

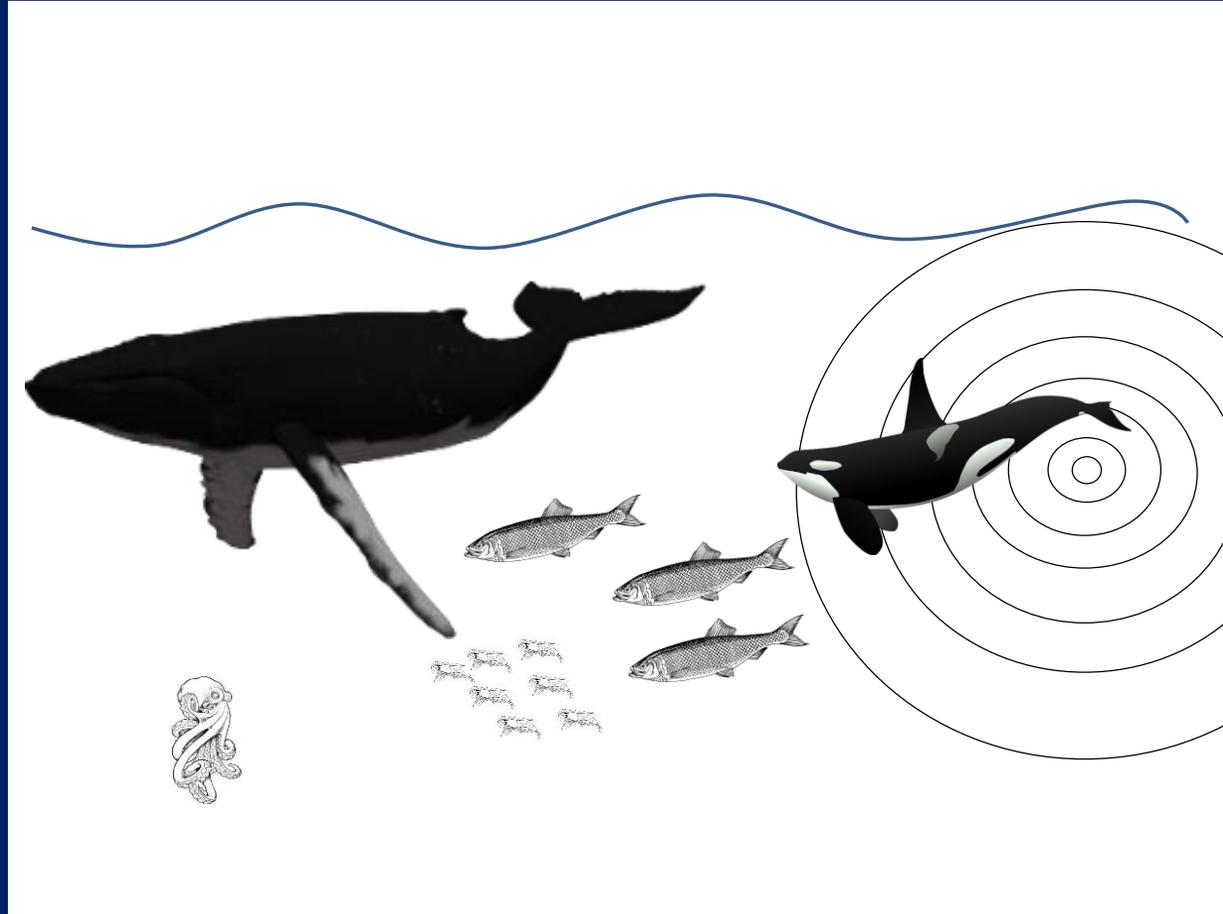
Frank Thomsen
Sónia Mendes
(Chairs)



European Marine Board Expert Working Group

Underwater Noise

Underwater Noise impacts have become an important issue worldwide



TORs

High-level objectives

- Update on progress related to this topic since the 2008 EMB publication,
- Raise awareness of the current knowledge and research gaps
- Broaden the scope from marine mammals to all marine organisms, and
- Highlight the conflicts and solutions that exist relative to underwater noise.

