Experiences of the Norwegian longline fleet with ‘pingers’ and ‘scramblers’

Jan Erik Dyb
Møre Research, PO Box 5075, Ålesund 6021, Norway

The Norwegian longline fleet has since the mid 90s experienced an increasing problem with depredation by sperm whales (*Physeter macrocephalus*). There was a need to both describe the problem and to experiment with gear to reduce sperm whale depredation. A survey was therefore arranged onboard a commercial longliner during the Greenland halibut (*Reinhardtius hippoglossoides*) fishery in the Greenland waters. The goal was to observe and describe the activity of the whales, and to test acoustical devices and describe their effect on the whales. The project was intended to lay the foundation for later more extensive surveys, and was mainly conducted by the crew of the longliner.

Two different types of acoustic devices were tested. One acoustic device, a pinger was attached to the longline and the other, a scrambler, was lowered and operated from the vessel. The intention was that these devices create a sound barrier to prevent sperm whales from using their own sonar. The pinger was based on pingers used in gillnet fisheries to avoid entanglement with small tooth whales. These self-sustaining units were battery operated and periodically sent out different sounds. The signals were adjusted to match the sperm whales echolocation band, and the housing was modified to handle depths down to 2,000 m. Up to five units were attached to each longline set.

The scrambler was operated from the vessel and was comprised of a ceramic transducer, an amplifier and a computer. The resonance frequency was 11 kHz, and the omni beam pattern was +/- 1dB (up to 18 kHz). The effect on the amplifier was 2 kW. Pre recorded sounds were operated from the computer. White noise was mostly used, but it was also possible to send out other sounds and sweeps continuously or periodically. It was planned that the sounds should be used systematically. But as the frustration and the number of whales increased, the sounds were used at random whenever the crew thought they might have the biggest effect.

Except at the beginning of the survey, sperm whales were observed at every station. In the beginning 2 to 4 individuals were observed around the vessel, but the number increased with time. In the end up to 15 whales were observed simultaneously. The best fishing time was the period without any observations of sperm whales. As soon as sperm whales arrived the catches dropped, and the catches decreased more or less steadily until the end of the survey. The catches were also under the influence of the acoustic devices, forcing the whales further away from the vessel and showed an effect in the beginning. The average catch number pr set without whales observed was 240 Greenland halibut pr set. When the sperm whales arrived the average number dropped to 147 and 106 Greenland halibut per set respectively, with and without the use of the scrambler.

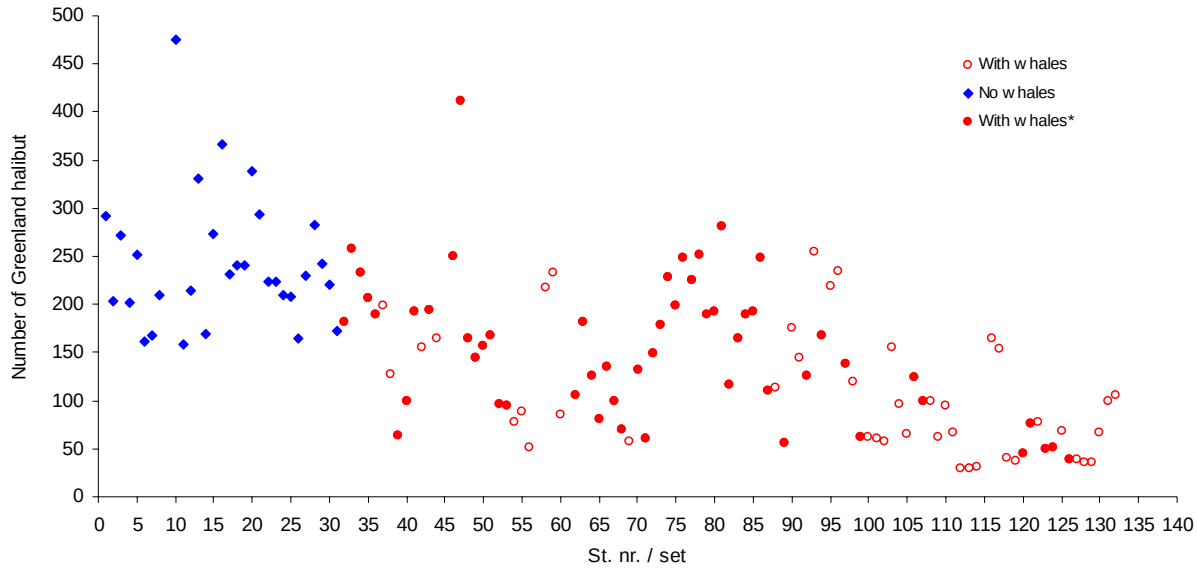

Figure 1 The catch number of Greenland halibut per set during the 30 day trip. The solid circles represent sets when the scrambler was used and the hollow circles represent sets without the use of the scrambler.

