



REPORT OF THE WORKSHOP

“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”



held at 31st ECS Conference, Middelfart, Denmark, 29th April 2017



This document has been prepared thanks to financial support from the Principality of Monaco but cannot, in any way, reflect the position of the Government.

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“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”

31st ECS Conference (29th April 2017, Middelfart, Denmark)

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INTRODUCTION

The 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” was held on Saturday 29th April 2017 in Middelfart, Denmark.

This joint ACCOBAMS/ASCOBANS/CMS/ECS workshop was financially supported by:

- ACCOBAMS through a Voluntary Contribution from the Principality of Monaco,
- ASCOBANS,
- ECS,
- The Regional Activity Centre for Specially Protected Areas (RAC/SPA -MAP-UNEP) who supported the participation of experts from South Mediterranean Countries.

The workshop consisted of two parts:

- ACCOBAMS and ASCOBANS Secretariats were leading on the first part of this workshop with the objective of (i) gathering information about impulsive noise registers in EU countries and Mediterranean border countries, and (ii) debating the standardisation of registers in order to promote inter-regional cooperation for noise registers.
- The second part was led by Natacha AGUILAR and Peter EVANS. Perspectives for improving Descriptor 11 of the Marine Strategy Framework Directive were discussed by gathering expert opinion on potential improvements of monitoring methods used by countries and/or defined by the MSFD.

The agenda of the workshop appears in [Annex 1](#) of the report.

Forty-three attendees from more than 15 different Countries participated to the workshop.

The list of participants can be found in [Annex 2](#) of the report.

PART I - STRENGTHENING COOPERATION BETWEEN REGIONAL IMPULSIVE NOISE REGISTERS EXISTING FOR COUNTRIES BORDERING THE SEAS AROUND EUROPE

1) Definitions of impulsive noise and registers

Jakob Tougaard introduced the work in TSG-Noise and the Regional Sea conventions towards GES on underwater noise.

The Marine Strategy Framework Directive (MSFD) sets the overall framework for obtaining good environmental status (GES) with respect to underwater noise in European marine waters. Furthermore, it specifically states that monitoring and assessment of GES should be coordinated at the level of the regional seas of EU (the Baltic Sea, North-east Atlantic (incl. the North Sea), the Mediterranean Sea and the Black Sea). This focus almost automatically puts the corresponding Regional Seas conventions (HELCOM, OSPAR, the Barcelona convention and the Bucharest convention, respectively) in a key role for implementation of the directive. In the coordinating role between the political level of the regional seas conventions is the EU technical subgroup on underwater noise (TSG-Noise), which

also serves as the link to the EU Commission and provides technical guidance at the general level, covering all EU Member States. Technical guidance and advice on implementation of criteria for GES at the level of the regional seas are on the other hand fed to the Regional Seas conventions from their own expert network and through partnering or subcontracting to other bodies, such as ASCOBANS, ACCOBAMS and ICES.

An example of how the division of work can be established is offered in the HELCOM area by the BIAS project. The BIAS project was conducted as a demonstration of how the MSFD could be implemented in a coordinated way throughout an entire regional sea and was designed on the basis of initial guidance offered by the TSG-Noise. Subsequently, BIAS resulted in development of specific standards for monitoring and analysis and this experience was later used by TSG-Noise in their revision of guidance on monitoring. In addition, HELCOM has adopted the key principles of BIAS and is working towards including noise as a core indicator, monitored and analysed in compliance with the recommendations from BIAS.

Ibrahim Benamer presented a background of the Ecosystem Approach of the Barcelona Convention.

Since the last 20 years, ACCOBAMS and SPA have been working together to achieve and maintain a favourable conservation status for cetaceans, within the framework of the implementation of their respective Action Plan for the conservation of cetaceans, notably in the spirit of the recommendations of the Barcelona Convention Contracting Parties at their COP 14 (Portoroz, November 2005) concerning the relation between the implementation of ACCOBAMS and the SPA/BD Protocol.

Therefore, and in order to provide new orientations for the Action Plan for the conservation of cetaceans in the Mediterranean, which are in line with the evolving regional context regarding cetacean conservation and with the new challenges and priorities as identified by the most recent scientific knowledge, RAC/SPA has collaborated closely with the secretariat of ACCOBAMS in revising the Appendix to the Action Plan for the conservation of cetaceans in the Mediterranean (adopted in 1992). The revised appendix of the Action Plan for the conservation of cetaceans in the Mediterranean sea, adopted during the 19th Ordinary Meeting of the Contracting Parties to the Barcelona Convention (Feb. 2016) invites the States to orient their action during the period 2016-2020 towards the legal and institutional measures, the improvement of the knowledge about cetacean populations, the reduction of cetacean-fisheries interactions, the mitigation of the impact of underwater noise, and habitat conservation.

Furthermore, the Contracting Parties to the Barcelona Convention decided to apply the Ecosystem Approach (EcAp) to the management of human activities that may affect the Mediterranean marine and coastal environment. In this context, they adopted 11 Ecological Objectives whose achievement should help attaining a Good Environmental Status (GES) of the Mediterranean Sea and Coast.

