

The impact of man-made noise on marine mammals and mitigation procedures – the Italian situation

Pavan G., Fossati C., Manghi M., Priano M., Podestà M.*

CIBRA - Centro Interdisciplinare di Bioacustica e Ricerche Ambientali
Università di Pavia, Via Taramelli 24, 27100 Pavia, Italy
Email gpavan@cibra.unipv.it

*Museo Civico di Storia Naturale di Milano
Corso Venezia 55, 22100 Milano, Italy

ABSTRACT

In response to harmful interactions and to the increasing international concern about the impact of anthropogenic noise on marine life, and on marine mammals in particular, it is widely requested to enforce suitable permit systems and mitigation procedures in the European waters. Missing specific prescriptions, in Italian and Mediterranean seas the EU Habitat Directive is the main framework for developing such measures and for complying with the recommendations expressed by several European and International organizations (ACCOBAMS Recommendation 2.7 and ACCOBAMS Resolution 2.16, the recommendations of the 2004 IWC meeting, and the latest Motion B6-0089/04 of the European Parliament). This paper introduces the issues of acoustic pollution, the basic concepts for the development of a mitigation policy, and reviews the situation in Italian waters.

OVERVIEW

Noise is today an ubiquitous form of marine pollution, especially in areas of high naval traffic and anthropized coast. The knowledge that man-made acoustic signals can affect marine mammals has increased over the past few years, mainly within the context of low-frequency active sonars and seismic surveys. Intense underwater pollution is generated by airguns widely used in oil industry exploration, by ships' traffic, high power sonar, shoreline and offshore construction, and a series of other commercial, military and industrial sources.

Noise pollution can cause marine mammals to abandon their habitat and/or alter their behaviour, mask their acoustic signals. This may be critical for their survival. High energy sound can trigger mortal events, as recently evidenced by several dramatic and well documented mass strandings of beaked whales. Unfortunately no definitive solutions to protect underwater life exist yet.

Current mitigation policies, developed or being developed by navies and commercial companies, are concerned to avoid exposing animals to sound pressures that could potentially damage their hearing or disrupt their behaviour so that their survival could be threatened. This can be accomplished by 1) avoiding areas with large populations of marine mammals, 2) patrolling the area to estimate that no animals are present before starting acoustic emissions, and 3) observing the area while emitting sounds to check that no animals are within or are approaching the exposure area.

The approach to accomplish these rules is to collect databases reporting the distribution of marine mammals, their feeding, reproductive and nursery areas, their migration routes and their critical habitats and habits. This helps in avoiding areas where it is most likely to find animals.

A second step is to implement those techniques needed to detect the animals in a given area: spotting them at the surface and listening to their underwater sounds are today the two better performing and most reliable techniques. But these techniques may fail: observers can only work in daylight with good weather conditions, and while acoustic watch can be done 24/24, it requires suitable equipment and detects vocalizing animals only.

Anyway, animals can be difficult to spot, some species can do long dives, up to 1 hour, or they can be silent, at least in the observation period, or produce emissions out of the detection equipment range. A good integration of techniques seems to be the most successful solution to date. Trained marine mammal's observers (MMOs) and good acoustic equipment with trained acousticians can improve the probability to detect marine mammals.

Towards a regulation system in EU waters

In response to harmful interactions and to the international concern about the impact of anthropogenic noise on marine life, it is requested to setup a suitable permit system and mitigation procedures.

Missing specific laws, in the Mediterranean waters the EU Habitat Directive is probably the best framework for integrating such measures, complying with the opinions wrote by international organizations (ACCOBAMS Recommendation 2.7 and ACCOBAMS Resolution 2.16, the recommendations of the 2004 IWC meeting, and the latest European Parliament Motion B6-0089/04).

The European Union Habitat Directive states that it is not allowed to deliberately disturb, in the wild, any creature which is enlisted in Annex IV (a), and all Cetaceans (and several other marine mammals) are reported there. In addition to species protection, the Habitats Directive also makes provision for the site-based protection of a range of marine mammal species. To achieve this Special Areas of Conservation (SACs) should be proposed and designated.

Even if dedicated prescriptions are not available yet, it is important to act in a precautionary way and give these animals, together with marine turtles and other zoological groups, protection against noise.

To better address these issues, ACCOBAMS has recently set a working group for reviewing current knowledge, the regulatory systems already in force, primarily in US, and for developing a common set of guidelines for the ACCOBAMS countries.

