

Workshop 1: Insights into killer and sperm whale depredation from fisheries interactions involving other marine mammal species

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The objectives of the workshop were to 1) examine the problem of depredation in fisheries by small cetaceans, 2) identify commonalities in depredation and behavioral patterns, and 3) discuss possible solutions that may be applicable across species and fisheries. The workshop participants were asked to relay observations and experiences from various fisheries to better understand the scope of the problem, the fisheries affected, research that has been conducted to date, and actions that can be taken by fishermen and fisheries managers to reduce depredation and its impacts on small cetaceans. The goal of the workshop was to help guide the work of others in the immediate future.

How have human behaviours influenced the spread of depredation in other fisheries?

Marine mammals in captivity readily learn novel behaviours that yield predictable rewards, and often adapt quickly to consistent schedules and routines. Fisheries management actions often contribute to the predictability of fishing, by restricting fishing to consistent areas and times. This predictability likely contributes to the spread and severity of depredation.

In addition, the activities and practices of fishermen may contribute to an increase in depredation. In Hawaii, dolphins and whales are considered spiritual animals, and fishermen will give them some of the catch as a spiritual offering that symbolizes taking but also giving back. Shrimp and crab pot fishermen that dump unwanted fish in the presence of dolphins train them to associate fishing boats with food. This may create a problem for other fishermen, notably hook and line fishermen, who subsequently experience higher levels of catch stealing by dolphins. Dressing fish on the boat may also have an influence, as the heads and guts of dressed fish are typically thrown overboard. Some fishermen in Alaska reported that they purposely dump offal to deter whales from eating the target catch, and as a result they have less of a problem with depredation than boats that don't provide offal.

Depredation in Spain

In Spain, bottlenose dolphins are abundant and remove mullet from both gillnet and trawl nets, damaging nets in the process. Reports of depredation are increasing, but it is not known if the problem is increasing in frequency, or if more fishermen are speaking up about it in order to solicit help in solving the problem.

Fishermen have been interested in using pingers to acoustically deter dolphins, but researchers are not optimistic that they will work well in reducing depredation. Pingers were banned from use in 2005 over concerns that they disturbed dolphins. Trials with acoustic deterrence devices (e.g., alarms) around fishing activities have shown that animals may initially be deterred but quickly become used to the sound, overcome their discomfort, and continue to depredate.

In the Atlantic US

In the Atlantic pelagic longline fishery, where depredation by pilot whales on swordfish and tuna catches is a problem, a multi-stakeholder team developed a take reduction plan to reduce interactions. The plan calls for shortening the length of the main line to no more than 32 km the area that experiences the highest rates of both depredation and interactions with fishing gear. The team focused first on strategies that would reduce the probability that whales would detect fishing activity, and then on strategies that would reduce the probability of depredation, and

lastly on strategies that would reduce the extent of harm to depredating marine mammals from entanglement or hooking.

Is bait or the catch targeted for depredation?

There are questions regarding whether whales are stealing the bait or the catch. Whales in Alaska are clearly feeding on the live catch and not the dead bait. However, this question has not been resolved for other fisheries. In cases where whales are stealing the catch, there are questions as to whether these fish species are part of the whales' normal diet. Researchers need a better understanding of the normal diet of whales in these areas. Biopsies and isotopic analyses could help identify typical prey items as well as prey of depredating whales.

Why do whales and dolphins depredate?

More information is needed regarding what causes whales and dolphins to start depredating on fishing gear. Declines in traditional prey species may be a factor. Depredation may have given whales an opportunity to expand their diet – to try something new. There was speculation that younger animals in the population are the first to experiment with novel food sources such as hook-caught fish. If true, this may explain why depredation behaviours sometimes spread within a whale or dolphin population rather slowly. In contrast, if mothers learned depredation first, it is expected that the behaviours would be picked up by their offspring rapidly.

It is not known if individual animals within a group have preferences for different prey species. Social factors may also significantly affect patterns of depredation. For example, tradition appears to play a strong role in the dietary preferences and feeding behaviours of killer whales, which appear generally slower than other whales and dolphins to turn to depredation. However, when depredation behaviour does become entrenched in killer whale populations, the whales can become extremely efficient and difficult to deter. Their seasonal distribution may change in order to take advantage of prey acquired by depredation, and it appears likely that populations could eventually become dependent on depredation. In contrast, other whales and dolphin species may take advantage of fisheries more quickly than killer whales but never become as efficient, singled-minded, or dependent.

It is not understood why depredation happens in some areas and not in others. It may be linked to the availability of food, or it may be a localized behavior and there hasn't yet been a transfer of behavior or exchange of animals between areas.

Methods to avoid depredation

Regardless of which deterrents are used, researchers need to test new deterrents and fishermen need assurances they will work. There is annual variability in both fishing success and depredation rates. Unfortunately, there has to be a fairly high interaction rate in order to test different mitigation strategies. Researchers also have to make the best use of scarce research dollars when choosing which new strategies to test. It may be necessary to do a cost-benefit analysis of different strategies first.

