

RESOLUTION 7.13**ANTHROPOGENIC NOISE**

The Meeting of the Parties to the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area:

Recalling Resolutions 4.17 on “Guidelines to address the impact of anthropogenic noise on cetaceans in the ACCOBAMS Area”, 5.15 on “Addressing the impact of anthropogenic noise” and 6.17 on “Anthropogenic noise”,

Taking into consideration Recommendation 12.4 “Anthropogenic Noise” of the 12th ACCOBAMS Scientific Committee Meeting,

Recognizing that a large portion of the Mediterranean area is impacted by noise-producing human activities and that it is likely that such activities will increase,

Recognizing also that cetaceans and other marine mammals, reptiles and fish species, and their prey, are vulnerable to noise disturbance and subject to a range of human impacts,

Convinced that environmental impact assessment procedures should be carried out prior to projects that may affect cetaceans and especially those involving impulsive noise,

Recalling IMO Guidelines (MEPC.1/Circ.833) for the reduction of underwater noise from commercial shipping to address adverse impacts on marine life and taking note of the need for a full implementation of the guidelines by governments and the shipping industry,

Welcoming Directive 2014/52/EU of the European Parliament and of the Council, amending Directive 2011/92/EU on the Assessment of the Effects of Certain Public and Private Projects on the Environment,

Noting that the Marine Strategy Framework Directive of the European Union (MSFD) and its implementing act, requires that Member States in European Union marine waters take necessary measures by 2020 to achieve or maintain the good environmental status, which is established by each of them and in coordination at the European Union, regional and sub-regional levels, and which include underwater noise among the descriptors of such environmental status (Descriptor 11),

Also welcoming the Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (IMAP) of the Barcelona Convention, which includes candidate common indicators for underwater noise (Ecological Objective 11), with the intention for these candidate common indicators to be tested on an indicative basis as appropriate, prior to incorporating them into IMAP upon completion of its initial phase,

Further welcoming the work undertaken by ACCOBAMS during the triennium 2017-2019 regarding the management of noise-producing activities, more particularly:

- the QuietMed project, which aimed to improve the level of coherence and the comparability as regards Descriptor 11 (underwater noise) by enhancing cooperation among Mediterranean Sea Basin countries within the implementation of the second cycle of the EU Marine Strategy Framework Directive;
- the QuietMed2 project which aims to support the assessment of the extent to which Good Environmental Status has been achieved in the Mediterranean Region regarding underwater noise to get updated, improved and more complete regional assessments;
- the joint ACCOBAMS/ASCOBANS/CMS/ECS workshop entitled “Best Practice Workshop: Fostering inter-regional cooperation in underwater noise monitoring and impact assessment in waters around Europe, within the context of the European Marine Strategy Framework Directive”, which was held on 29th April 2017 in Middelfart, Denmark;
- the finalization of the ACCOBAMS MMO/PAM Courses for the standard MMO/PAMs training of all accredited “trainer” organizations, the accreditation of the three first “ACCOBAMS Highly Qualified MMOs/PAM operator” trainer organizations and the implementation of the first ACCOBAMS training for High Quality MMO/PAM Operator in Constanta, Romania, on 12-16 September 2018;
- the ACCOBAMS workshop on “sonars and cetaceans’ interactions” which aimed to improve dialogue and cooperation of national navies with ACCOBAMS, especially regarding military activities of navies (8 – 9 October 2019, Toulon, France);

Taking into consideration recommendations from the Second Meeting of the ACCOBAMS Follow-up Committee (Monaco, 5-6 March 2018) regarding underwater noise issue,

Conscious of the related work by the Convention on the Conservation of Migratory Species of Wild Animals (CMS), and *recalling* its related decisions, in particular Resolution 12.14 on Adverse Impacts of Anthropogenic Noise on Cetaceans and Other Migratory Species with the attached CMS Family Guidelines on Environmental Impact Assessment for Marine Noise-generating Activities,

Taking note of the IWC Resolution 2018-4 on Anthropogenic underwater noise,

Considering the recommendations developed during the workshop hosted by OceanCare and NRDC, in collaboration and with the support of the Deutsche Bundesstiftung Umwelt, on 22-23 November 2017 in Split, Croatia, for mitigating the impact of underwater noise on marine biodiversity in the South Eastern European waters of the Mediterranean Sea,

Recalling Article 236 of the United Nations Convention on the Law of the Sea, which states: “The provisions of this Convention regarding the protection and preservation of the marine environment do not apply to any warship, naval auxiliary, other vessels or aircraft owned or operated by a State and used, for the time being, only on government non-commercial service. However, each State shall ensure, by the adoption of appropriate measures not impairing operations or operational capabilities of such vessels or aircraft owned or operated by it, that such vessels or aircraft act in a manner consistent, so far as is reasonable and practicable, with the said Convention,”