In Europe, as far as military sonar operations are concerned, at least one, the NATO URC Marine Mammals Risk Mitigation Policy, exists and other protocols/guidelines are being developed by Navies about to the use of sonar and explosives.

Nevertheless, the issue of anthropogenic noise is largely underestimated and thus both scientific research and legislators should be addressed to find answers to the current environmental concerns and to provide viable management and mitigation solutions.

The Italian situation

Missing national rules, the Italian reference legal framework is the Habitats Directive. The Ministry of the Environment, Office of Protected Marine Resources, is in charge for authorizing seismic surveys and for providing basic guidelines to minimize impact on marine fauna. But no office in charge of controls exists, and effectiveness and the whole regulatory system is unclear.

In support of a stronger implementation of mitigation procedures, a recent law (L. 8 febbraio 2006, n. 61) allows extending Italian jurisdiction beyond the national waters, creating special Ecological Protection Zones. But specific laws and the designation of organizations committed to control their implementation are now required along with support to research, education and training to build up a context in which mitigation rules and technical tools can be designed, implemented, verified and improved.

The Italian Navy adopts a policy to mitigate the effects of sonar operation and other Navies operating in the Mediterranean are going to stick to similar rules.

The NATO Undersea Research Center, located in La Spezia - Italy, runs an international research project named SOLMAR, that resulted in the development of the NATO Policy.

The SOLMAR Project and the NATO Undersea Research Center Policy

SOLMAR (Sound, Oceanography and Living Marine Resources) is an international program that addresses the issue of underwater noise and its effects on the marine environment. The Project started in 1999 to support the NURC commitment to conduct marine research in an environmentally responsible manner and to provide guidelines and dedicated tools to the NATO Navies and to the scientific community.

One of the goals is the development and refinement of the tools and/or procedures to guarantee a marine mammal free zone near a sonar source prior to and during its use. It also seeks to improve the understanding of anthropogenic noise characteristics which are aversive and potentially harmful to animals. The project includes the development of a set of comprehensive databases of oceanography, ecosystem dynamics and living marine resources in the Mediterranean Sea to support the development of models for predicting the presence of marine mammals according to seasonal and environmental parameters.

NATO Policy

One product of the SOLMAR Project is the NATO Undersea Research Centre's risk mitigation policy for protecting divers and marine mammals (NATO Staff Instruction 77-04).

According to this policy, that is continuously updated, acoustic emissions are planned to avoid known diving areas or marine mammal breeding grounds, and best efforts must be made to ensure that no sound higher than a given value reaches a marine mammal. Once a mammal-free zone is established by means of visual and passive acoustic methods, acoustic source level is slowly increased, and continuous monitoring with combined techniques should ensure no animals approach the sound source.

The Italian Navy's Policy

The Italian Navy began early to be concerned by the potential risks of exposing marine mammals to powerful sonar sources and in 1995 adopted specific rules to be applied in protected areas such as the Cetacean Sanctuary in the Ligurian Sea. Since then the concern for environmental problems increased and produced interesting cooperation with research institutions. A Sonar Mitigation Policy was designed and adopted by the IT Navy in 2005 for evaluating its effectiveness and operational impact, to be definitively adopted in 2006. It is based on the same principles of the NATO Policy but with slightly different threshold levels and different models for sound propagation.

Research and education

Environmental, zoological and ecological research is required to know more about how animals use their habitat, about their behaviour, and to understand how to minimize harmful interactions. Research is thus important to help in planning where, when and how sonar, seismic or other high impact operations can safely operate. Research funding is required to support management and conservation issues as well as to continuously refine and update mitigation rules and tools.

At the same time funding to education and training is required to form qualified personnel such as marine mammals' observers, marine biologists, bioacoustic experts, veterinaries, law officials, etc.

Support should be extended to stranding networks that can collect important bio-indicators to monitor chemical contaminants and to evidence acoustics-related trauma.

Starting in 1986 a national stranding network (Centro Studi Cetacei) organized the study of the cetaceans found stranded in Italy. This stranding network is still active based on voluntary cooperation of single individuals and Institutions. Data is collected by a central coordination site in Milan, at the Museum of Natural History. All data are there filed and listed in yearly published reports (*Journal Atti della Società Italiana di Scienze Naturali e del Museo civico di Storia Naturale di Milano*).

Each report lists the animals found dead at sea or on the shore, entangled in fishing nets or sighted in distress close to shore. Bycatches and ship collisions are enclosed in the list as well.