Specific objectives

- Highlight areas of increased understanding of underwater noise causes and effects, and emergent research and methods
- Explore research and policy gaps
- Highlight the challenges and potential solutions when establishing underwater noise mitigation measures and assessing their effectiveness
- Consider current barriers to progress, including collaboration needs
- Considering all of the above, highlight key actions related to research, monitoring, policy and management needs



2021
2030 United Nations Decade
of Ocean Science
for Sustainable Development

- Outcome 1 - *A clean Ocean where sources of pollution are identified and reduced or removed*
- Outcome 2 - *A healthy and resilient ocean where marine ecosystems are understood, protected, restored and managed*
- Challenge 1 - *Understand and map land and sea-based sources of pollutants and contaminants and their potential impacts on human health and Ocean ecosystems, and develop solutions to remove or mitigate them*
- Challenge 2 - *Understand the effects of multiple stressors on Ocean ecosystems, and develop solutions to monitor, protect, manage and restore ecosystems and their biodiversity under changing environmental, social and climate conditions*
- Challenge 7 - *Ensure a sustainable ocean observing system across all ocean basins that delivers accessible, timely, and actionable data and information to all users*

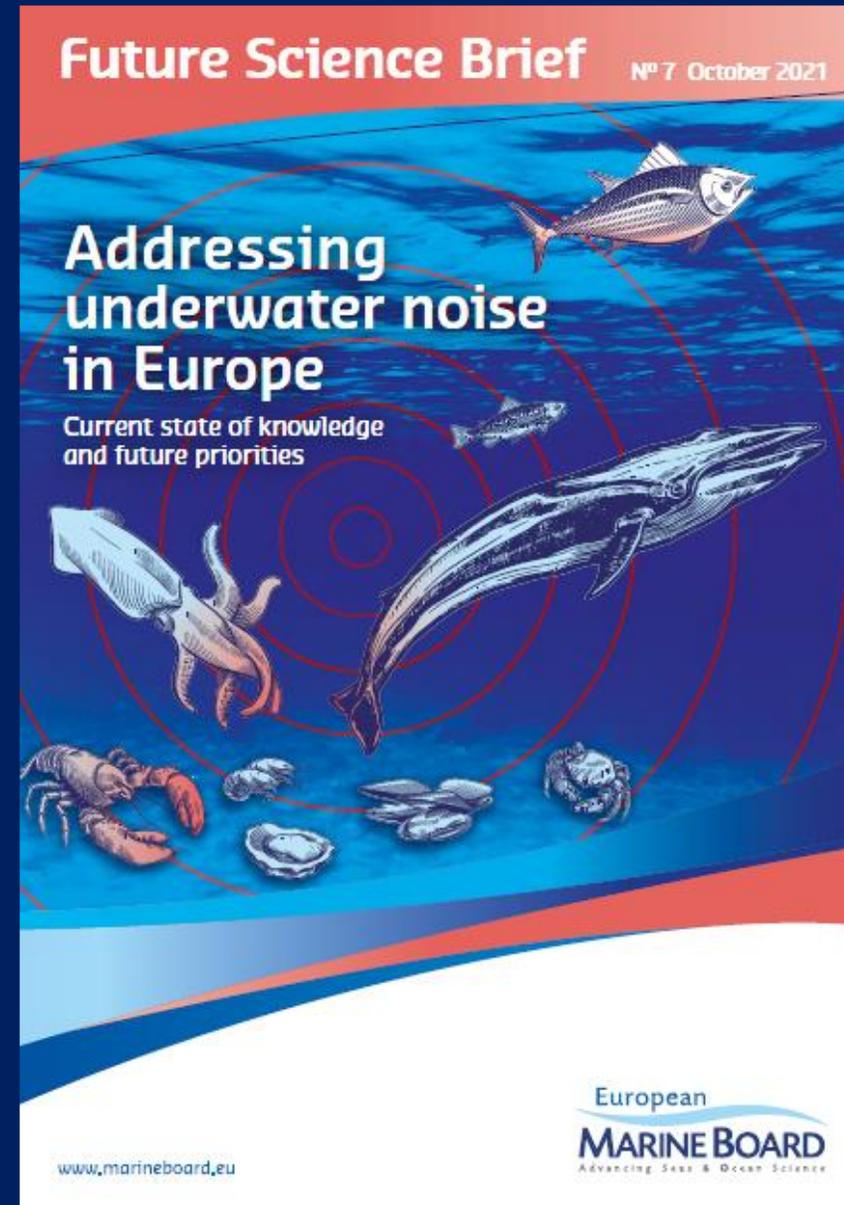


The (Dream) Team

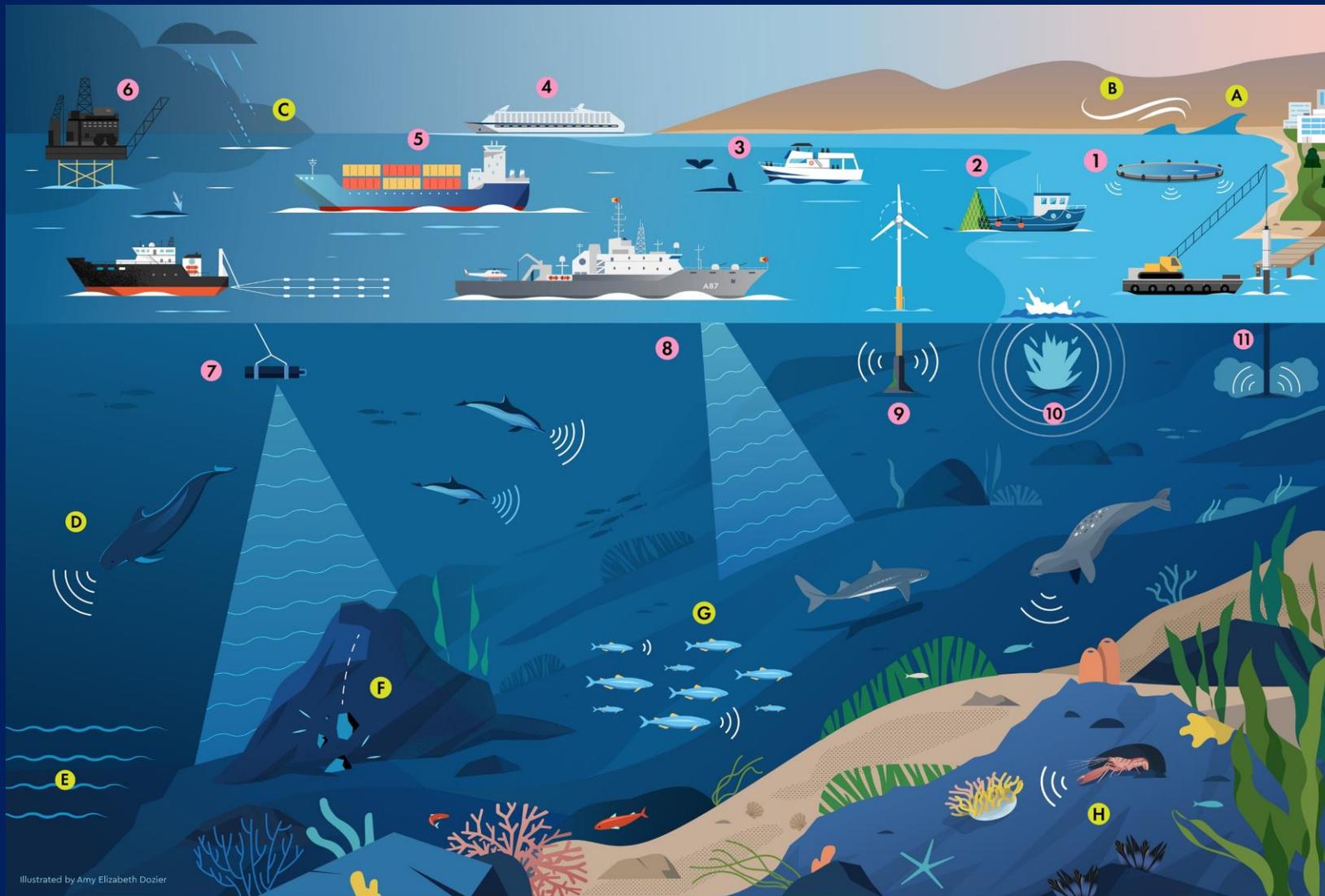
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<https://www.marineboard.eu/publications/addressing-underwater-noise-europe-current-state-knowledge-and-future-priorities>