1. *Reaffirms* that there is a need for ongoing and further internationally coordinated efforts, including research, addressing the impact of underwater noise in order to provide adequate protection to cetaceans;
2. *Invites* Parties and non-Parties to implement CMS Resolution 12.14 on Adverse Impacts of Anthropogenic Noise on Cetaceans and Other Migratory Species with the attached CMS Family Guidelines on Environmental Impact Assessment for Marine Noise-generating Activities;
3. *Invites* the ACCOBAMS Parties to take into consideration the revised Methodological Guide: "Guidance on underwater noise mitigation measures" (MOP7/2019/Doc31) in their future work in the ACCOBAMS Area;
4. *Requests* the Secretariat to implement the Action Plan resulting from the ACCOBAMS Workshop on "Sonars and Cetacean Interactions" ([Annex 1](#)) and to report on this issue during the Eighth Meeting of the ACCOBAMS Parties;
5. *Requests* Parties and non-Parties to ACCOBAMS to provide the Secretariat with a Point of Contact in their Navy in order to facilitate the implementation of the Action Plan from the ACCOBAMS workshop on " Sonars and Cetacean Interactions ";
6. *Adopts* the revised detailed Guidelines to address the impacts of anthropogenic noise on cetaceans in the ACCOBAMS Area that are presented in [Annex 2](#) to the present Resolution, and which include recommendations for both impulsive and continuous noise;
7. *Mandates* the Secretariat to disseminate the guidelines annexed to this Resolution to the Parties and to operators who are likely to produce underwater noise (e.g., seismic exploration industry, offshore windfarms);
8. *Encourages* Parties and operators to take these guidelines as a reference in conducting noise-producing activities;
9. *Strongly encourages* Parties and other authorities to undertake as soon as possible mitigation actions, such as ship speed reduction in some specific sensitive areas, as described in the revised detailed Guidelines to address the impacts of anthropogenic noise on cetaceans in the ACCOBAMS Area;
10. *Welcomes* the establishment of the ACCOBAMS regional register for impulsive noise sources in the ACCOBAMS area and *agrees* to support its management;
11. *Strongly encourages* Parties to contribute to the ACCOBAMS regional register for impulsive noise sources, especially by sharing their data, and *calls* the Parties for the development of a co-operation mechanism to identify the source of long-distance underwater noise in order to address its long-distance effects;
12. *Strongly encourages* Parties to collect more data and develop capacity building programs about noise;

13. *Stresses* the importance of:

- developing noise hotspot maps in the Black Sea during the 2020-2022 triennium;
- further developing with the Joint CMS/ACCOBAMS/ASCOBANS Working Group on Noise (JNWG) the concept of “quiet zones” as outlined in Recommendation 10.5 of the ACCOBAMS Scientific Committee with a focus on a quantitative elaboration and evaluation of the scientific evidence for establishing such areas both in space and time;

14. *Requests* the Permanent Secretariat:

- to inform Parties about the deliverables of the QuietMed and QuietMed2 projects on guidance for underwater noise monitoring and assessment, and to encourage Parties to make relevant stakeholders of the private sector become aware of these developments;
- to disseminate the results obtained from the establishment of an international register for impulsive noise sources in the ACCOBAMS area to Parties and relevant regional organisations, such as the RSC in the Agreement area;
- to support the implementation of monitoring programmes of underwater noise;
- to continue developing cooperation on noise issue, including capacity building, with other relevant international Organizations such as the CMS Family, the European Union, OSPAR, ICES, the Barcelona Convention, the Black Sea Commission, CBD, IWC, NATO, IMO, IUCN;

15. *Reiterates* the importance for Parties to grant, in priority, permits for industrial activities in their national area to industrial companies employing ACCOBAMS Highly Qualified MMOs/PAM operators;

16. *Encourages* Parties:

- to fully address the issue of anthropogenic noise in the marine environment, including cumulative effects, in the light of the best scientific information available and taking into consideration the applicable legislation of the Parties, particularly as regards the need for environmental impact assessments being undertaken before granting approval to proposed noise-producing activities;
- to integrate the issue of anthropogenic noise in management plans for marine protected areas;
- to avoid or minimize producing noise in marine protected areas, as well as in particular in areas containing critical habitat of cetaceans likely to be affected by man-made noise;

17. *Strongly urges* Parties to fully apply the precautionary approach and to envisage the appropriate mitigation measures, including a provision for expert review by specialists and a provision for the action to be taken if unusual events, such as atypical mass strandings, occur;

18. *Recommends* to the Permanent Secretariat and to the Scientific Committee to develop a project that overlays continuous noise mapping (including main shipping lanes and areas close to ports) and cetacean density mapping, to identify priority areas for mitigation, including consideration of the concept of ‘quiet zones’. This effort should also include ongoing initiatives on impulsive noise (e.g. areas targeted by seismic surveys or military exercises);

19. *Encourages* the Permanent Secretariat and any stakeholder active in the ACCOBAMS region to promote the “Tools ensuring Highly Qualified MMOs/PAM operators in the ACCOBAMS Area” to the private sector;

20. *Recommends* the Permanent Secretariat:

- to promote the undertaking of a project aimed at building a central repository (such as NETCCOBAMS), at the regional scale, as a tool to have an overview of monitoring programs using PAM techniques in marine protected areas and other area designated as important for cetaceans. The objective of this repository would be to monitor the number of PAM-based programs, the location and periods of execution, the objectives of the programs and target species and/or other environmental elements;
- to organise an expert workshop to examine the available PAM techniques and how they can be incorporated most effectively in the ACCOBAMS context with a view of fostering the implementation of PAM-based monitoring programs as a mean of contributing to conservation;

21. *Decides* that the present Resolution replaces the Resolution 4.17.

