Group

The topic was first proposed as a Working Group activity during a call for new topics in Summer 2023 by the EMB Member Organisation Stazione Zoologica Anton Dohrn (Italy), their Delegate Chris Bowler, Alternate Adriana Zingone, and colleague Raffaella Casotti. It was discussed during the Autumn 2024 EMB Plenary meeting at HCMR in Rhodes, Greece. Adriana Zingone highlighted the topic as significant because it is not well known and its relevance as not yet being conveyed to a wider audience. EMB Members then voted for the topic a new EMB activity.

2. Working Group Objectives

The EMB Working Group on “Biomolecular approaches for the observation and management of marine life” will build on EMB’s Future Science Brief No. 3 on “Strengthening Europe’s Capability in Biological Ocean Observations” (published in 2018) as well as the recommendations from the Ocean and Biodiversity Chapter of EMB Position Paper No. 28 “Navigating the Future VI”. The Working Group aims to assess and present the current status of molecular approaches for the observation and management of marine life, including key European and international initiatives. It will focus on highlighting the science and policy gaps and needs to advance the uptake of molecular tools in marine science and environmental management.

Specific objectives may include, but are not limited to:

- Highlighting state-of-the-art biomolecular methods and their applications to marine conservation, management, and policy;
- Highlighting emerging, next-generation biomolecular methods and future requirements e.g. real-time molecular monitoring technologies to support rapid decision-making;
- Exploring how to standardise, optimise and operationalise methodology used across Europe and internationally;
- Identifying knowledge gaps and technological advances needed, and providing recommendations to support wider uptake of molecular methods in Europe.

3. Working Group Composition

Working Group Chair and co-Chair

The Working Group (WG) Chair and Co-Chair represent the WG and take responsibility for its deliverables.

Profile

The Working Group (WG) Chairs should have significant experience and expertise and be leading on the topic at national and/or European level. It is important that the Chair and Co-Chair have a big picture

approach to ensure a focused and balanced view on the topic, and that they fully commit to facilitating the writing of this document.

Selection process

The Working Group (WG) Chair and Co-Chair will be selected as a result of a call for WG members' nominations issued by the European Marine Board Secretariat. The European Marine Board Secretariat in consultation with the ExCom, make the selection of the Chair from the pool of nominations received. A WG Co-Chair will be selected by the WG Chair with assistance from the EMB Secretariat.

Roles and responsibilities of Working Group Chairs

The Working Group (WG) Chair and co-Chair are responsible for ensuring the scientific quality of the WG output(s) and its timely delivery according to the WG Terms of Reference and as agreed at the kick-off meeting. The WG Chairs provide scientific leadership and act as the driving force for the WG activities with the support of a dedicated European Marine Board Science Officer who acts in the capacity of WG facilitator (see below). The mandates of the Chair and co-Chair are complimentary and the exact roles and responsibilities can be agreed on a case-by-case basis. **The time contribution estimated for the Chair and co-Chair is 15 days per year per person** (this does not include time to travel to in-person meetings), considering the roles listed below (see Annex 3).

The WG Chairs (Chair primarily and co-Chair when the Chair is not available):

- Chair WG meetings, i.e. moderate discussions and ensure delivery of meeting outputs;
- Coordinate the scientific contributions to the document draft according to the objectives defined at the kick-off meeting;
- Maintain an overview of the content and quality of the various inputs and requests additional expertise if necessary;
- Ensure timely delivery of the WG document;
- Enhance the document's strategic impact by promoting WG activities and output at national and European levels; and
- Report uptake and dissemination of the publication to the EMB Secretariat.

Working Group Members

A Working Group of approximately 12 members is proposed.

Profile

The selected Working Group Members will preferably have a background and expertise in at least one of the following fields:

- *Genomics, transcriptomics, proteomics, metabolomics, epigenomics of marine organisms and ecosystems;*
- *Integrative taxonomy;*
- *The use of molecular tools in inter- and trans-disciplinary approaches;*
- *Computational resources and bioinformatic analysis of molecular data;*

- *Development of technologies and/or observation systems for molecular approaches;*
- *European and/or international -omics observation networks; and*
- *Molecular tools for the implementation of the MSFD and other relevant European and international policies; and*
- *Bioprospecting and access and benefit sharing regulations.*

Working Group Member selection process

The Working Group (WG) experts will be selected as a result of a call for WG members' nominations issued by the European Marine Board Secretariat to the European Marine Board Member Organisations. WG Members are usually drawn from EMB Member organisations, although Delegates may also propose WG Members from relevant European projects and initiatives, industry and non-profit organisations if no internal candidates are available.