An ambitious Integrated Monitoring and Assessment Programme (IMAP) was adopted within the framework of the Ecosystem Approach process of the Barcelona Convention. This Programme is meant to enable a quantitative analysis of the state of the marine and coastal environment of the Mediterranean in an integrated manner, covering pollution and marine litter, biodiversity, non-indigenous species, coast, and hydrography, based on common regional indicators, targets and Good Environmental Status descriptions. IMAP was prepared and will be implemented through collaborative efforts including with key regional organisations such as ACCOBAMS, who greatly contributed to its development. The implementation of IMAP involves assisting Southern Mediterranean countries in developing their national IMAP compatible monitoring programmes, following the agreed common indicators. ACCOBAMS is leading the work on common indicator fact sheets related to marine mammals and is undertaking an identification of noise hot spots in the Mediterranean, and will continue collaborating for the IMAP implementation related to marine noise.

2) Presentation of regional registers of impulsive noise sources in the ACCOBAMS and ASCOBANS areas

Neil Holdsworth presented the impulsive noise register developed by ICES for the OSPAR and HELCOM regions (<http://www.ices.dk/marine-data/data-portals/Pages/underwater-noise.aspx>).

ICES has developed an impulsive noise register, following the technical recommendations from the EU Technical Subgroup on Underwater Noise, to apply by member states in all OSPAR (North East Atlantic) regions. Later on, HELCOM (Baltic Sea) regions have also joined this register. This register provides a common impulsive noise event-reporting framework that can be used by member countries with or without their own regulatory noise tracking systems, and can accommodate varied data input formats (e.g. differences in spatial grid dimensions).

The portal, operational since 2016, has 3 main functions:

- Browse data - allows inspecting the full list of data uploaded in the register. A simple spatial map can be generated for each data entry
- View on map - allows selecting and plotting noise data and filter by year, source level and source type in an interactive map
- Web services – provides the ability to retrieve data and use the services from the Underwater Noise Register through a programming interface for data checking and indicator viewing.

Alessio Maglio presented the impulsive noise register developed by ACCOBAMS for the Mediterranean Sea and surrounding regions (accobams.noiseregister.org)

The ACCOBAMS Secretariat, in cooperation with UNEP/MAP and taking advantage of the guidance relative to the MSFD-D11, supported the development of the technical guidance for the implementation of the EcAp – Ecological Objective 11 (EO11)

The development of a regional impulsive noise register started in February 2016 to cover the MSFD and the EcAp processes. This web platform allows one to perform a number of operations, including: selecting, filtering and displaying data on a map; uploading and downloading data on/from the database; calculating, displaying, and downloading noise indicators in different readable formats; creating and managing user's accounts and account rights.

The Mediterranean register, as for the OSPAR and HELCOM regions, provides a common impulsive noise event-reporting framework that can be used by countries (either EU-Member States or Contracting Parties to ACCOBAMS and UNEP/MAP, or both) with or without their own regulatory noise tracking systems, and can accommodate varied data input formats (e.g. differences in spatial grid dimensions).

3) Presentation of national registers

National experts were invited to present national implementation of the MSFD-Descriptor 11 and/or ECAP-ecological Objective 11 on anthropogenic noise.

All the presentations are summarised in the two following tables:

NATIONAL and REGIONAL IMPLEMENTATION OF THE MSFD-DESCRIPTOR 11 AND/OR ECAP-ECOLOGICAL OBJECTIVE 11 ON ANTHROPOGENIC NOISE

COUNTRY	Implementation level of the MSFD-Descriptor 11 and/or ECAP- Ecological Objective 11	How to improve this implementation level ?	Institution(s) / organization(s) in charge of the implementation of D11 / EO11
ALGERIA	Implementation of ECAP- Ecological Objective 11 is planned	Training on standard methodology, acquiring equipment, caring on surveys	CNRDPA
EGYPT	No Implementation	Cetacean Knowledge enhancement More effort in coordination with oil and gas companies to gather the detailed information regarding to impulsive noise produced by their activities Encourage the country to consider the underwater ambient noise in its environment law Better cooperation with EU Countries in order to implement the Ecological Objective 11 Capacity building / Awareness	<ul style="list-style-type: none"> - Ministry for environment - Egyptian Authority for Maritime Safety - National Research Centre - Universities - NGOs
FRANCE	<p><u>Impulsive noise</u> :The register is suitable with OSPAR recommendations and will be uploaded in 2017</p> <p><u>Continuous noise</u> :Evaluation using a propagation model and opportunistic long-term measurements</p>	<p>Improving the knowledge on the uncertainties:</p> <ul style="list-style-type: none"> -quality check on the pulse block day -source levels -propagation errors <p>Definition of the GES</p>	Shom
GERMANY	<p>Impulsive noise:</p> <p>Impulsive noise registry has been implemented. The data will be regularly submitted to the noise registry for OSPAR and HELCOM hosted by ICES</p>	Assessment criteria have to be further developed, especially on a regional basis	BSH (responsible for the national noise registry), BfN, UBA
	<p>Continuous noise:</p> <p>Monitoring of continuous underwater noise is under development in the framework of national research projects</p>	<p>Regional cooperation in the framework of joint research projects will enable the full implementation in the future.</p> <p>On national level the costs and responsibilities still have to be defined and regulated.</p>	BSH, UBA, BfN
ITALY	Filling Database with Coast Guard data, 70% of 2016, searching/browsing other data sources. Online map database test phase.	Data collection requires more time and should be Institutionally supported for “official” requests to data owners. Navy data very generic. Meeting with Navy should be organized to discuss to which level of detail they could deliver non classified information.	CNR – CONISMA – UNIPV