ANNEX 1

ACTION PLAN resulting from the ACCOBAMS Workshop on sonars and cetacean interactions

N°	Action	Pilot
Organisation		
1	Request the TG-Noise/MSCG ¹ chairs to share information on EU parties point of contact (POC)	ACCOBAMS Secretariat
2	Request MEDPOL Focal Points to share information on POC for non-EU Contracting Parties	ACCOBAMS Secretariat
3	Encourage Parties (Focal Points) to assign a POC in national navies by MOP7 using Resolution 6.17	ACCOBAMS Secretariat
4	Allow the ACCOBAMS secretariat to get in direct contact with navies' POC for the purpose of implementing the action plan	Parties
5	Allow the Secretariat to get into contact with NATO (working group)	Parties
6	Request the ACCOBAMS Secretariat, with the engagement of the Scientific Committee, to organize information/training/formation session of appropriate bodies in navies (planners and CO), also recalling final report of MOP6	Parties
Information Sharing		
7	Provide ACCOBAMS with clarification of the distinction between exercises and operations, for purposes of informing how impacts from naval sonar activities can be mitigated (consider more the activity rather than the area)	French Navy
8	Map/identify sonar exercise areas, including where major NATO exercises are carried out	ACCOBAMS Secretariat in coordination with navies
9	Produce an overview of sonar types	ACCOBAMS Secretariat in coordination with navies
10	Consider listing and prioritizing areas for avoiding or limiting active sonar use	ACCOBAMS SC
11	Provide navies with available practical information on cetacean distribution (map) and seasonality, in a way that is understandable by navy planners and crews	ACCOBAMS Secretariat
12	Improve knowledge on cetacean distribution and seasonality, particularly on beaked Whales and unsurveyed areas, and provide updated information to navy planners and crews	ACCOBAMS SC
13	Provide feedback to ACCOBAMS SC and Secretariat on how information on cetacean distribution and seasonality has been used in planning and mitigation of active sonar activities	Navies
14	Ask the appropriate scientific organisations in countries to establish cooperation (e.g., data collection) with ACCOBAMS SC	ACCOBAMS Secretariat
15	Collect data from appropriate bodies (e.g. CMRE ¹) on cetacean distribution	ACCOBAMS SC
16	Analyse data gaps pertaining to marine mammal conservation and request the	ACCOBAMS SC

¹ Marine Strategy Coordination Group

	ACCOBAMS SC to fill these gaps; priority should be given to areas planned for exercises	
17	Hold follow-up workshop(s), inclusive of additional navies and NATO, to aid in implementing the elements of this action plan	ACCOBAMS Secretariat, in coordination with navies
Protocols/Procedures		
18	Prioritize areas of high risk to beaked whales for spatial avoidance (following Bernaldo de Quiros et al. 2019)	ACCOBAMS Secretariat and SC, in coordination with Navies
19	Ask the navies to provide standing protocols they use, then synthesize and propose a global protocol	ACCOBAMS Secretariat with ACCOBAMS SC
20	Propose a pilot project to perform scientific surveys of the exercise areas before and after the exercise	ACCOBAMS SC
21	Propose sending gliders (with hydrophones) to monitor a proposed exercise area ahead of exercises in suitable beaked whale habitat to avoid beaked whales	Navies
22	Support permanent monitoring of areas used recurrently	Parties
23	Investigate how to transpose to sonar the best practices used by Germany's Sound Protection Concept (StUk3) for pile driving	ACCOBAMS SC
24	Ask the relevant bodies to provide guidelines they have already published (e.g. TG Noise)	ACCOBAMS Secretariat
25	Encourage national navies to make use of relevant guidelines (ACCOBAMS/CMS)	ACCOBAMS Secretariat
26	Explore the possibility of replacing the notion of "moratorium area" with that of "sensitive zone"	ACCOBAMS SC
27	Use information on cetacean distribution and seasonality provided by ACCOBAMS in planning and mitigating active sonar activities, and provide feedback to ACCOBAMS on actions taken to reduce impact of sonar on cetaceans	Navies
28	Give available information relating to use of sonar before, during and after exercises	Navies
29	Include risk assessment for marine mammals in the planning of major exercises or of regular sonar activity in an exercise area	Navies

ANNEX 2

GUIDELINES TO ADDRESS THE IMPACT OF ANTHROPOGENIC NOISE ON CETACEANS IN THE ACCOBAMS AREA

(Revisions highlighted in bold)

A. GENERAL GUIDELINES

Procedures should be practical in that they should use data that can be readily collected by cetacean observers, account for operating conditions and constraints, and, as far as possible, minimize disruption of operations while maximizing environmental protection.

Besides procedures for specific activities, the following guidelines and concepts should be taken into account for any activity:

- a) Consult databases of cetacean spatial and seasonal distribution and habitat databases so that activities can be planned and conducted to avoid critical habitats and when and where animals are unlikely to be encountered.
- b) Collect information and, if required, organize surveys (shipboard and/or aerial) or monitoring with fixed detectors (buoys, bottom recorders, etc.) to assess the population density in the areas chosen for operation.
- c) Avoid cetaceans' key habitats and marine protected areas, define appropriate buffer zones around them; consider the possible impact of long-range propagation.
- d) Closed areas should be avoided and surrounded by appropriate buffer zones.
- e) Consider cumulative impacts not just of noise but of all anthropogenic threats over time; consider effects modelling; include consideration of seasonal and historical impacts from other activities (shipping, military, industrial, other seismic) in the specific survey area and nearby region. For these purposes, databases/GIS that track the history of sonar/seismic and other industrial activities and anthropogenic threats **should be consulted: the best tool currently available meeting this need is the International Noise Register developed by ACCOBAMS which is aimed at centralising data on positions and periods of occurrence of human activities producing impulsive noise.**
- f) Model the generated sound field in relation with oceanographic features (depth/temperature profile, sound channels, water depth, seafloor characteristics) to assess the area possibly affected by relevant impacts.
- g) Determine safe / harmful exposure levels for various species, age classes, contexts, etc. This must be precautionary enough to handle large levels of uncertainty. When making extrapolations from other species, measures of uncertainty should quantify the chances of coming up with a wrong, and dangerous conclusion.
- h) There should be a scientific and precautionary basis for the exclusion zone (EZ) rather than an arbitrary and/or static designation; exclusion zones should be dynamically modelled based on the characteristic of the source (power and directionality), on the expected species, and on the local propagation

features (cylindrical vs spherical spreading, depth and type of sea bottom, local propagation paths related to thermal stratification). These EZ should be verified in the field.

