

## **Workshop 2: Insights into the prevention of depredation from knowledge of whale behaviour and impacts of depredation on whale populations**

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The primary purpose of this workshop was to allow researchers and fishers to jointly discuss strategies for reducing or preventing depredation based on ongoing behavioural research and real-life observations of depredation. The workshop participants also briefly discussed the potential impact of depredation on whale populations. They agreed at the outset that the complex social behaviours of killer whales and sperm whales likely affect how depredation occurs, and that not all members of a population should be expected to respond in the same way to the opportunity to depredate. They also agreed that since both species have strong behavioural traditions, once a behaviour (such as depredation) becomes entrenched in a population it is likely to be difficult to change.

### **What do we know about whale behaviour that makes them likely to depredate?**

Both sperm whales and killer whales have very good underwater hearing, and they also use echolocation to help them acquire information about their environment. Since light transmits relatively poorly in water while sound propagates efficiently over great distances, whales generally rely on hearing more than they do vision. They are able to distinguish the sounds of different vessels, and can associate certain sounds (such as those produced by hydraulic winches) with certain activities (such as hauling gear). Thus it is very hard for a vessel to hide its activities from whales. It is known that many of the bottom fish depredated by killer whales are hauled up from depths exceeding the whales' maximum dive range, and that it therefore provides a resource that they would not otherwise have access to. Whales are capable of learning complex behaviours such as techniques for removing fish from gear with minimal risk of injury. Both species are capable of learning such techniques from other members of their social group, so that once developed by one or a few individuals, the behaviours can spread.

### **Where does depredation occur?**

Depredation occurs in areas where whales occur naturally. Depredation seems more likely to occur in areas where whale populations are growing, compared to areas where whale populations are in decline.

Some fishermen noted that when they fish in gullies, they are not bothered by whales. The reason for this was unknown. If they fish in shallower areas, they are more likely to be depredated.

### **Why does depredation occur?**

Depredation occurs because whales are rewarded with food, particularly in areas where fish abundance is low or high quality fish are difficult to acquire.

Both killer whales and sperm whales can use echolocation to obtain information on the size and species of fish on the line.

### **How do whales detect fishing activity?**

As described above, whales appear to use sound to locate vessels that are actively fishing. They recognize vessel noise and hydraulic noise. Some fishermen have spent a great deal of money trying to make their vessels quieter, but it has not significantly reduced the frequency with which they are targeted by depredating whales. This apparent contradiction may be explained

if whales cue in on cavitation sounds produced by vessels accelerating or hauling at high power, since these sounds are intense, travel great distances, reliably indicate fishing, and cannot be reduced by insulating engine compartments, uncoupling mechanical devices from the hull, etc.

Sperm whales appear to depredate any vessel fishing in the area, without showing preference for a particular vessel. This may be because all of the vessels respond in the same way to depredation, ie they continue to haul their gear. It is possible that if some vessels stop hauling their gear, or drop it back into the water, sperm whales will learn to start targeting only those vessels that continue to bring fish on board. This would be a worthwhile research project.

There is a general feeling that killer whales recognize boats from one year to the next, and some fishermen feel that they recognize individual humans. They do interact differently with different vessels, for reasons that are not known.

Sperm whale sounds travel further underwater than vessel noise, suggesting that fishermen should use hydrophones to detect sperm whales, and only set when they cannot hear them.

### **How do whales interact with the gear when they are depredating?**

It seems as if killer and sperm whales interact differently with fishing gear. Killer whales appear to be more conservative than sperm whales in terms of the risks that they will take to remove a fish from the line. It is likely both species use a variety of methods to remove fish from the line.

Despite their size, video footage shows that killer whales are capable of very delicate precise movements, which allows them to quickly take fish off the line. They do not damage the fishing gear when they do this.

Video footage from Alaska shows sperm whales raiding longline gear, and the line did not move when fish were taken, suggesting that sperm whales suck the fish off the line. Since they have massive tongues, it is possible that they could create enough suction to do this. Sperm whales do damage the line occasionally.

Sperm whales also tug on the gear. It is possible they can 'twang' the gear (pull hard on the line and then release it) to shake fish, particularly soft-mouthed species such as blackcod (sablefish), off the line. In Alaska when a line is 'twanged', rockfish float to the surface, although they are not taken by the whales. Perhaps sperm whales consume other more desirable species.

### **What effect does depredation have on whale populations?**

Depredation is not known to have had population level effects on killer or sperm whales. In the long run, however, food augmentation may lead to increased population size and/or dependency. On the other hand, injury from depredation or depredation deterrence could reduce whale numbers. In the early 1980's in Prince William Sound black cod fishers shooting at depredating killer whales caused a number of serious injuries but had little success in reducing depredation.

### **What does NOT discourage depredation?**

Retaliation appears to have little affect. As noted above, even shooting does not generally prevent depredation---it simply encourages the whales to be more evasive and to surface further from the boat.

**Suggested Future Research Actions**

Examine whether electricity could be used to deter whales from taking fish while the lines are being hauled (it would probably deter fish if used while fishing).

It is possible that if some vessels stop hauling their gear, or drop it back into the water, sperm whales will learn to start targeting only those vessels that continue to bring fish on board. It would be worthwhile to test whether sperm whales respond to this change in human fishing behaviour.