Illustrated by Amy Elizabeth Dozier

TODAY'S OCEAN SOUNDSCAPE

European
MARINE BOARD
Advancing Seas & Ocean Science

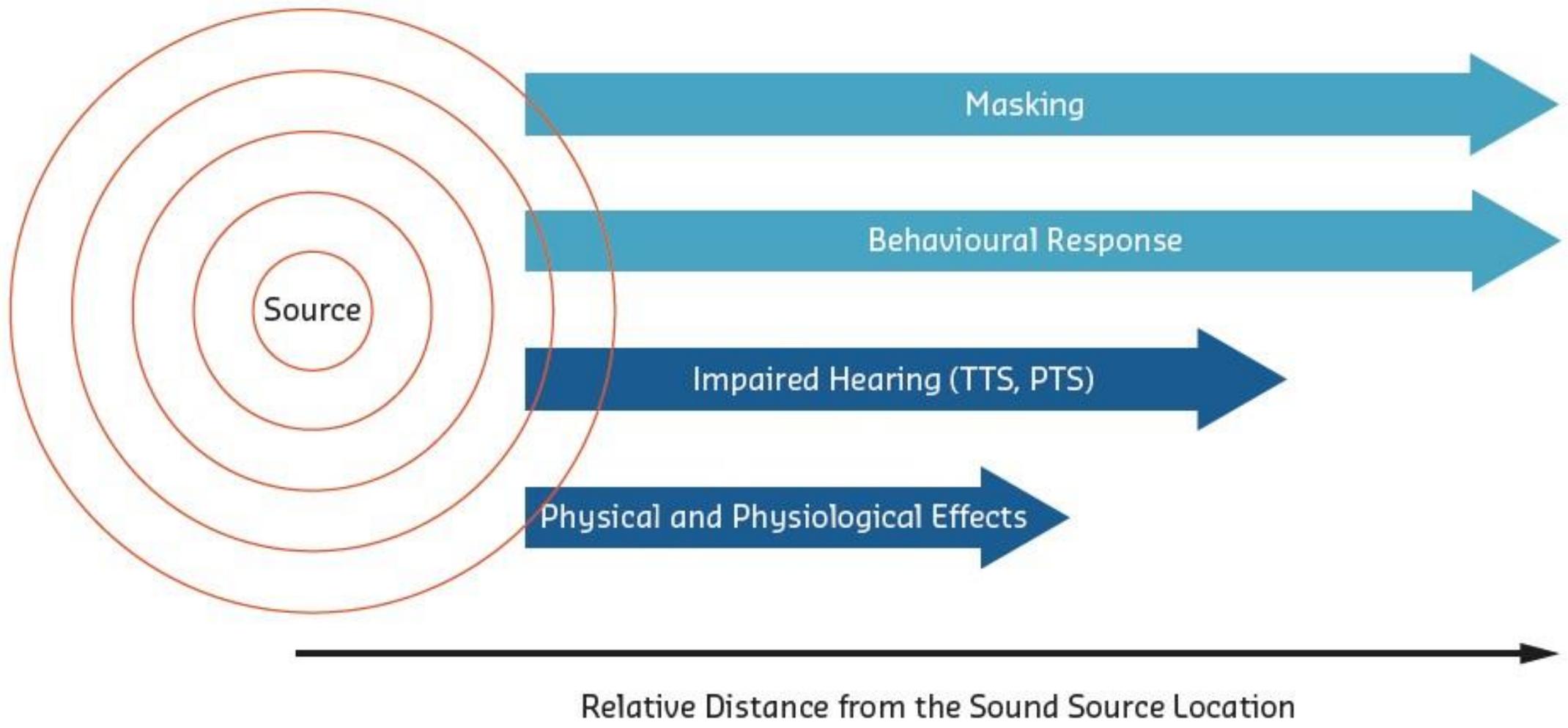
jonas
Joint Framework for Ocean
Noise in the Atlantic Seas

● ANTHROPOGENIC SOURCES

- | | |
|------------------------------|----------------------------------|
| 1 Acoustic deterrent devices | 7 Seismic airgun surveys |
| 2 Fishing vessels | 8 Military & civilian sonar |
| 3 Recreational vessels | 9 Offshore renewable energy |
| 4 Cruise ships | 10 Underwater explosions |
| 5 Commercial shipping | 11 Construction and pile-driving |
| 6 Offshore oil & gas | |