COUNTRY	Implementation level of the MSFD-Descriptor 11 and/or ECAP- Ecological Objective 11	How to improve this implementation level ?	Institution(s) / organization(s) in charge of the implementation of D11
LIBYA	<p>Libya did not develop any monitoring programmes for ambient noise (both on land and sea) nor have any legislation to regulate or mitigate it. However, and through the Ecological Approach protocol (EcAp), the country should have the capability of implementing an Integrated (long term) Monitoring Programme for underwater noise (Common Indicator No. 11)</p>	<ol style="list-style-type: none"> 1. In order to apply a monitoring programme on ambient noise, more knowledge is needed regarding species presence, distribution and abundance. 2. The national stranding network should be developed and implemented as an assisting tool to know the impacts of noise and other anthropogenic activities such as fisheries. 3. Encourage and facilitate collaboration between national research organisations and other related sectors in the country (oil and shipping companies, coastguards, the navy). 4. Capacity building and training to how to conduct and carry out the monitoring programme. 6. Public awareness, especially to mitigate and tackle the dynamite fishing issue. 	<p>National bodies that could help in the implementation are: the Environmental General Authority; the Marine Biology Research Centre; the National Agency for Scientific Research in collaboration with local universities</p>
SPAIN	<p><u>GES initial assessment</u></p> <p>The initial assessment (Art8, MSFD) done in 2012, lacks of detailed information regarding noise sources and appropriate models, thus a collection of noise sources was done.</p> <p><u>Environmental targets and associated indicators</u></p> <p>The targets are classified in target of state, pressure or operational targets. Spain has defined two environmental targets to address Descriptor 11 in the Mediterranean Sea area.</p> <p><u>Monitoring programme</u></p> <p>The monitoring programme for Descriptor 11 (RS) consists of 2 sub-programmes for each of the five sub-regions. Development of these sub-programmes are in accordance with the</p>	<p><u>National definition of D11 GES</u></p> <p>The GES definition at criteria and indicator follows the 2010 decision requirements but in the future, the GES will be defined as a threshold value or a trend in the proportion of days with sounds impulsive in specific areas or in the whole of a demarcation when a systematic record of impulsive noise sources is developed.</p> <p>With regard to ambient noise, it would be necessary to gain more knowledge about acoustic pollution levels that affect marine life and to obtain more noise maps.</p> <p><u>GES assessment</u></p> <p>Will be necessary the establishment of an impulsive noise sources register including information about the distribution in time and place of loud and mid frequency impulsive sounds.</p> <p>With respect to the impulse noise, it would be necessary to have time series of direct measurements using hydrophones with a sufficient spatial coverage and appropriate models.</p>	<p>National authority: Ministry of the Agriculture and Fisheries, Food and the Environment (MAPAMA) through the Directorate General of Sustainability of the Coast and the Sea.</p> <p>Technical support for the design of the monitoring programmes of D11: CTN- Marine Technology Center</p>

COUNTRY	Implementation level of the MSFD-Descriptor 11 and/or ECAP- Ecological Objective 11	How to improve this implementation level ?	Institution(s) / organization(s) in charge of the implementation of D11
	methodological guides on underwater noise from TSG-Noise.	<p><u>Environmental targets and associated indicators</u> These targets are considered unspecific and would be necessary to move their definition forward.</p> <p><u>Monitoring programmes</u> RS.1: IMPULSIVE NOISE PROGRAM. It is necessary to collect and upload data for the last 2 years. <i>Collection of data could be improved by software interfaces</i> <i>Interfaces with the national environmental data base for the preconsenting procedures.</i></p>	
TUNISIA	As contracting Parties to the Barcelona Convention, Tunisia decided to apply the Ecosystem Approach (EcAp) to the management of human activities that may affect the Mediterranean marine and coastal environment. In this context, they adopted 11 Ecological Objectives whose achievement should help attaining a Good Environmental Status (GES) of the Mediterranean Sea and Coast.		Once, the EcAp-med II will be adopted, this monitoring program will be in charge of UNEP, PAM, PAC/SPA and ACCOBAMS. A national program would be established for the assessment of underwater noise by different Ministry (Agriculture, Water Resources and Fisheries ; Defense ; Energy), Tunisian company of petroleum activities and National Frequency Agency.
UK	Impulsive Noise (D11.1.): Implemented through the UK Marine Noise Registry (MNR; https://mnr.jncc.gov.uk/) hosted by JNCC and went live in August 2016. The data is annually submitted to the OSPAR noise registry hosted by ICES (http://ices.dk/marine-data/data-portals/Pages/underwater-noise.aspx). It collects data through licence conditions, or for non-licensed activities through voluntary submission. The MNR records date, location and type of activity for impulsive noise events from the	<p>Iterative improvements to the MNR online user interface are carried out to ensure ease of data entry and accuracy in recording impulsive noise events. There is also a quality control process in place.</p> <p>Increased understanding with regards to knowledge gaps e.g. population level consequences to marine species, and impacts to non-marine mammal species and to develop more biologically meaningful indicators for the effects of impulsive and continuous noise.</p>	<p>Joint Nature Conservation Committee (JNCC) D11.1.</p> <p>Centre for Environment, Fisheries and Aquaculture Science (Cefas) D11.2.</p> <p>Both on behalf of DEFRA – Department for Environment Food and Rural Affairs</p>

