

Killer whales (*Orcinus orca*) scavenging on discards of freezer trawlers north east of the Shetland islands

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Summary

An account is given of observations on killer whales (*Orcinus orca*), scavenging on discards of a mid-water freezer trawler north-east of the Shetlands. Approximately 30-40 killer whales were present near 10 freezer trawlers fishing on large shoals of mackerel (*Scomber scombrus*). A brief description is given of different kinds of discards from this freezer trawler. The animals were feeding on fish that slipped through the meshes or fell overboard when hauling or shooting the net. The share of discards in their feeding is discussed.

Introduction

Flocks of seabirds scavenging on offal and discards of fishing vessels is a well-known phenomenon. Likewise cetaceans sometimes are associated with fishing vessels, not only for bow-riding, but also because of the discards. Scavenging by bottlenose dolphins (*Tursiops truncatus*) has often been described (Caldwell & Caldwell, 1972; Hill & Wassenberg, 1990; Leatherwood, 1975; Wassenberg & Hill, 1990), while information on other species is scarce. According to a skipper of a Dutch freezer trawler in the mid-water fishery west of the British Isles, dolphins come up to the ship, when the net is being hauled. According to fishermen, harbour porpoises (*Phocoena phocoena*) are often seen following the trawls, catching fish squeezed out through the meshes (Clausen & Andersen, 1988; Northsea, Skagerrak, Kattegat). The presence of killer whales in Faroese waters has been associated with the purse-seine mackerel-fleet (Bloch & Lockyer, 1988). Some observations are known of killer whales (*Orcinus orca*) (Postma, 1992) and pilot whales (*Globicephala maleana*) (observations of Henk Heessen, along the east-coast of Canada; observations by the author during the same period as dealt with in this paper) which came very close to fishing-boats. This paper gives an account of observations on killer whales (*Orcinus orca*). These observations were made aboard a Dutch mid-water

freezer trawler that fished for two weeks north-east of the Shetland islands, UK during the autumn of 1992.

Gear size and bycatches of small cetaceans

The vessel, named "SCH 33, Johanna Maria", is a 71 m stern-trawler. It is the smallest of the 13 Dutch freezer trawlers. Nevertheless the pelagic trawl that is used by this vessel has an opening of about 30 m vertical and 60 m horizontal. The front meshes have a diameter of 14 m. The largest freezer trawlers of the fleet use trawls with a vertical opening of 55 m and horizontal 120 m, with front meshes of 20 m. Towards the rear end of the trawl the meshes become gradually smaller.

The fishing areas of the fleet are around the British Islands, mainly along the shelf edge. Fishermen on board freezer trawlers frequently observe dolphins. According to the crews of some trawlers 'dolphins' are sometimes caught by accident. The information that is available at RIVO-DLO, is insufficient to make a reliable estimate of the yearly impact. However, it is assumed that bycatches by a freezer trawler are rare, (only a few occasions every year), but if dolphins are caught, this sometimes occurs in fairly large numbers (up to 10) in one haul. Species that are known to be involved are whitesided dolphin (*Lagenorhynchus acutus*), white-beaked dolphin (*Lagenorhynchus albirostris*), pilot whale (*Globicephala maleana*) and common dolphin (*Delphinus delphis*). It seems that killer whales seldom or never occur as bycatches in the Dutch pelagic trawl fishery.

Circumstances and method

During the stay in the area the trawler fished almost constantly. The period of a haul varied from 1 hour to about 10 hours (with an average of 4 hours). The vessels speed during a haul was 7 km/h and course was changed continually. Between two hauls speed was between 16 and 20 km/h, covering several (up to tens) km. Six times the vessel was not fishing or cruising at all for a period of 12 to 24 hours; on

