

International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer



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**Answer to DG Environment request on scientific information concerning impact
of sonar activities on fish**

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Answer to DG Environment request on scientific information concerning impact of sonar activities on fish populations

The European Commission, DG Environment has requested ICES:

“to undertake a scientific review and evaluation of all relevant information concerning the impact of sonar on cetaceans and fish, to identify the gaps in current understanding and to make recommendations for future investigations/research. The Commission would also be interested in advice on possible mitigation measures to reduce or minimise the impact of sonar on cetaceans and fish.”

ICES comments

Scientific review and evaluation of relevant information concerning the impact of sonar on fish

The full effects of sonar on fish are poorly known, mostly due to the lack of study. In the studies that have been conducted, effects of sonar have been noted at the individual level. However, these studies have focussed on a few species and it is not known whether their responses are representative of the wide diversity of other marine fish species. Based on the limited information currently available, wide-ranging species of fish of commercial importance are unlikely to be affected at the population level with current rates of usage (and areas of usage) of military sonar. Other sonars (and noise sources) are more widespread, but their effects are not known.

Gaps in current understanding and recommendations for future investigations or research

There are insufficient data on the effects of exposure to sound, let alone sonar, for the vast majority of fishes, and there is a great diversity of ear structures, hearing capabilities, and/or acoustic behaviours among fish. The literature on the detection of, and response to, sound are limited and the data on vulnerability to injury are almost totally non-existent, only relevant to particular species, and because of the great diversity of fishes are not easily extrapolated. The major differences in anatomy between fish may affect the degree of injury to fish from high intensity sounds or sonar.

1. As well as a need for information on the hearing thresholds for a range of fish species, information is also required on temporary and permanent hearing loss associated with exposure to sounds. The use of sounds during spawning by some fish, and their potential vulnerability to masking by anthropogenic sound sources, requires investigation.
2. The effects of sound may not only be species specific, but depend on the mass of the fish (especially where any injuries are being considered) and life history phase (eggs and larvae may be more or less vulnerable to exposure than adult fish.)
3. No studies have investigated effects of cumulative exposure of fish to any type of sound. Moreover, no studies have carefully examined effects on fishes that are distant from the source, or have considered whether there are subtle and long-term effects on behaviour or physiology that could have an impact upon survival of fish populations.
4. It is important to note that some fish are sensitive to the particle motion component of sound rather than the sound pressure. Even in fish that are sensitive to sound pressure the particle motion may be important for discriminating sounds from different directions. In determining the sensitivity of fish to sounds and the impact of sounds upon fish it is important to express the sound levels in terms of particle velocity or intensity as well as sound pressure. Different signal parameters (e.g. bandwidth, duration, temporal variation) are also important. Producing a controllable particle motion signal in a small tank is extremely difficult and care must be taken to choose a suitable acoustic environment.

Possible mitigation measures to reduce or minimise the impact of sonar on fish

Given that there is little evidence of effects of sonar on fish, it is difficult to propose mitigation measures to reduce effects. If there is concern that sonar may be having effects, then the obvious measure would be to disassociate any sonar use from areas known to contain concentrations of fish believed to be at risk.

Source of Information

Report of the Ad hoc Group on the Impact of Sonar on Cetaceans and Fish (AGISC).