COUNTRY	Implementation level of the MSFD-Descriptor 11 and/or ECAP- Ecological Objective 11	How to improve this implementation level ?	Institution(s) / organization(s) in charge of the implementation of D11
	<p>following activities: geophysical surveys, percussive pile driving, explosions, unclassified military sonar, multibeam sonar (<12Khz) and acoustic deterrent devices.</p> <p>Continuous Noise (D11.2.): Assessment of baseline levels for MSFD 2018 carried out in 2016 based on 2013-2014 field monitoring: Merchant, N.D., Brookes, K.L., Faulkner, R.C., Bicknell, A.W., Godley, B.J. and Witt, M.J., 2016. Underwater noise levels in UK waters. Scientific Reports 6, 36942.</p> <p>Implementation of ambient noise monitoring programme is ongoing, expected to be operational by 2018.</p>		
UKRAINE	<p>No register but part of the EMBLASII Project whose objective is to:</p> <ul style="list-style-type: none"> • To improve availability and quality of Black Sea environmental data in line with the MSFD and Black Sea Strategic Action Plan (2009) needs • To improve partner countries' ability to perform marine environmental monitoring along MSFD principles, taking into account the Black Sea Diagnostic Report II recommendations on capacity building 		

Only if a national / regional noise register is in place or under development

COUNTRY/ REGIONAL SEA	How data are sought, collected and entered in the register?	What information is collected for each noise source?	Spatial grid used and justification	Advices for improving the implementation of a national/regional noise register
ACCOBAMS	No defined at the moment The current version only contains demonstrative data	The information collected is proposed in a template which is a simplified version of the template from OSPAR/ICES	Option 1: GFCM Statistical Rectangles (30' x 30'). This choice is consistent with the use of the ICES statistical rectangles grid for the OSPAR region. This option is not definite and can be further discussed, changed, etc. Option 2: 20 x 20 km grid. A finer spatial resolution grid proposed for the EcAp process. The justification, coming from the ACCOBAMS Scientific Committee, is based on conservation measures for cetacean management.	-Further development of the online application -Defining a framework for centralization of data -Defining GES
ICES	Data are collected by responsible institutes in member countries for both OSPAR and HELCOM Data are validated and uploaded to underwaternoise.ices.dk according to a standard format (Excel and XML)	Information according to format but including time, location, duration, type of event, energy level, mitigation measures; also possible to record where no activity has occurred by event type	ICES rectangles as default but also other grids could be used of a similar scale i.e. C squares (0.05) for alignment with Med	General for all <ul style="list-style-type: none"> - Take development in steps; some data is better than none, then start to improve resolution and quality - Get a good agreement on the key information to capture and ensure it is well defined/documented

COUNTRY/ REGIONAL SEA	How data are sought, collected and entered in the register?	What information is collected for each noise source?	Spatial grid used and justification	Advices for improving the implementation of a national/regional noise register
				Specific to regional noise reg <ul style="list-style-type: none"> - Improve automation of data provision, validation - Harmonization with ACCOBAMS register - Update indicator temporal resolution
FRANCE	Data collected using public information networks and by contacting competent authorities	It follows OSPAR/ICES recommendations	ICES grids	
GERMANY	Data are collected by state agencies mostly in the frame of license procedures for offshore activities. The data are then forwarded to the national registry hold by BSH. A data management system is used for administration, assessment and exchange of the data with the noise registry at ICES.	Spatial and temporal attribution of impulsive events, information on the source, information about mitigation measures and measurement data on the noise level, when available	At present ICES rectangles and German naval tills are implemented. Extensions are also possible, once agreed on a regional basis.	The collection of data on impulsive events strongly depends on regulation, in frame of license procedures or other administrative processes.
ITALY	The data is collected from multiples sources. Only activities submitted to EIA (Env Impact Assessment, VIA in Italy) are available in public databases Seismic exploration for research only are not submitted to EIA, thus data must be requested to companies and institutions. Other info such as weapon destruction can be found in ordinances of the Coast Guard, but not centralized archive is available. No acoustic data description available. Navy operations poorly defined.	As much as possible when available, otherwise minimum required by MSFD. Best data probably from geophysical research institutes (on courtesy basis) but takes time to have them due to time consuming retrieval. We always associate to each data string the source to eventual successive insight.	Data are collected as accurate as possible, putting data on a grid is an arbitrary choice to simplify visualization e raw evaluation	<p>Companies/Institutions performing seismic exploration without EIA should be obliged by law to send info to the Registry</p> <p>Navy should make available areas, periods, and noise sources of naval exercises</p> <p>Coast Guard should organize a centralized database to be accessed by the Registry or provide the data through a dedicated agreement</p>