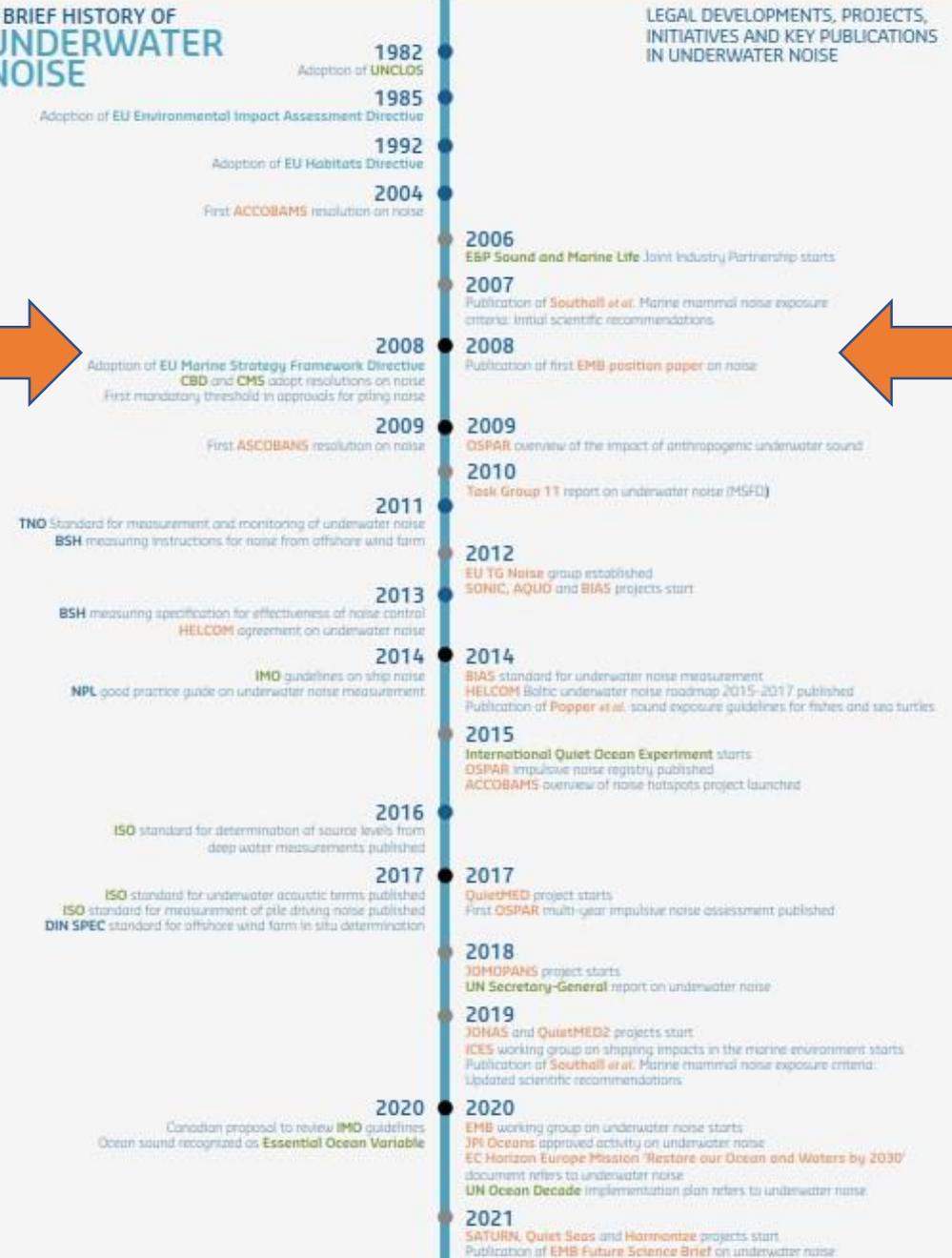
● NATURAL SOURCES

- | | |
|------------------|---|
| A Waves | F Underwater landslides, volcanos and earthquakes |
| B Wind | G Fishes |
| C Rain | H Invertebrates |
| D Marine mammals | |
| E Currents | |