Under the influence of the scrambler the distance between the whales and the vessel was at its highest in the beginning of the trip. This distance decreased with time and by the end of the survey no difference in distance was observed with or without the scrambler. The average distance without the use of the scrambler also differed between sets, but there was no trend during the fishing period.

The fishermen found the scrambler most effective in the beginning of the survey. As soon as the scrambler was turned on, the whales came to the surface and swam rapidly away. But after a while the whales got used to the sounds and came back to the vessel. When this happened, the fishermen used a new sound and again the whales came to the surface and swam rapidly away. As in the first time, the whales became adapted to the sounds and came back. This cycle repeated with each new sound, but the adaptation time decreased with each new sound.

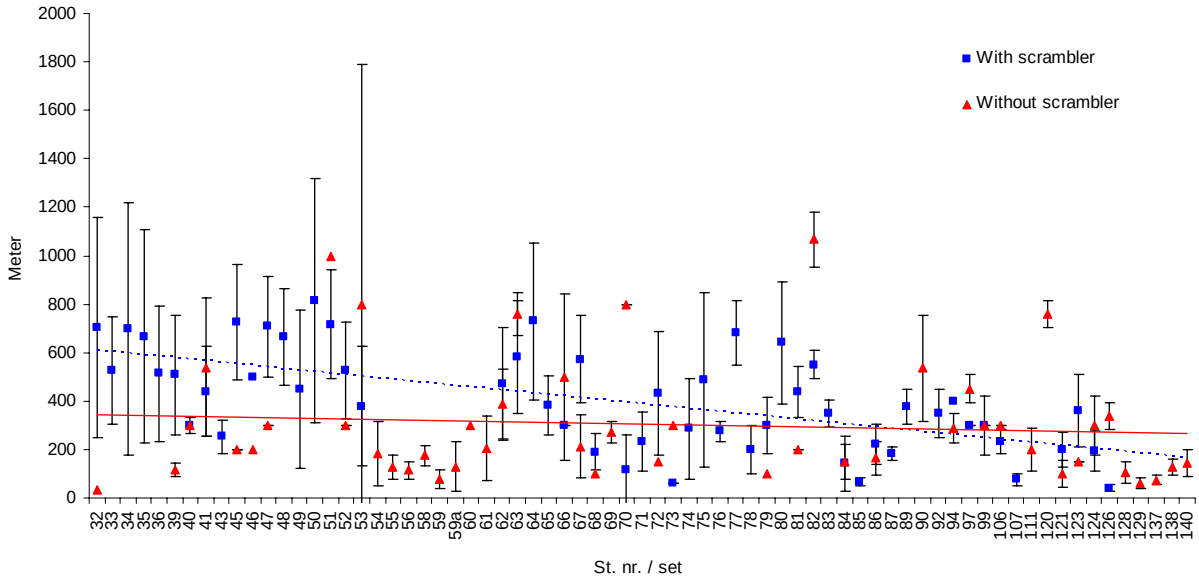

Figure 2 The average distance per set between each whale observation and the vessel. The observations are separated with and without the use of the scrambler.

It was hoped that the pingers would create a protective zone around the longline. This would lead to higher density of fish around the pingers, since whales would depredate other areas without the influence of the pingers. Pingers were also used before the whale's arrival. This period gave a significant difference in the catch in areas with and without pingers, where the catch was highest without the pingers. This indicates an effect of the pingers on the behaviour of the fish. This observation also repeated after the arrival of whales, were the highest densities of fish on the line were without any influence of pingers. On the other hand it was also observed areas on the sets completely without any fish, and no pingers were in these areas. There were always some fish around the pingers. If the pingers had an effect on both the fish and the whale, a pattern like this could be observed. But the data amount and quality were not sufficient to provide any clear conclusion.

The conclusion of the survey is that sperm whales reduce catch rates. The decrease in catch is explained by the increasing number of whales and the decrease in the distance between the boat and the whales, due to the reduced effectiveness of the scrambler. Smaller catches, especially in the beginning, would have been the situation without the acoustical gear. The scrambler was most effective, but the effect decreased by time and ended up having more or less no effect in the end. None of them worked as planned, as they seemed to have more of a 'scaring' effect then a 'shielding' effect.