A Mediterranean Marine Mammal Tissue Bank has been established in 2002 at the Department of Experimental Veterinary Science of the University of Padova, with the goal of collecting, preserving and give access to tissue samples from the stranded specimens.

In recent years, information about marine mammals started to be collected also by other regional and local stranding networks, environmental organizations, and local Authorities.

With the increased concern about marine mammals expressed by several Authorities, it is important to have a centralized data collection, where entries can be validated and redistributed. The Italian Ministry of the Environment has just signed an agreement with the University of Pavia and the Museum of Natural History of Milan, to create a national data centre in tight connection and coordination with the Tissue Bank in Padova.

REFERENCES

AA.VV., 2003. Ocean noise and marine mammals. National Research Council. The National Academies Press, Washington DC, US.

Carron, M. 2004. NATO SACLANTCEN marine mammal risk mitigation programme (sound, ocean, and living marine resources). In Proceedings of the workshop on active sonar and cetaceans, pp. 59–62. Ed. By P. G. H. Evans and L. A. Miller. European Cetacean Society Newsletter No 42.

D'Amico A. (Ed.) 1998. Summary Record, SACLANTCEN Bioacoustics Panel. La Spezia, Italy, 15-17 June 1998. Saclant Undersea Research Centre, M-133.

European Habitat Directive 92/43/EEC.

Evans P. G. H., Miller L. A. (Eds.), 2003. Proceedings of the workshop on Active sonar and cetaceans, 17th ECS Conference, European Cetacean Society Newsletter n. 42 – Special Issue.

Gisiner R.(Editor), 1998. Proceedings of the workshop on the effects of anthropogenic noise in the marine environment. 10-12 February 1998, Office of Naval Research, 141 pp.

Hildebrand J., 2004. Impacts of anthropogenic noise on cetaceans. IWC SC/56/E13

IWC, 2004. Report of the Scientific Committee. IWC 56 Summary Report & Annexe K.

Legge 8 febbraio 2006, n.61. Istituzione di zone di protezione ecologica oltre il limite esterno del mare territoriale. Gazzetta Ufficiale N. 52 del 3 Marzo 2006.

McCarthy E., 2004. International Regulation Of Underwater Sound: Establishing Rules And Standards To Address Ocean Noise Pollution. Kluwer Academic Publ.: 287pp.

Merril J. (Ed.), 2004. Human-generated Ocean Sound and the Effects on Marine Life. MTS Journal, Volume 37 (4), Winter 2003/2004.

Nascetti P., Perazzi A., Hastrup O. 1997. An investigation of the interaction between active sonar operations and marine mammals. European Research on Cetaceans, 10: 61-67.

NATO URC Human Diver and Marine Mammal Risk Mitigation Rules. Staff Instruction 77-04.

NATO URC, 2005. Proceedings of the Intergovernmental Conference “The Effects of Sound on Marine Mammals”. CDROM I&II.

Pavan G., 2002. Effects of underwater noise on marine mammals. Les effets des bruits sous-marins sur les mammifères marins. Bulletin ACCOBAMS, 4 (February 2002): 11-14.

Pavan G., Manghi M., 2004. Tools for underwater noise monitoring, marine mammals' surveys, and acoustic risk mitigation policies' implementation. Marine Mammals Commission, USA. Published online <http://www.mmc.gov>

Podestà M., A. D'Amico, G. Pavan, A. Drougas, A. Komnenou and N. Portunato, 2006. A Review of *Ziphius cavirostris* (G. Cuvier, 1823) Strandings in the Mediterranean Sea. Journal of Cetacean Research and Conservation 7(3). In Press.

Richardson et al., 1995. Marine Mammals and Noise. Academic Press

Richardson W.J., M. Holst, W.R. Koski, M.A. Smultea, M. Rawson, 2004. Marine Mammal Monitoring and Mitigation during Recent Seismic Surveys for Geophysical Research. Marine Mammals Commission, USA. Published online <http://www.mmc.gov>.

Simmonds et al. (Editors), 2004. Oceans of Noise. A WDCS Science Report: 1-168.

Web references

ACCOBAMS <http://www.accobams.org>

Cetacean Tissue Bank <http://www.sperivet.unipd.it/tissuebank/index.html>

CSC <http://www.centrostudicetacei.org>

CIBRA <http://www.unipv.it/cibra>

NURC <http://www.nurc.nato.int>

SOLMAR <http://solmar.nurc.nato.int>

Italian Ministry of the Environment <http://www.minambiente.it>