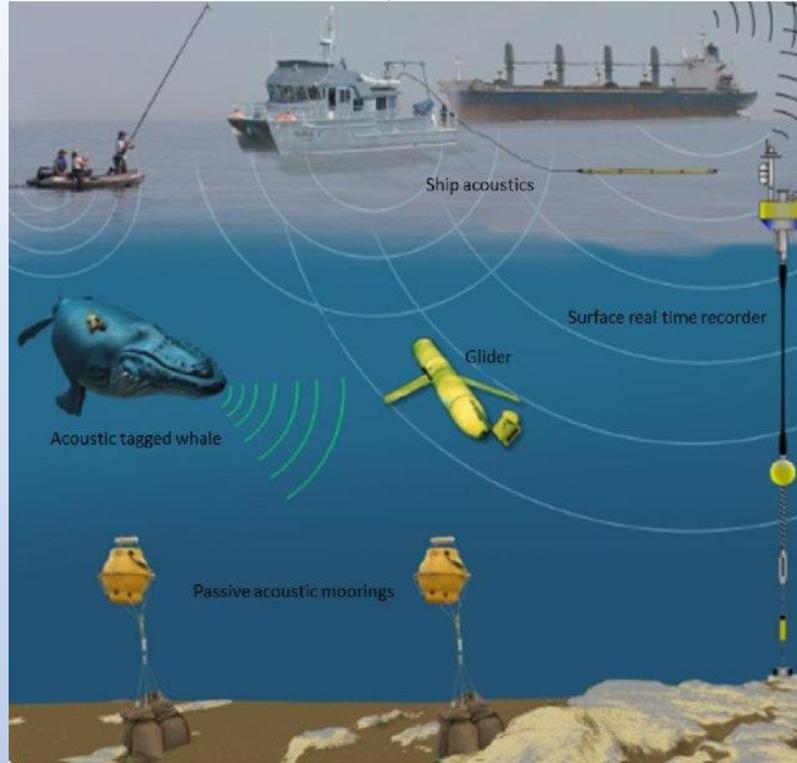


International, regional and national regulations and other drivers

A BRIEF HISTORY OF UNDERWATER NOISE

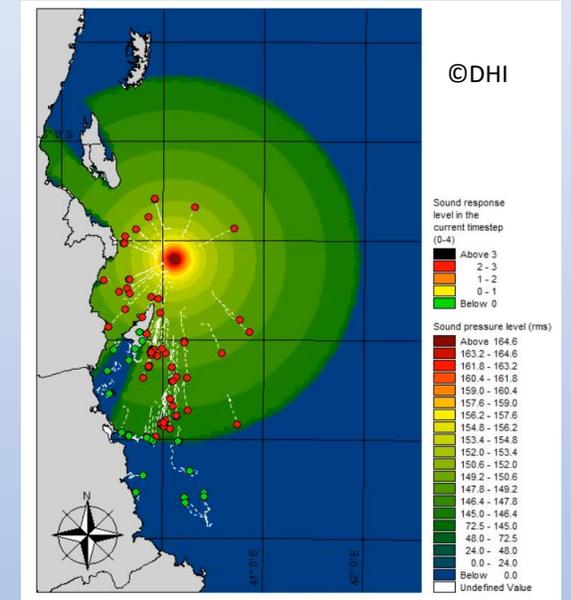


©Mike Thompson - NOAA/Stellwagen Bank National Marine Sanctuary.



Passive acoustic monitoring and wildlife tags

Animal movement models



Emerging technologies and methods



Remotely operated aerial monitoring (e.g. drones)

**EMB WG
recommended
actions
(chapter 6)**

- 1. Develop collaborative international standards applicable to all steps of the risk framework.**
- 2. Conduct comprehensive monitoring combined with spatial ecological modelling of marine species' dynamic habitat use, movements, behaviour and distribution to establish baselines.**
3. Foster comprehensive monitoring and data collection of current soundscapes/ambient noise, including via joint monitoring programmes in existing and new areas.
4. Shortlist high priority (and biologically relevant) sound sources and perform standardized source characterisation studies.

EMB WG recommended actions (chapter 6)

5. Promote hearing studies on baleen whales and on selected fish and invertebrate species.
6. Conduct field and modelling studies on changes in acoustic habitats to identify masking risks to communication in fishes and marine mammals.
7. **Conduct further studies on behavioural response of marine mammals and fishes due to exposure to high intensity impulsive sounds to assess population consequences via e.g., displacement.**
8. Conduct taxa-relevant studies on hearing impairment and physiological stress to address existing knowledge gaps in invertebrates, fishes and marine mammals. Priorities for marine mammals are understanding the relationship between Temporary- and Permanent Threshold Shift and physiological stress; priorities for fishes are stress; and priorities for invertebrates are a basic description of physiological impacts.
9. **Conduct dedicated studies including multi-species investigations, predator-prey interactions, and interaction with other food web levels, addressing the question of how noise impacts combine with other stressors.**
10. Develop frameworks and conduct studies to allow population-level assessment of effects from cumulative impact of noise and other pressures.

EMB WG recommended actions

11. Conduct dedicated modelling and field studies to improve understanding on effectiveness, safety and cost-effectiveness of noise mitigation devices, mitigation measures and management options.

12. Develop regional action plans and guidelines for Environmental Impact Assessment and policies.

13. Initiate international collaborative projects to develop stakeholder and societal capacity in understanding and addressing underwater noise.

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Thank you
for listening!

Addressing underwater noise in Europe

Current state of knowledge
and future priorities

