

The impact of seismic surveys

Sound is an important means of communication for many species of fish, in terms of feeding, survival and reproduction. The sound waves from seismic guns have low frequencies that overlap the range at which fish hear well. All evidence suggests that fish are not particularly keen on the sound energy produced by seismic surveys. Just like humans, fish move away from sources of unpleasant noise if possible.

BY JOHN DALEN AND KJARTAN MÆSTAD

ADULT FISH

When adult and adolescent fish are affected by seismic surveys, they attempt to swim away from the noise source. Seismic surveys can therefore lead to major reductions in the catches of fishermen, even if they are not harmful to the fish themselves.

SEISMIC SURVEYS, SPAWNING AND SPAWNING MIGRATION

As a precaution, the Institute of Marine Research recommends that seismic surveys should not be carried out in areas with spawning fish or with fish on concentrated spawning migration routes. If fish are exposed to powerful external forces on their spawning grounds, they may be disturbed or even cease spawning altogether. The disturbance to fish heading to spawning grounds may be sufficient to displace their spawning geographically and temporally. The larvae may therefore miss out on the time window with the optimal biological conditions for their survival and growth.

SEISMIC SURVEYS AND LARVA AND SPAWN MORTALITY

Larvae and spawn are not able to escape from sound sources in the same way as bigger fish. The sound energy from seismic surveys can kill

larvae and spawn that are close to the seismic guns, and damage their hearing, kidneys, hearts and swim bladders. However, this only happens if the spawn are less than five metres away from the noise source. 20 metres away it is highly unlikely that the spawn will be damaged, a finding supported by all the research that has been performed on this topic. Larvae and spawn have such high natural mortality rates that the negative impact of the seismic surveys is small by comparison.

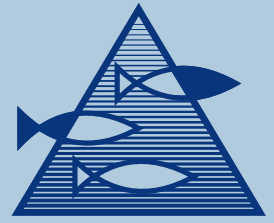
DAMAGE TO LARVAE AND SPAWN

Behavioural observations during some experiments revealed that some larvae and spawn lost their sense of balance and swam on their backs or on their sides immediately after being exposed to the sound. The vast majority of them regained their sense of balance in due course. When fish lose their sense of balance or are knocked unconscious, they may float up to the surface. Birds diving behind seismic survey vessels have probably been picking up dead or unconscious larvae. No research has been able to demonstrate that fish 100 metres away from the seismic guns receive any hearing damage from them.

LONG-TERM IMPACTS

Nor is a normal level of repeat exposure considered





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to be a great problem. During seismic surveys, the guns go off every ten seconds, with the vessel travelling at five knots. That means that the seismic survey vessel travels approx. 25 metres between each shot. If the range of the air gun is more than 25 metres, some larvae might be hit by two shots. It is therefore unlikely that larvae and spawn will be exposed to harmful effects several times.

SCIENTIFIC BASIS

We consider the scientific basis for the advice given by the Institute of Marine Research on seismic surveys to be just as good as for the other advice given by the institute. In terms of the harmful effects of seismic surveys, and the range of those effects, there is generally international agreement among marine research institutes.

BIOLOGICAL DATA

It is important to keep up-to-date with where and when different species spawn. Over 15 years ago the institute completed a multi-year investigation into the distribution of fish eggs and larvae north of 62° N (the Institute of Marine Research's egg and larvae programme, HELP). It may be useful to supplement this information, partly to take into account changes in spawning grounds, plankton, larvae and spawn, so as to improve our knowledge of

where and/or when seismic surveys should be avoided.

A BETTER UNDERSTANDING

Although we know a lot about seismic surveys in a lot of areas, there remain several areas where the Institute of Marine Research would like to know more – that's the nature of research. Our proposals for research projects in the field of seismic surveys include:

- Impacts on spawning migration and spawning.
- Impacts on pelagic fish.
- Impacts on fish without swim bladders.
- Impacts on the hearing and tissue of large fish and larvae.
- Impacts of underwater noise from the offshore oil and gas industry on fish behaviour and communication.
- Impacts on the behaviour and catch rates for sand eels.
- Stress and behavioural changes in small fish and spawn.
- Impact on mortality rates and behaviour of prey species (plankton).
- Impacts on behaviour of marine mammals.
- Impacts on farmed fish at various stages of development.

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Oil-fish