Prevention

Prevention is better than cure – if a deterrence or a barrier is used initially, animals would not learn the behavior and would not be motivated to go after the catch. However, once whales know where the fish are and how to get to them, they will not be deterred by noise or barriers.

Changing the pattern of the fishery

If depredation is linked to the predictability of fishing, it may be advantageous to change the starting date or length of the fishing season to keep one step ahead of the whales. Over time

whales learn new patterns, so fishermen might have to change their fishing patterns from time to time to keep whales away. In general, much more information is needed on whale movement patterns and normal feeding behavior to avoid fishing in areas and at times when whales are typically present.

Conflict with other species

Evidence of conflict between killer whales and other species may be useful in developing deterrents. In the Strait of Gibraltar, killer whales disappear when pilot whales arrive in the area. This seems curious because killer whales are bigger, although pilot whales are more aggressive. There are typically 6 killer whales in a group, whereas pilot whale groups are larger (perhaps 15 or more). In Alaska, researchers have seen Pacific white-sided dolphins harassing killer whales.

Acoustics

Researchers have tried playing sounds of competitors or harassers to deter certain marine mammals from an area, but have had only limited success. Marine mammals habituate to underwater sounds fairly quickly. This may be because the sounds don't mimic real life very well, in terms of the variety of sounds or the context that the sound is being used in. Sound devices in general don't seem to work in the long term. Note that this subject is discussed in much more detail in the workshop summary on acoustics.

Shooting

Some fishermen have shot at marine mammals in the past, but it is no longer an accepted practice and to a large degree fishermen have learned to live with depredation and loss of catch. It may not be a good situation, but at least in some fisheries the problems are manageable.

Government regulations

In some areas, the ideas that fisheries managers have come up with have not been taken up by fishermen voluntarily. These include communication between captains and not dumping offal. It may be more effective to put regulations in place so that fishermen comply with these avoidance techniques. If marine mammals are to be trained to avoid fishing vessels, it will require 100% compliance from all who are fishing in the area.

Suggestions for future research:

Develop a better understanding of the problem through baseline observations and analysis of existing data. More information is needed on the depredators (food habits, movement patterns (in time and space), population distribution and abundance, the age and sex of animals that are depredating). If possible, identify individuals using photos to determine if it is the same whales depredating.

Know the fishery well and ensure that realistic data describing the fishery is being collected. An understanding of where and when fishing takes place, and how the fishery has changed over time may provide insight into why depredation is taking place. Solutions may depend in part on how adaptive the fishery is. Is it flexible in terms of timing, and can fishermen stop fishing if whales are present?

Acoustic studies may provide some keys to avoiding depredation. These are elaborated on in Workshop 6.

Develop a better understanding of the impact of discharging offal and/ or discarded fish on depredation. Whales are learning to feed near boats (through positive reinforcement), which is then prompting depredation.

Develop a better understanding of the impact of depredation on the social structure, group size and dietary habits/preferences of whales. Are there potential effects on fitness, parasites, hunting abilities, disease resistance on whales, or on the carrying capacity of the area?

Consider the impact of interactions between depredating species and their possible implications for deterrence.

Use video equipment or acoustic recorders or echo-sounders to learn more about the ways that depredation occurs.

Suggestion for managers

Provide education and awareness amongst fishermen/stakeholders in different areas, and facilitate communication between and within groups of managers, fishermen, scientists, and other stakeholders directly involved with the problem.

Management solutions should be considered in the context of ecosystem management. For example it may be possible to allow for full retention of valuable species. The fishery needs to be managed adaptively.

What are practical solutions that fishermen can apply immediately?

Be aware of the presence of whales, using visual observations, hydrophones, acoustic detection, etc.

Do not provide any positive reinforcement (no intentional feeding and no discharging offal or discarding fish in the presence of whales across fisheries). Although some fishermen have found it beneficial to do this, it is a short term solution that causes more problems in the long run.

Reduce engine noise associated with fishing.

Stop fishing when depredation is taking place.

Share information amongst the fishing community about what works and where the whales are at any given time.

Use shorter lengths of gear so that it can be hauled more quickly.

Actively monitor the situation, such as through the placement of observers on board (although this may present some challenges because some fishermen may be reluctant or unable to accommodate an additional person on board). The observers need to be well trained on species identification and behavior. Observers must also be able to generate data in a useable form – i.e., there must be a user friendly data collection scheme.

What are measures/applications that DON'T work?

Although acoustic alarms may be effective in the short term, the workshop participants do not believe that they are a long term solution once depredation behaviours are well-established. Habituation is almost inevitable, given that marine mammals are intelligent and behaviourally flexible and fully capable of learning that the impact of alarms is outweighed by the benefits of extra food.

Discharging offal in the presence of whales does not work in the long run, it makes the problem worse.