The co-Chairs will select the WG Members from the proposed nominations. If the Chair and co-Chair believe that external expertise are needed they can propose additional experts, which have to be approved by the ExCom. Decisions on the composition of the WG are guided primarily on the basis of achieving the correct balance of expertise required to comprehensively address the topic at hand. When the expertise criterion has been exhausted, decisions between candidates can be made on the basis of ensuring a broad geographical representation and gender balance for the WG. Non-selection of some nominated candidates is therefore normal and bears no relation to the scientific excellence of candidates not selected.

Roles and responsibilities of Working Group Members

Working Group (WG) Members are responsible for ensuring the scientific quality of their inputs and their timely delivery according to the WG Terms of Reference. **The time contribution estimated for the Working Group Members is 7.5 days per year per person** (this does not include time to travel to in person meetings), considering the roles listed below (see Annex 3).

WG Members:

- Prepare for and attend the WG meetings;
- Submit written contributions within deadlines agreed at the kick-off meeting;
- Respond to comments and submit revisions within specified deadlines;
- Provide the EMB Secretariat with images and figures, with appropriate copyright;
- Guide and adhere to the high-level strategic objectives of the publication;
- Promote the resulting publication at national level and European levels; and
- Report uptake and dissemination of the publication to the EMB Secretariat.

Engaging the wider community

During the course of the Working (WG), members may invite a selection of stakeholders or observers from the wider community to participate (e.g. from science, industry, policy, funding agencies).

Interaction with relevant international and European initiatives working in this field should be explored. This could be achieved through informal interactions during the writing process, through consultation and/or workshops held during the lifetime of the activity, by engaging key people as external reviewers, or by selecting several key experts to serve as members of the WG.

EMB Secretariat facilitation

The European Marine Board Executive Director is an *ex officio* Working Group (WG) manager. S/he nominates one or two Secretariat Science Officers to support and facilitate the WG.

The EMB Secretariat will coordinate this activity with the Chair and co-Chair. A dedicated EMB Science Officer will act in the capacity of facilitator and other EMB Secretariat staff may be involved depending on the specific topic for each WG activity.

- WG manager: *Sheila Heymans*, EMB Executive Director
- WG facilitator: *Britt Alexander*, Science Officer

4. Mode of Operation

Work programme

The work programme for the Working Group (WG) will consist of:

- One kick-off meeting and additional meetings as required (remote meetings via video conference or in-person, to be considered by the working group);
- Writing assignments;
- Regular email interactions and online progress meetings (as agreed by the WG);
- Editing to publication standard by the WG Chair/Co-Chair and EMB Secretariat;
- Revisions based on peer review comments (see section 5); and
- Final copy-editing and design by the EMB Secretariat and WG Chair /Co-Chair.

Support from the EMB Secretariat includes:

- Organisational support for WG meetings;
- Cost of all catering associated with WG meetings, including a WG dinner;
- Costs of publication (including design and printing) and dissemination of the document to relevant stakeholders;
- Writing and disseminate of meeting minutes, and maintenance of regular dialogue with the WG Chair and Co-Chair to ensure timely delivery of the document.
- Monitor and report the progress of the WG to EMB Board;
- Maintain the webpage for the WG; and
- Provide technical editing, graphic design and layout of the publication to guarantee the EMB style.

Note: WG Members and Chairs are not financially supported by the EMB (unless an extraordinary contribution is secured by one or more EMB Member Organisations). WG member participation (e.g. travel costs) is normally funded by their institution or the EMB member that proposed them for the WG. The establishment of a WG is for a limited duration and the WG will be disbanded by the Board when it has fulfilled its mandate.

General Data Protection Regulation (GDPR) policy for EMB Working Groups

Personal data for EMB Working Group (WG) Members and those involved in other EMB core activities is used for internal communication with the activity as well as external communication of the EMB activity via publications, the EMB website and EMB social media outlets.

For any new EMB activities, consent is sought at the kick-off of the activity to cover all relevant use and storage of personal data. The personal data of the working group members is retained beyond the end of the activity to enable follow-up communications for impact reporting and on related topics, and thus their data will continue to be stored, unless consent is later withdrawn. A template consent form can be found in Annex 1.

Reviewers are also contacted within the context of EMB activities. The template email they receive clearly outlines their right to act such that their input remains anonymous, in which case the reviewer would simply be listed as “Anonymous”. The reviewer will be informed of how and where their personal data will be stored. The consent of the reviewer will also be specifically sought for their personal data to be used outside of any activities directly relating to their role as reviewer, using the template text included in this document.