COUNTRY/ REGIONAL SEA	How data are sought, collected and entered in the register?	What information is collected for each noise source?	Spatial grid used and justification	Advices for improving the implementation of a national/regional noise register
SPAIN	<p>The register data is obtained from the documentation required in the formal procedures of environmental control for activities that generate underwater noise:</p> <ul style="list-style-type: none"> -Study of environmental impact (EIA) -Environmental Impact Statement (DIA) - Environmental Monitoring Plan (PVA) -Compatibility Report. <p>Source: SABIA Database from the Directorate General of Environmental Quality and Evaluation and the Natural Environment (Ministry level)</p>	<p>1. Identification -ID Activity: -Data source. -Project Status:. -Date of registration: .</p> <p>2. General Identification of the entity which produces the activity.</p> <p>3. Activity Type of activity:</p> <p>4. Date of the main activity Start day (DD/MM/YY) End day (DD/MM/YY) Days exempt from Activity Days with activity</p> <p>5. Properties of the source a) Seismic Study Type of data Volumen airgun -cm³ SPL -dB re 1uPa·m SEL -dB re 1uPa²·m² Intensity range -dB re 1uPa·m</p> <p>b) Geophysical Survey Data Frequency-Hz SPL-dB re 1uPa·m SEL-dB re 1uPa²·m² Intensity range -dB re 1uPa²·m²</p>	<p>Spatial grid used: 5' x 5'</p> <p>The 'Regulations for implementation of the law on research and exploitation of hydrocarbons" of 37 June 1974, indicates that the area on which the granting of research must be between two meridians and two parallel equidistant an exact number of minutes and in multiples of five, resulting in a cell size of five for five minutes.</p>	<p>Collection of data for the noise register would be easier with software interfaces with the national data base for environmental pre-consenting process.</p>

COUNTRY/ REGIONAL SEA	How data are sought, collected and entered in the register?	What information is collected for each noise source?	Spatial grid used and justification	Advices for improving the implementation of a national/regional noise register
		<p>c) Acoustic deterrent devices Frequency-Hz SPL-dB re 1uPa·m SEL-dB re 1uPa²·m² Intensity range-dB re 1uPa·m</p> <p>d) Installation of piles Maximum energy of the hammer -kJ SPL-dB re 1uPa·m SEL-dB re 1uPa²·m² Intensity range</p> <p>e) Explosiones Equivalente TNT-kg SPL-dB re 1uPa·m SEL-dB re 1uPa²·m² Rango de intensidad-kg</p> <p>f) Sonar Frequency-Hz SPL-dB re 1uPa·m SEL-dB re 1uPa²·m² Intensity range-dB re 1uPa²·m²</p> <p>c) Other Frequency-Hz SPL-dB re 1uPa·m SEL-dB re 1uPa²·m² Intensity range dB re 1uPa·m</p> <p>6. Additional data Spectrum of the source: initial frequency; final frequency -Hz Transmission duration per day-h</p>		

COUNTRY/ REGIONAL SEA	How data are sought, collected and entered in the register?	What information is collected for each noise source?	Spatial grid used and justification	Advices for improving the implementation of a national/regional noise register
		Frequency of transmission Transmission duration (a single impulse) Total Number of Pulses Directivity (Q Value) Depth of the source-m Speed of the platform if applicable-m/s Mitigation actions		
UK	<p>Data is collected via consenting regimes and license conditions for impact pile driving, seismic surveys, sub-bottom profiling, multi-beam echosounders, and explosions. Data on unclassified military sonar, acoustic deterrent devices and non-oil and gas geophysical surveys is collected via voluntary submissions.</p> <p>Data is collected prior to the activity taking place (forward look) and on completion of the activity (backward look).</p> <p>Data is entered into the UK Marine Noise Registry through a number of processes based on discussions and agreed statements of intent with individual regulators.</p>	<p>For all activity types information on Location (lat/long in decimal degrees; oil and gas block code; polygon in decimal degrees) and dates of occurrence is collected.</p> <p>a) Seismic surveys</p> <ul style="list-style-type: none"> - Survey Type (Ocean Bottom Cables/Ocean Bottom Nodes; Vertical Seismic Profile; Site; Regional; Reservoir; Other) - Data Type (2D; 3D; 4D) - Maximum Airgun Volume (cu in) - Sound Pressure Level (dB re 1µPa peak) - Sound Exposure Level (dB re 1µPa2.s) <p>b) Sub-bottom Profiling</p> <ul style="list-style-type: none"> - Source (Pinger; Boomer; Sparker; Chirp) - Frequency (Hz) - Sound Pressure Level (dB re 1µPa peak) - Sound Exposure Level (dB re 1µPa2.s) <p>c) Impact Pile Driving</p> <ul style="list-style-type: none"> - Maximum Hammer Energy (kilojoules) - Sound Pressure Level (dB re 1µPa peak) - Sound Exposure Level (dB re 1µPa2.s) 	<p>Spatial grid used for mapping are the UK Oil and Gas Licensing Blocks, which measure 10 minutes' latitude x 12 minutes' longitude.</p> <p>The grid was chosen for ease of recording of seismic survey activities as this is the spatial area used during licensing.</p>	<p>Take the development in steps; some data is better than none, then start to improve resolution and quality with time and support from data suppliers.</p> <p>Work with regulators and other data suppliers to ensure good agreements for data collection, and be supportive to ensure they continue to input data in the future.</p> <p>Work to find methods for the collection of data from impulsive noise sources where no license is required.</p> <p>Develop automated services to produce outputs such as impulsive noise pressure maps/summary tables/etc., and to convert national registers data into the formats used by regional noise registers to ensure ease and accuracy of data sharing.</p>

COUNTRY/ REGIONAL SEA	How data are sought, collected and entered in the register?	What information is collected for each noise source?	Spatial grid used and justification	Advices for improving the implementation of a national/regional noise register
		<p>d) Explosives</p> <ul style="list-style-type: none"> - TNT Equivalent (kilograms) - Sound Pressure Level (dB re 1μPa peak) - Sound Exposure Level (dB re 1μPa2.s) <p>e) Acoustic Deterrent Devices</p> <ul style="list-style-type: none"> - Frequency (Hz) - Sound Pressure Level (dB re 1μPa peak) - Sound Exposure Level (dB re 1μPa2.s) <p>f) Multibeam Echosounders</p> <ul style="list-style-type: none"> - Frequency (Hz) - Sound Pressure Level (dB re 1μPa peak) - Sound Exposure Level (dB re 1μPa2.s) <p>g) Ministry of Defence Activity</p> <ul style="list-style-type: none"> - Source (Anti-submarine Warfare Sonar; Anti-submarine Warfare Sonar (Check); Explosion) 		

4) Recommendations

1. How to collect relevant and quality data?

- Incorporate the impulsive noise registry data into the permit process.
- Define different level of data access in order to facilitate data collection, including sensitive ones (ex.: navy and seismic data).
- Allow and/or promote, the possibility to collect data on other noise sources having potential negative effect on the marine environment, and that are not clearly identified by the MSFD-D11 process (ex.: Seal Scarers, echosounders, etc.)

2. How to develop common standards and interconnected register tool?

- Emphasize the importance of collecting high quality raw data rather than the developing standards for data use/management.
- Encourage Regional Seas Conventions to disseminate (e.g. translating where appropriate) the TSG-Noise and ECAP guidance.
- Encourage Parties to use such guidance for their national noise register.

3. How to provide capacity building and training for country?

- Provide countries with a step by step methodology to implement impulsive noise register.
- Use regional projects (such as BIAS, QuietMed, etc.) to diffuse existing tools (e.g.: excel template, technical documentation, etc.) and organise training sessions as appropriate.

4. How to move forward to the next step: impact indicators?

- Explore the feasibility of impact indicators based on animal stress, stranding and population distribution.

PART II - PERSPECTIVES FOR IMPROVING D11 INDICATORS AND DEVELOPING NEW ONES
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The afternoon session was organised as a round table where scientific experts on underwater noise debated about the current definitions of Descriptor 11 of the EU Marine Strategy Framework Directive (MSFD) and potential avenues to improve these descriptors. The debate was structured as a round table open to the participation of all attendees of the workshop. Detailed information about the debate is included in [Annex III](#) of this document. The main conclusions of the expert debate were the following:

1. To support the proposal of the TSG Noise to the Commission to include additional impulsive sounds on national impulsive noise registers: to include high intensity naval and scientific sonar at relevant frequencies and acoustic deterrent devices in addition to airguns, pile-driving and explosives (see page 8 in part 2 of Dekeling *et al.* 2014).

Acoustic deterrents are widespread in EU and adjacent waters and there is scientific evidence that they can disturb marine mammals. Experts proposed that the upper frequency limit of 10 kHz for inclusion of sources of impulsive noise into the indicator 11.1 registry is extended to higher frequencies and thus include all loud, impulsive sources likely to have a negative impact on marine organisms on a regional scale (kilometers). Experts proposed that the EU mandates its parties to require permits to use acoustic deterrents and keep a register of the use of these devices (type and location). With respect to sonar, experts acknowledged national security issues but also considered EU Resolution B6-0089/04 on the environmental effects of the use of high intensity active naval sonar. This resolution underlined the need to increase knowledge on sonar effects on marine fauna. Thus, experts proposed a balanced solution in which nations keep a register of sonar use in their waters and allow investigation of this register to authorized parties to investigate effects on marine mammals.

The workshop also recognized the need for higher data resolution than “pulse block days” for interpretation of the register towards defining noise impact thresholds as mandated by the MSFD. Thus, experts recommended to register the actual location and characteristics of the impulsive noise sources when these data are available as a base layer of “raw” data recording. These data can then be summarized as pulse block days and allow more detailed analyses when needed.

2. Experts advised consideration of the proposal of the TSG noise to register additional frequency bands when monitoring low frequency continuous (shipping) noise in shallow waters and to monitor broadband sound (up to 20 kHz). Noise at very low frequencies such as the third octave bands centered at 63 and 125 Hz (current indicators of continuous noise in the MSFD) is rapidly absorbed in shallow waters. Thus, these bands cannot fulfill the mission of the MSFD of characterizing shipping noise in shallow waters typical of the Baltic Sea and other European waters. Experts proposed that research should be done with urgency to identify areas of Europe where one or more additional higher frequency indicators would be essential to assess Good Environmental Status, and to define if there is a need for a common higher frequency band to be reported in all European waters, in order to enable future comparative studies throughout the maritime territory.
3. Experts recognized the importance of identifying common noise impact indicators for marine species and underwater noise sources, and supported efforts of the TSG noise on this regard. Experts proposed the Commission initiates the definition of noise impact indicators for those species and sound sources for which there is scientific evidence of impact already available, such as harbor porpoises and beaked whales, while further studies are performed in order to define thresholds of noise impacts for other species and noise sources as mandated by the MSFD.

ANNEX 1 – AGENDA

MORNING – IMPULSIVE NOISE REGISTERS

Chair: Yanis SOUAMI, Co-Chair of the CMS/ACCOBAMS/ASCOBANS Joint Noise Working Group

9:00 – 9:30	Registration	Aline KÜHL-STENZEL (ASCOBANS) Maylis SALIVAS (ACCOBAMS)
9:30 – 9:45	Welcome and introduction to the workshop by ACCOBAMS, ASCOBANS, CMS, ECS	Heidrun FRISCH-NWAKANMA (CMS) Maylis SALIVAS (ACCOBAMS) Aline KUHL-STENZEL (ASCOBANS) Peter EVANS (ECS)
9:45- 10:00	Definitions of impulsive noise and registers	Yanis SOUAMI (Co-Chair of the JNWG)
	The work in TSG-Noise and the regional sea conventions towards GES on underwater noise	Jakob TOUGAARD
	Background of the Ecosystem Approach of the Barcelona Convention	Ibrahim BENAMER (RAC/SPA)
10:00 – 10:20	Presentation of regional registers of impulsive noise sources in the ACCOBAMS and ASCOBANS areas	
	Presentation of the impulsive noise register developed by ICES for the OSPAR and HELCOM regions	Neil Holdsworth (ICES) Carlos Pinto (ICES)
	Presentation of the impulsive noise register developed by ACCOBAMS for the Mediterranean Sea and surrounding regions	Alessio MAGLIO
10:20 – 11:00	Presentation of national registers	
	Presentation of the progress of national noise register in Algeria	Souad LAMOUTI
	Presentation of the progress of national noise register in Egypt	Mahmoud FOUAD
	Presentation of the progress of national noise register in France	Florent LE COURTOIS
	Presentation of the progress of national noise register in Germany	Miriam MÜLLER
	Presentation of the progress of national noise register in Italy	Claudio FOSSATI
Coffee Break		
11:30 – 11:50	Presentation of national registers	
	Presentation of the progress of national noise register in Libya	Ibrahim BENAMER
	Presentation of the progress of national noise register in Spain	Noelia ORTEGA
	Presentation of the progress of national noise register in Tunisia	Rimel BENMESSAOUD
	Presentation of the progress of national noise register in Ukraine	Oksana SAVENKO
	Long-term PAM across the regional seas of Ireland, Northern Ireland and West Scotland (COMPASS)	Denise RISH
11:50 – 12:00	Summary table of registers	Alessio MAGLIO and Silvia FREY
12:00 – 12:45	Discussion, round table and recommendations	Yanis SOUAMI

12:45 – 14:00 - Lunch break (offered by the ACCOBAMS and ASCOBANS Secretariats)**AFTERNOON – PERSPECTIVES FOR IMPROVING D11 INDICATORS AND DEVELOPING NEW ONES****Chair :** Natacha AGUILAR

14:00-14:10	Welcome, introduction to the workshop
14:10-14:20	TG noise working framework and definitions of indicators
14:20-14:40	MSFD noise measurements indicators
14:40-15:20	Experts round table about noise measurement indicators of the MSFD
15:20-15:30	Conclusions about noise measurements indicators
<i>Coffee Break</i>	
16:00-16:15	MSFD GES and noise impact indicators
16:15-16:45	Experts round table about GES and noise impact indicators of the MSFD. Open questions from the public in the last 10 min

ANNEX 2 – LIST OF PARTICIPANTS

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ANNEX 3 – DEBATE ABOUT MSFD DESCRIPTOR 11**Item 1: Frequency bands for noise measurement indicators currently defined by MSFD**

Background: MSFD Descriptor 11 defines that noise levels should be recorded in the octave bands centred upon 63 and 125 Hz by all EU member states, and yearly averages recorded to monitor trends for these bands.

Questions: How meaningful are recorded trends? How can we leverage the information provided by these indicators to assess GES? Are defined frequency bands well suited for all species and habitats?

Answers: There may be a need for a third band at a higher frequency, at least in some areas. This is because current frequency bands of Descriptor 11 have limited utility in shallow waters due to propagation effects absorbing low frequencies. This means that noise is being produced in shallow waters but it is not sampled (quantified) by the current frequency bands in the descriptor. The practical result is that there will be a bias in the results of the indicators, which will underestimate noise budgets in shallow areas. This prevents comparative analysis in the full EU territory, and introduces a strong challenge when assessing noise trends.

In addition to the problem introduced by characterising noise in shallow waters, current bands in Descriptor 11 cannot capture acoustic pollution from higher frequency emitting vessels, which are typically smaller boats, including many recreational, which are not mandated to carry AIS (Automatic Identification System for vessels).

Question: The two frequency bands in Descriptor 11 may be capturing very similar information, thus, experts proposed that perhaps the descriptor should include only one low frequency (LF) band and add one medium-high frequency (MF-HF) band.

Answers:

Two LF bands may be better to differentiate the spectra (i.e. discern ambient noise from anthropogenic noise).

This could test this in a data-driven manner in terms of additional gain of a second LF band. If gain is low then remove one.

