

REPORT  
of  
THE ICES WORKING GROUP ON RESEARCH ON SOUND AND VIBRATIONS  
IN RELATION TO FISH CAPTURE

April 10-12, 1972, Bergen, Norway

The terms of reference of the working group as laid down in Council Resolution 1971/2:5 were "to study, and if necessary carry out or promote collaboration in research concerned with sound and vibration, in so far as sound and vibration affect the fish capture process".

During the meeting the group proposed the following amendment to read:

"to examine and, if necessary, carry out or promote collaboration in research concerned with sound and related phenomena, in so far as these affect fish capture".

List of participants

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The working group reviewed and discussed the following topics in detail:

a) The sounds generated by ships and fishing gears

1. Techniques for the measurement of the sounds and vibrations generated by ships and fishing gears.
2. Data available on the sounds generated by ships and their sonar apparatus.
3. Data available on the sounds and hydrodynamic disturbances generated by fishing gears.

The group agreed that differences in the techniques used by different workers to examine the noise from ships and gears were causing confusion. There was therefore a need to standardize in techniques and in the presentation of results.

Studies should be performed to relate measurements of the radiated noise to vibration measurements made on the hull and machinery. This would enable a fuller understanding of the ship as a sound source. It was considered that vibration measurements alone might provide an alternative to the direct measurement of radiated noise.

It was decided that sonar apparatus should be considered in more detail as a potential source of disturbance, since there was evidence that such equipment produced low frequency sounds which fall within the hearing range of fish.

Though several projects were under way to examine the sounds produced by fishing gears, too little attention was being paid to damping phenomena in front of the net, also to warp vibrations. More information was required on these subjects.

b) Hearing in fish

1. The sensitivity of fish to sounds.
2. Intensity and frequency discrimination.
3. Masking phenomena.
4. The relevant stimulus parameter.
5. Directional hearing.

The group agreed that though a great deal of information was available on the hearing abilities of fish, there was still a need for continuing research in this field. In particular, it was noted that there is a wide gap between the studies performed on fish hearing, and studies of ship and gear noise. It is clear that fish are most sensitive to low frequency sounds, and that this coincides with the range of greatest noise from the ship and gear. Although the ability of some fish to detect

some particular sounds can be predicted, it is more important, but more difficult to predict the behaviour which may result. It was agreed that a closer examination of both masking phenomena and directional hearing is desirable.

c) Direct evidence of the importance of sound in fishing

There is much evidence that sound is important in fish capture. This is derived particularly from purse seining experience and from pelagic trawling. Evidence is lacking for the bottom trawl, and in addition detailed observations on the behaviour of fish in response to ships and gears are scarce. Many of the observations that have been made are anecdotal, and the importance of visual stimuli has not always been considered. Better observational techniques which can be applied in the field, under fishing conditions, are needed to assist this type of study. In particular, more observations are needed on the bottom trawl.

d) Current research projects in different countries

The noise and vibration generated by ships is being investigated in Norway, W. Germany and Scotland. The noise produced by fishing gears, especially the bottom trawl, is being investigated in Canada, Scotland and W.Germany.

Studies of the hearing abilities of fish are at present under way in Norway, Scotland and the Netherlands. In addition, in Norway experiments are being undertaken to examine the possibility of guiding the movements of herring using sound.

Research projects aimed at determining the response of fish to noise from the bottom trawl are being undertaken in W.Germany, Canada and Scotland.

Conclusions

1. The radiated sound from ships and fishing gears can be measured. Hearing studies have been undertaken on commercial fish for a long time, and data are now available for several species. It is clear that much of the sound generated by ships and fishing gears falls within the frequency range of high sensitivity of fish.
2. Fish are very sensitive to sounds in this frequency range but their response may vary greatly due to biological or other factors. This is still insufficiently understood.
3. There is evidence from some fisheries that sound is important in determining the behaviour of the fish. The group suggest that information derived from fishermen should be collected and examined for evidence on the response of fish to sounds.
4. The group considers that further studies, both quantitative and qualitative, on the response of fish to the sounds from

ships and gears are essential. The group recognises that much research vessel time and high costs may be involved if useful results are to be obtained.

5. The group considers that thought should be given to measures designed to reduce the noise levels of fishing vessels.
6. Further sound measurements on both ships and fishing gears should be encouraged. Most important, are studies of the variations in noise output which occur during fishing operations. In the case of fishing gears, more attention should be paid to measuring damping phenomena and warp vibrations.
7. The techniques and methods of collection and presentation of the results of noise measurements should be standardized, to enable different scientists to compare their data. Participants making such measurements are requested to send details of their own procedures to the convener for co-ordination.
8. Experimental facilities for research on the effects of sound upon fish are costly, and the techniques being used are extremely specialised. Coordination of the studies being performed in different countries is most desirable.
9. To improve the coordination the group stressed the need to hold more scientific discussion meetings of research workers in this field from different countries.