- i) In the case of multiple EZ choices, the safest, most precautionary option should be adopted.
- j) Consider establishment of an expanded exclusion zone aimed at reducing behavioural disruption. This should be based on received levels much lower than those supposed to produce physiological and physical damage. Whenever possible, consider an expanded exclusion zone where exposure could be limited by reducing the emitted power (power-down) whilst maintaining acceptable operative capabilities.
- k) Cetacean mitigation guidelines should be adopted and publicized by all operators, whether military, industrial or academic.
- l) A system of automated logging of acoustic source use should be developed to document the amount of acoustic energy produced, and this information should be available to noise regulators and to the public.
- m) Mitigation should include monitoring and reporting protocols to provide information on the implemented procedures, on their effectiveness, and to provide datasets to be used for improving existing cetacean databases.
- n) During operations, existing stranding networks in the area should be alerted; if required, additional monitoring of the closest coasts and for deaths at sea should be organized.
- o) If required, organize post cruise survey to verify if changes in the population density or anomalous deaths occurred as a possible consequence of operations (this requires a knowledge of the area before any operation has occurred – see points a & b).
- p) In the case of strandings possibly related with the operations, any acoustic emission should be stopped, and maximum effort devoted to understanding the causes of the deaths.
- q) In the case of abnormal behaviours observed in animals close to the operations, any acoustic emission should be stopped, and maximum effort addressed at monitoring those animals.
- r) Trained and approved Cetaceans Observers (visual observers and/or acoustic operators where appropriate) should be employed for the monitoring and reporting program including overseeing implemented mitigation rules.
- s) Cetacean observers and bio-acousticians in charge of the monitoring program must be qualified, dedicated and experienced, with suitable equipment. **To this end, ACCOBAMS has developed a certification system for Highly Qualified MMO and PAM operators. The goal of this certification is to guarantee, throughout the Agreement area, a high-quality standardized training of MMOs and PAM operators thanks to:**
 - a. **The high-quality training of MMOs and PAM operators,**
 - b. **The standardization of training content,**
 - c. **The standardization and quality of the data collected,****More information on this certification system is available by the ACCOBAMS Permanent Secretariat.**
- t) Marine mammal observers should report to the National Focal Point **and** the ACCOBAMS Secretariat using a standardized reporting protocol. **This reporting protocol has been developed in the framework of the certification system for Highly Qualified MMO and PAM operators.** Any unexpected condition and/or change in applied protocols should be discussed with the Secretariat in collaboration with the Scientific Committee.
- u) Accurate reporting is required to verify the **Environmental Impact Assessment (EIA)** hypotheses and the effectiveness of mitigation.

- v) Procedures and protocols should be based on a conservative approach that reflects levels of uncertainty. They should include mechanisms that create an incentive for good practice.
- w) Take a precautionary approach every time uncertainties emerge; in the case of unexpected events or uncertainties refer to the National Focal Point.
- x) **Detailed data on the execution of the activities emitting impulsive noise should be reported to the International Noise Register developed by ACCOBAMS, especially the following: geographical position, start and end dates, source description, source level, frequency band.**
- y) **Procedures for reporting impulsive noise data to the International Noise Register developed by ACCOBAMS should follow national instructions related to Descriptor 11 of the Marine Strategy Framework Directive of the European Union, or Ecological Objective 11 of the Ecosystem-Approach being implemented by the Barcelona Convention.**

B. GUIDELINES FOR (MILITARY SONAR AND CIVIL) HIGH POWER SONAR

For sonar operations the following guidelines and key concepts should apply in addition to the general guidelines. **Guidelines concerning MMOs and PAM operators refer, as far as possible, to the high-quality standards defined in the certification system for Highly Qualified MMO and PAM operators developed by ACCOBAMS. Reporting of sonar activities to the International Noise Register should follow national instructions related to Descriptor 11 of the Marine Strategy Framework Directive of the European Union or to the corresponding Ecological Objective 11 of the Ecosystem-Approach process being implemented by the Barcelona Convention.**

- a) Sonar surveys should be planned so as to avoid key cetacean habitat and areas of cetacean density, so that entire habitats or migration paths are not blocked, so that cumulative sonar sound is limited within any particular area, and so that multiple vessels operating in the same or nearby areas at the same time are prohibited.
- b) Use of the lowest practicable source power.
- c) Adapt the sequencing of sonar lines to account for any predictable movements of animals across the survey area and avoid blocking escape routes.
- d) Continuous visual and passive acoustic monitoring (PAM) with a specialized team of cetaceans observers and bio-acousticians to ensure that cetaceans are not in the “exclusion zone” before turning on the acoustic sources and while sources are active.
- e) Equipment for visual monitoring should include suitable binoculars, including big eyes, to be used according to the monitoring protocol.
- f) High power sources should be restricted at night, during other periods of low visibility, and during significant surface-ducting conditions, since current mitigation techniques may be inadequate to detect and localize cetaceans. Because of the impact of adverse weather conditions on the visual detection of mammals, emission during unfavourable conditions should be restricted as well.
- g) Passive acoustic monitoring (PAM) (towed array technology or other suitable technologies with enough bandwidth to be sensitive to the whole frequency range of cetaceans expected in the area) should be used to improve detection capabilities. PAM should be mandatory for night operations or when visibility is poor. However, PAM may be inadequate mitigation for night operations if cetaceans in the area are not vocal or easily heard.
- h) At least two dedicated Cetacean Observers should be on watch at every time on every operative ship; organize shifts to allow enough rotation and resting periods to MMOs. In case of acoustic monitoring, at least one operator should be on watch and shifts should be organized to allow 24/24h operation, unless automatic detection/alerting systems with proven effectiveness are available.
- i) Before beginning any emission there should be a dedicated watch of at least 30 minutes to ensure no animals are within the EZ.
- j) Extra mitigation measures should be applied in deep water areas if beaked whales have been seen diving on the vessel trackline or if habitats suitable for beaked whales are approached: in such cases, the watch should be prolonged to 120 minutes to increase the probability that deep-diving species are detected (e.g. Cuvier’s beaked whales). Ideally, however, sonar exercises should not be done in areas that beaked whales are known to inhabit.
- k) Every time sources are turned on, there should be a slow increase of acoustic power (ramp-up or soft start) to allow cetaceans sufficient opportunity to leave the ensonified area in the event that visual and