The [EMB privacy policy](#) contains information about our compliance with GDPR (data protection law). In this document you can find how to send us a request to let you access your data that we have collected, request us to delete your data, correct any inaccuracies or restrict our processing of your data. Please contact us at info@marineboard.eu for more information or concerns. You have the right to lodge a complaint about the way we handle your data with [Belgian Data Protection Authority](#).

5. Deliverables

The output of this Working Group (WG) is expected to be a *Future Science Brief. Position Paper* (~36 pages).

The document will be peer-reviewed by a minimum of two external reviewers (ideally one European and one international) selected from proposals by the Working Group Members, and will be coordinated by the EMB Secretariat. In accordance with the EMB procedures, the document will also be sent to EMB Member organizations for internal review and approval prior to finalization and publication.

The impact of the publication will be achieved *via* a targeted dissemination strategy as described below. WG Members will be required to make suggestions on how to reach end-user contacts and to contribute to the dissemination. Promotion of the document may include dedicated presentations at stakeholder events. WG Members will also be asked to notify the Secretariat of any dissemination activities or observed uptake / impact for up to two years following publication, for future impact reporting. A full outline of the decision-making procedure and system for WG operations is outlined in Annex 2.

6. Target Audience and Expected Impact

This specific publication targets the following stakeholders:

- European and national research funders;
- European and national policymakers;

- *European /International technology developers, observation networks, international policymakers and legal experts (for BBNJ and CBD implications); and*
- *The European and international marine science community.*

7. Communication and Dissemination Strategy

The targeted dissemination strategy includes, but is not limited to:

- Developing infographics to communicate key concepts and main messages from the document;
- Collecting photographs and other graphics to include in the document, use social media, and for other communication activities;
- A dedicated (in person, online or both) launch event;
- A news release on the EMB website and shared with EMB Member organisations to share on their websites;
- Social media content throughout the WG lifetime, for the launch and as post-launch follow up;
- Dissemination of digital and printed versions of the document to relevant stakeholders; and
- Presentation of the document by WG members and EMB Secretariat at relevant national and European events.

8. Indicative Timetable

The Working Group (WG) activities are foreseen to start in *September 2025* and continue for 12 months from kick-off. It is foreseen to publish the final document by the end of 2026 which will include a dedicated launch event (in person, online or both) and electronic and hard copy dissemination to relevant stakeholders. The European Marine Board conduct impact reporting, based on feedback from WG members and wider stakeholders, for a period of up to two years following publication.

An indicative timetable and order of activities is presented below.

Tasks	2025										2026											
	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	
Approval of ToR by EMB member organizations																						
Nominations of WG Members & Chairs																						
Appointment of WG Co-Chairs & Members																						
Kick-off meeting																						
Content drafting (incl. online meetings)																						
Editing by EMB Secretariat																						
Approval of draft text by WG members																						
Internal and external review, and revisions																						

Annex 1: Consent form for Core Activities

EMB holds personal data for anyone involved in core EMB activities, including Working Groups.

The following personal data may be held by the EMB Secretariat:

- Name
- Title
- Job title
- Areas of expertise and research interests
- Previously held roles
- Institute
- Country
- Institutional email address
- Institutional postal address
- Institutional telephone number
- Photographs
- Video

This information is stored in a secure spreadsheet and folder locations, and only EMB Secretariat staff have access to this.

In accordance with the EMB Gender and Diversity Equity and Inclusion Plan¹¹, EMB is interested to understand more about the demographic of its Working Group Members. The following questions are optional. The information gathered from responses will be stored and used completely anonymously, for overview reporting at EMB Board level only. This form will be stored in a secure folder location, and only EMB Secretariat staff will have access to this.

How do you describe your current gender identity?

- Female / Woman
- Male / Man
- Non-binary
- Other
- Prefer not to answer

How do you identify?

- White
- Black

¹¹ <https://www.marineboard.eu/gender-diversity>

- Asian
- Mixed ethnicity
- Other
- Prefer not to answer

EMB may:

- Contact you regarding the EMB activity that you are directly involved with
- Contact you regarding other EMB activities
- Add you to the EMB stakeholder mailing list
- Make your name, institution and country publicly available on the EMB website, in EMB communications, e.g. presentations regarding the activity you are involved in, and in EMB publications
- Take your photograph during EMB activities and use these pictures in publications, on the EMB website and on EMB social media outlets
- Take video footage during EMB activities and use these pictures in publications, on the EMB website and on EMB social media outlets

The data held may be reviewed and revised by the subject, and consent for any or all of the above may be withdrawn at any time.

☐

Please tick this box to confirm that you understand the above, and that you give EMB permission to obtain, use and store your personal data as outlined above.

Name:

Date: