AQUO Project G.A. 314227

Newsletter

Issue No. 5, November 2015

Introduction

Achieve QUieter Oceans (AQUO) Project is now ending.
The Practical Guidelines are being completed.
An overview is given in this newsletter.

AQUO guidelines

Eric Baudin, BUREAU VERITAS

The main objective of the guidelines is to provide the policy maker with an effective method and tool to fulfil the MSFD requirements with regards to the underwater continuous noise from shipping. For that purpose, the final steps aim at assessing the current environmental status of a given maritime area and the efficiency of a mitigation measure at a basin scale.
The technical solutions that could directly incur, at ship level, a reduction of the noise radiation are addressed in a synthetic way nevertheless covering the three key components: direct underwater noise reduction, impact on fuel efficiency and set-up and maintenance solutions to reduce underwater radiated noise.

The methodology developed (see Figure 1) provides a statistical assessment of the reduction solution at a basin scale taking into consideration the overall shipping noise arising from three specific areas (two in the Mediterranean sea, one in the Atlantic sea), the shipping activities and the ocean environment.
The results presented as statistical sound pressure maps of the area of interests are based on:

- AIS data
- Oceanographic data
- Ship URN patterns
- Species sensitivity criteria

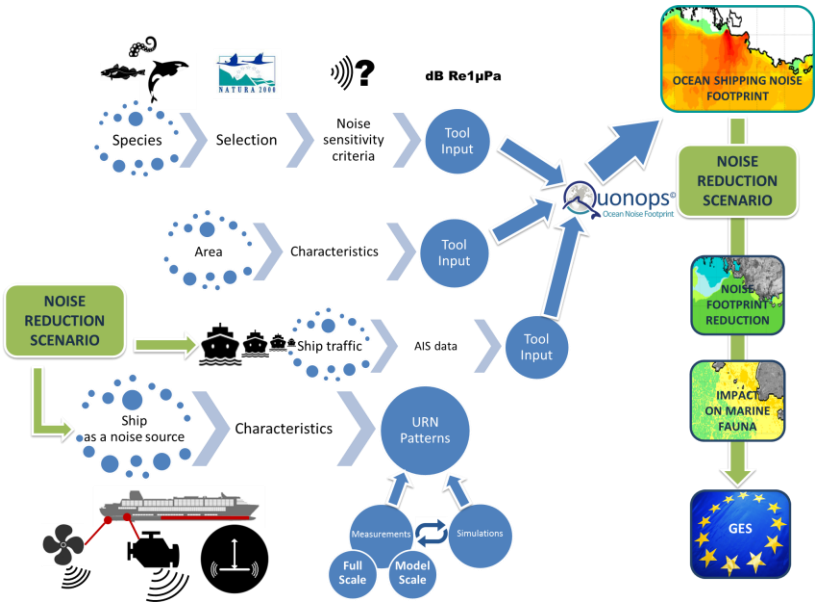

Figure 1: AQUO Overall methodology

The effectiveness of the noise reduction solutions have been determined by using the footprint assessment tool Quonops©.
At this stage, this tool is capable of assessing the current situation at a basin scale from a ship level consideration within its real environment (traffic and area). From the reduction solution identified in WP5 and the results of the bioacoustic research achieved in WP4 on cuttlefishes, Atlantic cod and harbour porpoises, reduction scenarii have been simulated. By applying solutions for the reduction of URN or traffic regulations, the comparison with the baseline statistics leads to the geographical quantification of the cumulative benefits or drawbacks of each solution at the scale of the basin and for a given period of time. In more details, technical solutions are addressed not only in terms of noise reduction but also with regards to fuel efficiency and applicability of the solutions for a given fleet.
Further investigations can be developed to extend this quantification to other cases (different species, areas).
It is important to note that the common guidelines with SONIC project have also just been issued. They are recalling not only the final solution part but also the other key topics that have to be addressed when studying underwater noise from shipping.

Bioacoustic criteria

Mathias Andersson, FOI

On the basis of previous AQUO studies, it has been decided to scale risks into zones of influence of different nature, see Figure 2.

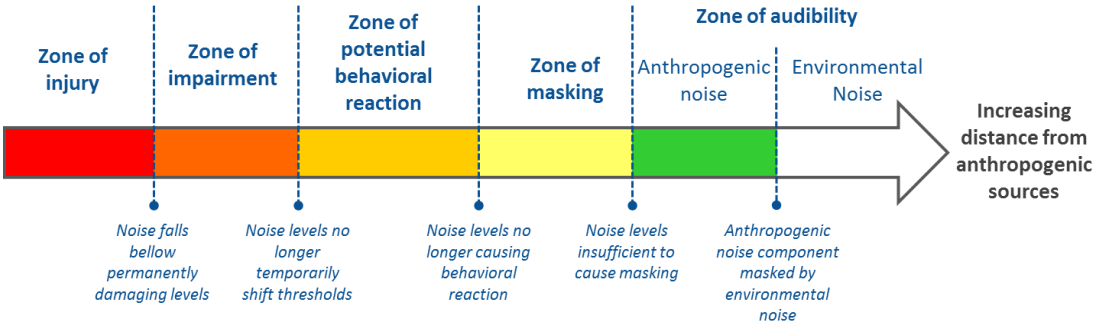

Figure 2 - Potential noise induced effects on marine animals: relationship between noise levels, distance from the source and potential effects (adapted from Dooling & Blumenrath 2013)

Five criteria have been defined to discriminate adjacent zones of influence:

- Zone of injury which corresponds to an area in which perceived noise levels exceed permanent physiological damage
- Zone of impairment which corresponds to an area in which perceived noise levels are likely to cause temporary physiological damage
- Zone of potential behavioural reaction which corresponds to an area in which perceived noise levels may cause sufficient annoyance for individuals to stop their normal activity and possibly flee the area.

- Zone of masking. Masking occurs when sound emitted and received by specimens in their hunting, socialisation activities or predator avoidance, are hidden by anthropogenic noise.
- Zone of audibility which corresponds to an area in which perceived noise levels are unlikely to cause any significant adverse effect.

Masking through shipping noise changes the auditory scene and may reduce the range over which some key species can operate acoustically: detection of prays, social and breeding communication, detection of predators, etc. Furthermore behavioural reaction through shipping noise changes the normal course of the activities of some key species. Both masking & behavioural reactions are likely to negatively affect the individual fitness and population dynamics.

AQUO quantified the effectiveness of mitigation in case studies for different effects on three different marine species:

- the masking effect on harbour porpoises
- the displacement of cod fishes
- the hearing impairment on cuttlefishes

Example of results of simulation

Thomas Folegot, CEO Quiet-Oceans

Masking of communication signal used by male cods during spawning

The masking of communication signal used by female Atlantic Cods to spawn is one of the scenarios implemented to assess the masking effect (see Figure 3). Male cod uses low frequency (< 500 Hz) broadband sounds (grunts) to attract female cod. The fish are located in the depth interval from the bottom to 50 m up in the water column. We have used R_{max}=20m as the averaged distance between female and male cods to evaluate the risk of masking of this signal from shipping noise. If this communication was to be masked out, the natural selection could be altered.

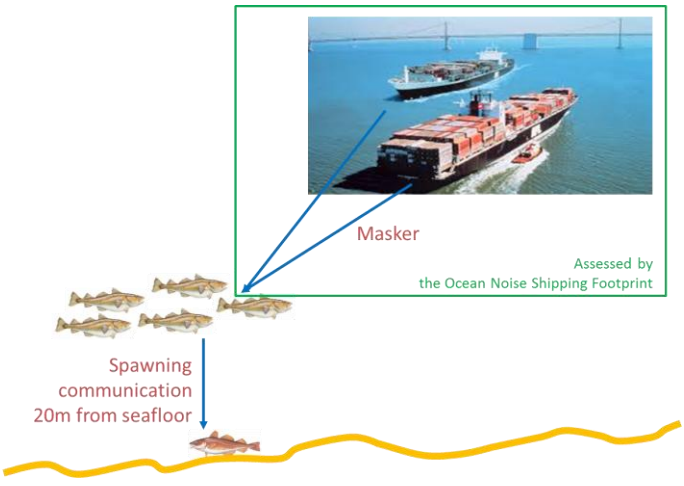

Figure 3: Assessment of masking spawning communication (20m from the surface) and potential behavioural reaction toward shipping noise in June 2014.

The assessment of masking spawning communication and potential behavioural reaction toward shipping noise in June 2014 is presented in Figure 4. Masking and behavioural reactions occur in relatively shallow water places, where the cods are at close distance to the vessel noise sources. Masking occurs in the vicinity of the traffic separation scheme, because the cumulative vessel noise from the specific traffic in this particular area is more intense. However, behavioural reactions in the deepest layers of the water column are unlikely because the water depth exceeds 100m.

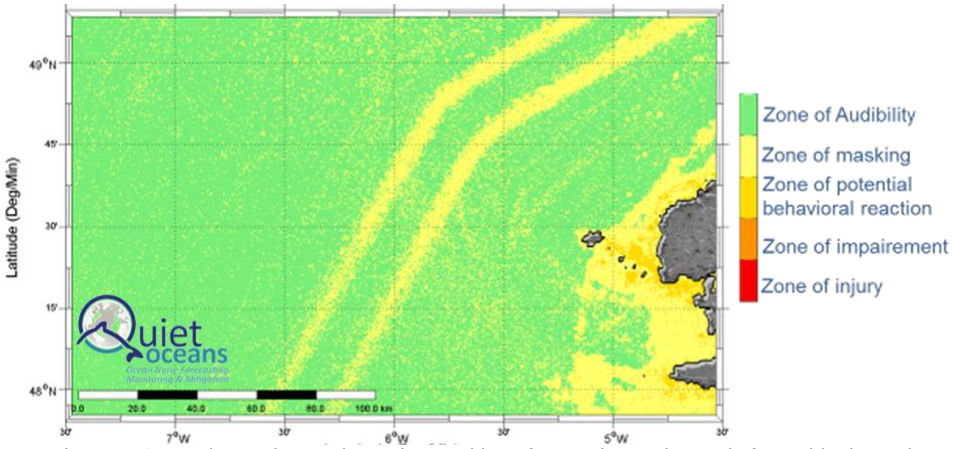

Figure 4: Scenario used to evaluate the masking of spawning cod sounds from shipping noise.

Recent Meetings

OCEANS'15, Genoa, Italy – May 2015
The Oceans'15 conference was selected for contributing to the dissemination of objectives of AQUO Project.

AQUO Plenary Meeting 6, Paris, France – September 2015
The final plenary meeting was hosted by DCNS near Paris. The final results of the project were presented and all partners of the project were represented.

European Commission meeting, Brussels, Belgium – September 2015
Joint meeting with SONIC to present final common guidelines.

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