passive searches are unsuccessful. Ramp-up should be at least 30 minutes (the effectiveness of this procedure is still debatable).

- l) The beginning of emissions should be delayed if cetacean species are observed within the exclusion zone (EZ) or approaching it. Ramp-up may not begin until 30 minutes after the animals are seen to leave the EZ or 30 minutes after they are last seen (120 minutes in case of beaked whales).
- m) Avoid exposing animals to harmful acoustic levels by preventing them from entering into the EZ, by changing the ship course, if applicable, or by reducing (power-down) or ceasing (shut-down) the acoustic emissions.
- n) Shut-down of source(s) whenever a cetacean is seen to enter the EZ and whenever aggregations of vulnerable species (such as beaked whales and sperm whales) are detected anywhere within the monitoring area.

C. GUIDELINES FOR SEISMIC SURVEYS AND AIRGUN USES

Guidelines for mitigating the effects of seismic surveys have been **first** experimented in the context of academic seismic surveys conducted under NMFS permits. **Since then the diffusion of such guidelines and their adoption during commercial hydrocarbon exploration has not ceased to increase.** Most of the following guidelines are equivalent to those required for sonar operations and should apply in addition to general guidelines. **Guidelines concerning MMOs and PAM operators always refers to the high-quality standards defined in the certification system for Highly Qualified MMO and PAM operators developed by ACCOBAMS. Reporting of seismic surveys and airgun uses to the International Noise Register should follow national instructions related to Descriptor 11 of the Marine Strategy Framework Directive of the European Union or to the corresponding Ecological Objective 11 of the Ecosystem-Approach process being implemented by the Barcelona Convention.**

- a) Seismic surveys should be planned so as to avoid key cetacean habitat and areas of cetacean density, so that entire habitats or migration paths are not blocked, so that cumulative seismic noise is limited within any particular area, and so that multiple vessels operating in the same or nearby areas at the same time are specifically regulated or prohibited.
- b) Use of the lowest practicable source power.
- c) Limit horizontal propagation by adopting suitable array configurations and pulse synchronization and eliminating unnecessary high frequencies.
- d) Adapt the sequencing of seismic lines to account for any predictable movements of animals across the survey area and avoid blocking escape routes.
- e) Modelling of the generated sound field in relation with oceanographic features (depth/temperature profile, water depth, seafloor characteristics) to dynamically set the Exclusion Zone. Confirm models by EZ tests in the field.
- f) Mitigation procedures should be practical in that they should use data that can be readily collected by cetacean observers during offshore operations, account for operating conditions and constraints of seismic surveys and, as far as possible, minimize disruption of surveys while maximizing environmental protection.
- g) Continuous visual and passive acoustic monitoring (PAM) with a specialized team of cetacean observers and bio-acousticians to ensure that cetaceans are not in the Exclusion Zone before turning on the acoustic sources and while sources are active.

- h)** Equipment for visual monitoring should include suitable binoculars and big eyes to be used according to the monitoring protocol.
- i)** Ideally, high power airgun configurations should be prohibited at night, during other periods of low visibility, and during significant surface-ducting conditions, since current mitigation techniques may be inadequate to detect and localize cetaceans. Because of the impact of adverse weather conditions on the visual detection of mammals, emissions during unfavourable conditions should be restricted as well.
- j)** Passive acoustic monitoring (PAM) (towed array technology or other suitable technologies with enough bandwidth to be sensitive to the whole frequency range of cetaceans expected in the area) should be used to improve detection capabilities. PAM should be mandatory for night operations or when visibility is scarce. However, PAM may be inadequate mitigation for night operations if cetaceans in the area are not vocal or easily heard.
- k)** At least two dedicated Cetacean Observers should be on watch at one time on every operative ship; shifts should be organized to allow enough rotation and resting periods to MMOs. In the case of acoustic monitoring, at least one operator should be on watch and shifts should be organized to allow 24/24h operation., unless automatic detection/alerting systems with proven effectiveness are available.
- l)** Before beginning any emission there should be a dedicated watch of at least 30 minutes to ensure no animals are within the EZ.
- m)** Extra mitigation measures should be applied in deep water areas if beaked whales have been seen diving on the vessel trackline or if habitats suitable for beaked whales are approached: in such a cases the watch should be at least 120 minutes to increase the probability that deep-diving species are detected (e.g. Cuvier's beaked whales).
- n)** Every time sources are turned on, there should be a slow increase of acoustic power (ramp-up or soft start) to allow cetaceans sufficient opportunity to leave the ensonified area in the event that visual and passive searches are unsuccessful (the effectiveness of this procedure is still debatable).
- o)** The beginning of emissions should be delayed if cetacean species are observed within the exclusion zone (EZ) or approaching it. Ramp-up may not begin until 30 minutes after the animals are seen to leave the EZ or 30 minutes after they are last seen (120 minutes in case of beaked whales).
- p)** Exposing animals to harmful acoustic levels should be avoided by preventing them from entering the EZ, by changing the ship course, if applicable, or by reducing (power-down) or ceasing (shut-down) the acoustic emissions.
- q)** There should be a shut-down of source(s) whenever a cetacean is seen to enter the EZ and whenever aggregations of vulnerable species (such as beaked whales) are detected anywhere within the monitoring area.
- r)** If more than one seismic survey vessel is operating in the same area, they should maintain a minimum separation distance to allow escape routes between sound fields.
- s)** Data sharing among surveyors should be encouraged to minimize duplicate surveying. Also, if old seismic data can be usefully re-analyzed using new signal processing or analysis techniques, this should be encouraged.

D. GUIDELINES FOR COASTAL AND OFFSHORE CONSTRUCTION WORKS

Coastal and offshore construction works, which may include demolition of existent structures, may produce high noise levels, even for prolonged periods, depending on the technologies used and on local propagation features that include propagation through the substrate.

Construction works on the coast or on the shoreline, including harbours, may propagate noise (e.g. from pile drivers and jack hammers) over wide areas in particular where the substrate is rocky. Traditional percussive pile-driving produces vibrations that propagate far and can ensonify large marine areas at distances of more than 100km; in such conditions alternative technologies should be used. **Updated information on the available mitigation technologies is maintained by the ACCOBAMS Secretariat.**

In the case of prolonged activities, such as construction works of large structures, a scheduling of the most noisy activities could be evaluated as a measure to avoid continuous exposures especially during critical periods for cetaceans living or transiting in the area; the concentration of noisy operations in short periods of time and alternative construction technologies should be also evaluated to minimize noise impacts.

Guidelines concerning MMOs and PAM operators always refers to the high-quality standards defined in the certification system for Highly Qualified MMO and PAM operators developed by ACCOBAMS. Reporting of coastal and offshore construction works to the International Noise Register should follow national instructions related to Descriptor 11 of the Marine Strategy Framework Directive of the European Union or to the corresponding Ecological Objective 11 of the Ecosystem-Approach process being implemented by the Barcelona Convention.

- a) Modelling of the generated sound field in relation to geological and oceanographic features (depth/temperature profile, water depth, coastal and seafloor characteristics) should occur, in addition to verification in the field; the area where animals could receive harmful noise levels (Exclusion Zone) should be defined.
- b) Noise producing activities should be scheduled according to the presence of cetaceans, if seasonal.
- c) Alternative technologies should be used or countermeasures to reduce noise diffusion, i.e. bubble curtains should be adopted.
- d) Noise monitoring stations at given distances from the source area should be set up to monitor for both local and long-range noise levels and verify if predicted levels are reached or not.
- e) Visual observation points/platforms to monitor for the presence and behaviour of cetaceans should be set up.
- f) Before beginning any noise producing action there should be a dedicated watch of at least 30 minutes to ensure no animals are within the EZ.
- g) In areas where water depths in the EZ exceed 200m the watch should be at least 120 minutes to increase the probability that deep-diving species are detected.

It is also important to consider the noise that will be generated by the structures once they are operative. Bridges propagate vibrations related to the traffic; offshore windfarms and oil extraction platforms produce their own noise and thus their environmental impact should be carefully evaluated and mitigated with dedicated rules.

E. GUIDELINES FOR OFFSHORE PLATFORMS

Offshore platforms may be used for a variety of different activities, such as seafloor drilling, oil/gas extraction, electricity production (windfarms), each one with its own particular impacts on the marine environment. Their placement should be carefully regulated; if their impacts include noise, they should be required to undergo a specific implementation of monitoring and mitigation procedures to be defined on a case by case basis and separately for the construction phase and for the operative life. The growing number of windfarms in coastal areas may have an impact on cetaceans, in particular because of the noise they make. They should be designed and operated to produce the lowest possible noise in all activity phases.

F. GUIDELINES FOR PLAYBACK & SOUND EXPOSURE EXPERIMENTS

Playback and Controlled Exposure Experiments (CEEs) are experiments in which animals in the wild are exposed to controlled doses of sound for the purposes of assessing their behavioural or physiological responses. CEEs are one of several methods that have historically been and are increasingly being applied to the study of cetacean behavioural responses to sound. These approaches can complement opportunistic observations or the tagging of animals around noise-producing activities. CEEs (which include some recent experiments under the generic heading of Behavioural Response Studies (BRS)), are designed to introduce small amounts of additional sound into the ocean in order to scientifically determine responses and assess the potential risk from human activities. However, playbacks may carry some risks themselves to target individuals and potentially expose not only the target species and/or individuals to be studied, but also additional ones. These considerations need to be carefully addressed through precautionary protocols in the execution of CEEs and the possible risks should be balanced against the potential for these studies to provide answers to management and/or scientific questions on a case by case basis.

Given that some CEEs can be controversial, and because of the known underlying concerns, it is particularly important that they are carefully designed and carefully conducted and their limitations and risks acknowledged. In order to achieve optimal scientific and conservation value, those involved in conducting, funding and managing large-scale CEE experiments should strive for international cooperation, coordination and very transparent information exchange and where possible joint programmes of work. Avoidance of duplicative or overlapping research will also help to prevent any unnecessary introduction of noise into the marine environment.

Controlled Exposure Experiments typically strive to use, without exceeding harmful levels, sound exposures that are as realistic as possible (relative to known human sound sources), but with the capability of close control over the type and nature of exposures. Many CEEs are designed to minimize the exposure required to elicit a detectable response. Opportunistic studies, on the other hand, involve actual sound sources and, thus, more realistic exposures, though the lack of experimental control in some circumstances can limit the power of resulting observations.

Both kinds of studies must include (or be preceded) by baseline studies of behaviour and physiology so that the results of the experiments are meaningful and can be properly interpreted. . To increase the utility of the results to regulatory decision-making, researchers conducting CEEs should openly communicate the design, procedures, and results of such studies to policymakers.

As with all biological research, methods that can yield conclusive results with less risk of harm to the animals should be preferred. Systematic observations using ongoing sound-producing activities should be used in place of CEEs if they can provide similar information with similar power to detect effects. It is noted, however, that the lack of experimental control over sources in opportunistic contexts, as well as the safety and/or national security considerations inherent in some situations can significantly limit their value in many real-world applications. Systematic studies of ongoing sound-producing activities can validate and strengthen monitoring efforts required as mitigation and have the benefit that such studies do not introduce additional sound directed at the mammals. The advantages of both observational and experimental studies are increased as more attention is given to optimizing measurement methods and study designs with the greatest power to detect real effects and provide convincing results. In practice, research investigating the impacts of large sound sources could be most successful when using a suite of approaches including observations of both controlled and uncontrolled sound exposures. Therefore, controlled experiments and opportunistic observations are usually best seen not as alternatives, but rather as complementary approaches that yield the most powerful results when both are conducted.

Sound exposure experiments require an explicit protocol to manage possible interactions among the sound source(s) and the target(s); in general, while designing and conducting such experiments, these guidelines should be taken into consideration:

- a)** use sound exposures that are as realistic as possible (while minimizing exposure required to detect responses) and with the same or similar characteristics of sound that the mammals are likely to be exposed to.
- b)** model sound propagation from the source to the targets based on local oceanographic features and background noise information.
- c)** use available technologies to monitor both target and non-target animals; monitor other individuals and species – which may require different methods but may provide additional information.
- d)** design experiments so that monitored animals are those exposed to highest levels.
- e)** halt sound emission if adverse response or behavioural changes are observed on either target or non-target animals.
- f)** limit repeated exposures on the same target(s) unless required by the research protocol.
- g)** avoid enclosed areas, avoid blocking escape routes.
- h)** avoid “chasing” animals during playbacks; if they move away -- don’t modify the course to follow them with the playback source.
- i)** exposures that are expected to elicit particular behavioural responses (e.g., responses elicited by predator sounds, conspecific signals) may be particularly useful control stimuli in CEEs; however, such exposures should be used only as necessary as part of a careful experimental paradigm that includes specific mitigation and monitoring protocols. In such cases, it is important to consider that the response may not be related to the loudness of the exposure but to the behavioural significance of the signal used.

G. GUIDELINES FOR SHIPPING

The international community recognizes that underwater-radiated noise from commercial ships may have both short and long-term negative consequences on marine life, especially marine mammals. Guidelines for shipping, developed by IMO/ASCOBANS working group in 2014 and available online (*Guidelines for the Reduction of Underwater Noise from Commercial Shipping to Address Adverse Impacts on Marine Life*, IMO/ASCOBANS 2014 Circ.833), consider common technologies and measures that may be relevant for most sectors of the commercial shipping industry and can be applied to any commercial ship. A successful strategy to reduce radiated noise should consider interactions and contributions from measures provided to achieve other objectives such as reduction of onboard noise and improvements in energy efficiency. These Guidelines do not address the introduction of noise from naval and war ships and the deliberate introduction of noise for other purposes such as sonar or seismic activities.

For commercial shipping, the following guidelines and key concepts should apply in addition to the general guidelines:

- a) Underwater noise computational models may be useful for both new and existing ships in understanding what reductions might be achievable for certain changes in design or operational behaviour.
- b) Underwater noise should be measured to an objective standard for any meaningful improvements: ISO/PAS 17208-1, ISO/DIS 16554. Several research ships have been designed using the noise specification, designed for fishery research ships, proposed by the International Council for the Exploration of the Sea (ICES) Cooperative Research Report No.209 (CRR 209). Other underwater noise rating criteria are available and may prove useful as guidance.
- c) The optimal underwater noise mitigation strategy for any ship should at least consider all relevant noise sources.
- d) The largest opportunities for reduction of underwater noise will be during the initial design of the ship. For existing ships, it is unlikely to be practical to meet the underwater noise performance achievable by new designs. For effective reduction of underwater noise, hull and propeller design should be adapted to each other. Propellers should be designed and selected in order to reduce cavitation, the ship hull form with its appendages should be designed such that the wake field is as homogeneous as possible. Consideration can be given to the investigation of structural optimization to reduce the excitation response and the transmission of structure-borne noise to the hull.
- e) Consideration should be given to the selection of onboard machinery along with appropriate vibration control measures, proper location of equipment in the hull, and optimization of foundation structures that may contribute to reducing underwater radiated and onboard noise.
- f) In addition to their use for new ships, the following technologies are known to contribute to noise reduction for existing ships: design and installation of new state-of-the-art propellers, installation of wake conditioning devices and installation of air injection to propeller (e.g. in ballast condition).
- g) Although the main components of underwater noise are generated from the ship design (i.e. hull form, propeller, the interaction of the hull and propeller, and machinery configuration), operational modifications and maintenance measures should be considered as ways of reducing noise for both new and existing ships. These include, among others: propeller cleaning,

underwater hull surface, selection of ship speed, rerouting and operational decisions to reduce adverse impacts on marine life.

- h) **When efforts have been made to mitigate underwater noise, as far as reasonable and practical, evaluation should be undertaken to determine the success or otherwise of ship noise reduction efforts and to guide and enhance future activities at noise reduction. Such evaluation can include forms of radiated-noise measurements, simulations or other ways of data gathering.**
- i) Noise from ships should be evaluated both at close range for its direct possible effects on local marine life and at long-range for the contribute to background noise at low frequencies. It is still difficult to say how much the radiated noise should be reduced to get visible effects. However, noise reduction should be evaluated in order to reduce both local and long-range effects (see quieting technologies).
- j) **Designers, shipbuilders, and ship operators are encouraged to also consider technologies and operational measures not included in these Guidelines, which may be more appropriate for specific applications.**

H. GUIDELINES FOR OTHER MITIGATION CASES

Any activity that produces noise levels that may pose risks to cetaceans requires attention and the implementation of monitoring and mitigation procedures. Some of the cases reported in this chapter (touristic boats and whale watching) may not produce physical injuries; however, they contribute to the underwater noise and may have a significant impact on the behaviour and welfare of the animals, and, in the long term, a negative effect on the local population. At least in sensitive areas these should be taken under control and eventually limited.

Touristic boats

Tourist traffic in some areas is becoming a serious problem; noise irradiated by engines and propellers is an important component of the disturbance to animals.

Tourist boats should avoid approaching dolphins and dolphins schools, as well as larger cetaceans, and especially if calves are present. Specific guidelines are already available (**please refer to code of conduct of the ACCOBAMS HQWW[®] Certificate**) and their distribution should be supported as much as possible.

In case of sensitive habitats and marine protected areas, the relevant authorities should severely restrict the use of tourist motorboats and eventually encourage the use quieter electric engine boats.

Boats should be as quiet as possible and noise controls should be made at the beginning of every field season. Noise limits should be set to reduce the behavioural disturbance to animals as much as possible.

Whale watching

Whale watching is a **commercial tourism activity through which people observe whales and dolphins in their natural environment from a boat. This activity** is increasing every year and that may have an impact on cetacean populations, stocks, and individuals. Rules and permits are already in force in many countries,

but the noise issue is seldom taken into consideration. Noise irradiated by engines and propellers is an important component of the disturbance to animals. Beyond complying with national rules and restrictions, whale watching operators should also comply with noise emission restrictions.

Boats should be as quiet as possible and noise controls should be made at the beginning of every field season. Noise limits should be set to reduce the behavioural disturbance to animals as much as possible.

Created in 2014 to supervise an expanding tourism activity and guide volunteer operators, the High-Quality Whale-Watching® (HQWW) certificate is an ACCOBAMS trademark jointly developed with the Pelagos Sanctuary. This certification, created to frame and harmonize whale watching activity, have an international dimension with a naturalist approach: the label guarantees a whale and dolphin approach respectful of the code of good conduct for the observation of Mediterranean cetaceans. Any certified operator can provide educational information acquired during his formation. Finally, in the framework of responsible ethics certified operators commit to waste sorting on-board their vessels. Each of the member countries should mandate a private or public structure to animate the certification on its territory.

Explosive disposal of residual war weapons, use of explosives for testing or for decommissioning structures

In many areas of the Mediterranean Sea the detonation of residual war weapons is a recurrent activity that needs special care; also, explosives are used widely for offshore decommissioning of structures and for military trials, e.g. for testing ships and submarines.

In all such cases, the definition of an Exclusion Zone is required, based on the power of the expected explosion(s) and on the oceanographic features; consequently, the EZ area should be monitored to be sure no animals are inside. The watch before starting operations should be at least 30 min, it should be prolonged to 120 minutes in areas where deep divers could be present. Additional measures could include the use of absorbing materials, e.g. bubble curtains that are proven to attenuate the shock wave or at least to dampen the shock wave onset. The use of aversive sound devices to remove animals from the danger area for the relatively short period of blasting holds great promise for mitigation. However, further studies to develop and test such devices with the range of species of interest would be required before these could be relied on for mitigation.

Underwater acoustically active devices

Underwater acoustics is an expanding field and new acoustic technologies are continuously developed, tested and applied for a variety of uses, e.g. for searching/monitoring/exploiting environmental resources, for conducting scientific research, and for military purposes.

Examples of activities that may require a permit include: oceanographic experiments based on the use of high power acoustic sources, including the use of acoustic positioning devices, the use of deterrent devices (Pingers, Acoustic Deterrent Devices, and Acoustic Harassment Devices, in particular if used in array configurations), e.g. to protect commercial fisheries or to protect industrial water intakes (cooling systems).

In all cases where high noise levels are expected in areas with the potential presence of cetaceans, at least the following guidelines should apply:

- a)** There should be modelling of the generated sound field in relation to oceanographic features (depth/temperature profile, water depth, coastal and seafloor characteristics) and verification in the field; the area where animals could receive harmful noise levels (Exclusion Zone) should be defined.
- b)** Activities should be planned for areas with low cetacean densities, avoiding wherever possible sensitive species, such as beaked whales, and sensitive habitats (e.g. breeding areas, nursing areas, etc.).
- c)** Noise producing activities should be scheduled according to the presence/absence of cetaceans, if seasonal.
- d)** Noise monitoring stations should be set up to monitor for both local and long-range noise levels and verify if predicted levels are reached or not.
- e)** Visual observation points or mobile platforms should be set up to monitor for the presence and behaviour of cetaceans.
- f)** PAM stations or mobile platforms should be setup to monitor for the presence and behaviour of cetaceans.
- g)** Before beginning any noise producing action there should be a dedicated watch of at least 30 minutes to ensure no animals are within the EZ.
- h)** In areas where water depths in the EZ exceed 200m the watch should be at least 120 minutes to increase the probability that deep-diving species are detected.

ⁱ Centre for Maritime Research and Experimentation