Selection of an appropriate MF-HF band should be data driven.

Continuing to record both LF bands may represent little additional work and may provide an important long-term perspective on trends. Throwing out these data may be a risk down the line.

Question: Noise recording technology is currently being developed that only records noise levels in the two bands of current Descriptor 11. This technology facilitates use by member states, but challenges further improvements of the Descriptors. This seems to contradict the philosophy of MSFD stating that descriptors should be revised for efficiency and potentially improved every six years.

Answer: It is likely that devices under development to monitor and store noise information exclusively on the current LF bands defined by Descriptor 11 are in fact sampling the full 48 kHz frequency band at 1 minute averages, and then filtering the data to report only the bands of the descriptor. This means that it should be easy to re-tool this technology and this should be a priority of the Commission, before data-restricted technology is widely used within EU waters.

Storage of only spectra data (i.e. descriptor levels in numbers) is low cost in terms of memory and resources. However, some experts proposed that it would be valuable to store raw acoustic data to allow further analysis and differentiation of noise sources.

Conclusions:

- Indicators must be relevant for the GES and adequate to enable comparative analysis across all EU regions. There is room for improvement of current Descriptor 11 indicators.
- The added value of having two lower bands should be assessed through a data driven process.
- The workshop supports the work of TSG on the need for a third higher band and proposes that studies should be advanced towards identifying the areas of EU marine territory where a MF-HF band is needed and to evaluate the potential need for a common MF-HF band across the EU marine territory. The adoption of this new band should be proposed at the regional and EU Commission level to ensure consistency.

- The selection of the MF-HF band and the length of time averaging of noise levels at each band should be data driven.
- Focus should be to develop and deploy recording technology that covers a wide spectrum from LF to HF, so any band of interest can be filtered post-hoc and ensure present and future descriptors to characterise underwater noise.

Item 2: MSFD GES and noise impact indicators

MSFD requires member states to establish threshold values of acceptable noise impacts. This task is challenged by a scarcity of knowledge on several key issues including natural background sound levels and how these have been changed by human activities, and the implications of changes of the acoustic environment for marine fauna. However, there is an increasing body of knowledge showing reactions of species to anthropogenic noise, and this underlines the importance of establishing thresholds of impact which should be re-evaluated as more information becomes available.

It needs to be considered that the recognition of underwater noise as a form of pollution is still relatively recent and even debated by some, i.e. noise is considered a pollutant of emergent concern and thus still poorly regulated in many EU member states. Noise is not treated in the same way nor consistently across EU member states. The development of protocols for the regulation of underwater noise can be inspired by the procedures applied to chemical pollution. Emission of chemical pollutants is regulated by national and international law. Different management may be required for noise pollution when noise is a by-product or a requirement of anthropogenic activity.

Question: Should the focus be on particular indicator or vulnerable species?

- Focus could be on species of greatest conservation concern (i.e. endangered species and/or species which have shown to be particularly sensitive, such as harbour porpoises and beaked whales).
 - A point was made that the classification of a species as protected may take a long time and significant impacts on species not currently classified as of high conservation concern may occur during anthropogenic activities. There was a recommendation that the principles for assigning impact threshold values should be more precautionary in their approach. This should then be followed by a post-implementation assessment of whether they are appropriate or not, based on new information.
 - In response, it was noted that natural fluctuations of populations should be taken into account. Also, focusing on non-endangered species could divert funds from more urgent mitigation actions on more critical species.
 - Target species for mitigation is largely region specific depending on the distribution of vulnerable species.
 - We do not have information on the vulnerability of many species, but there are scientific evidences showing that some species are sensitive to noise (e.g. harbour porpoises and beaked whales). Thus, precaution should be applied at least when activities emitting intense sound coincide with areas where these species occur.
 - Lack of data should not imply lack of precaution. Informed recommendations can be based on expert opinions in lieu of information on quantitative thresholds, and these recommendations can be updated as more information becomes available.

Question: Can we work towards scaling mitigation actions currently applied at regional or member state level to the overall region?

The recognition of underwater noise as a relevant pollutant and thus the development of national guidelines to mitigate noise impacts are not homogeneous within the European region. There is a need for regional level sharing of information about acoustic pollution (scientific knowledge on noise impacts or apparent lack of impacts observed on different species of marine fauna; management and mitigation procedures).

Within the EU, there are different approaches to mitigate noise impacts. Examples are: UK has undertaken an area-based approach (noise should not exceed a given threshold in more than 20% of the national territory). Germany is more conservative, and focuses on “prevention of disturbance” to protected species, mainly harbour porpoise.

Denmark sets thresholds of total acoustic energy to be introduced in the marine environment by an activity. These approaches may be more attainable than attempting to quantify population level effects.

It was noted that reducing noise production is expected to be beneficial. In this light, the application of noise reduction methods is desirable. Examples of technologies developed to attain this goal include bubble curtains to reduce the acoustic footprint of pile driving activities. Again, the application of these technologies varies among countries, e.g. bubble curtains for pile driving are mandatory in Germany but not in other Member States.

In parallel to the development of studies about the sensitivity of marine fauna to noise, quantitative analysis of the efficiency of noise reduction protocols and technologies are required to base a potential requirement from the EU to Member States to apply noise reduction measures.