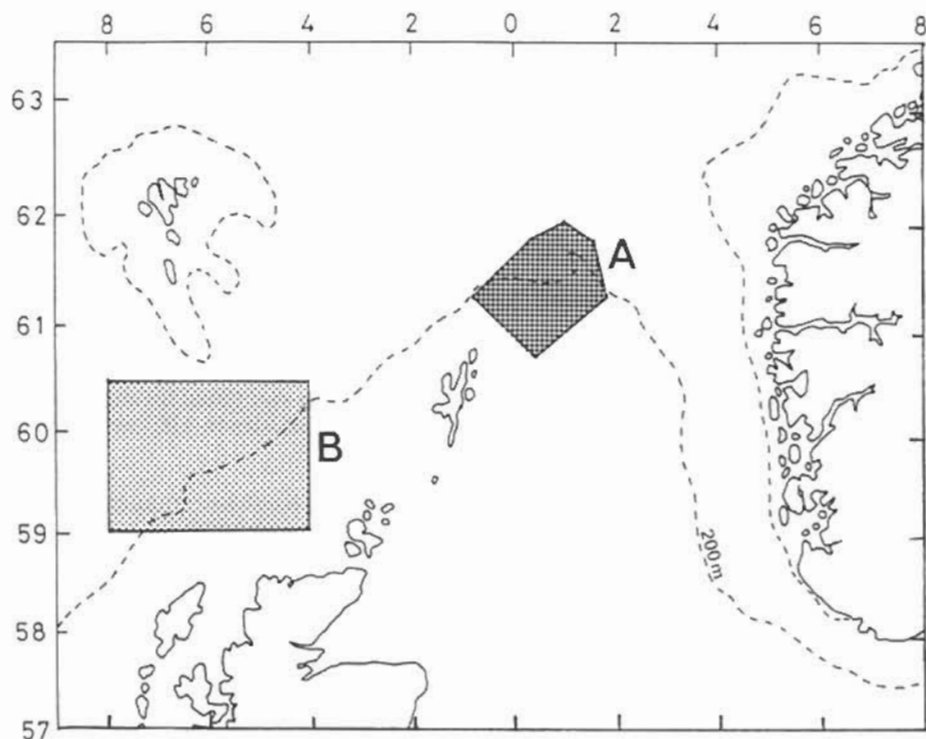


Figure 1. Trawler catching areas.

A Area fished in by the site-ship and other freezer trawlers in October and November 1992.

B Area where killer whales have been associated with the mackerel fleet between 1975 and 1986 (after Bloch & Lockyer, 1988).

these occasions a quantity of fish had to be frozen, before the storage-space in the cooling-tanks was large enough to allow further catches.

The ship stayed in an area between 61.10°N–0.49°W, 60.00°N–0.51°E, 61.10°N–1.46°E, 61.36°N–1.37°E, 62.01°N–0.52°E and 61.18°N–0.14°E (see Figure 1). The observation period was from 21 October till 5 November. The weather conditions were, considering the season, favourable. Half of the time the windforce was about 2 beaufort. However, stormy weather in the southern North Sea and in Faroese waters, as well as different directions of the swell made the sea surface rough. Days were relatively short and gloomy. During the second half of the period, the weather was rainy. Air temperature varied from 5 to 10°C.

Observations were made with a 10 × 42 pair of binoculars from the bridge or the bridge-wing (this also allowed a rear-view). Eye-level was about 8 m above the sea surface. Species, dates, positions and pod compositions and weather conditions were noted and the behaviour of the whales was observed.

The fishermen's target-species was mackerel (*Scomber scombrus*). During the period 26 hauls

were accomplished. The total catch was 900 tons. The catch of one haul varied from a few tons to over 100 tons. Catches were brought aboard in portions, so-called 'sacks' (in fact the far-most end of the net that has been tied off) of about 2–4 tons. The catch of a haul is collected in a sort of gutter. From there the fish falls through holes into the cooling-tanks of the ship. Catches are sorted, packed and frozen within 48 hours.

Discards on board of this freezer trawler can be divided into four categories:

1. *Discards that are released when the net is hauled*
That is fish slipping through the meshes or fish that fall overboard when a sack is emptied. This especially happens when there is too much fish in the gutter, after a relatively successful haul (more than 50 tons).

2. *Damaged, small fish and non-target species that are sorted out on the working deck*

These are washed off board. Since processing of the catches continues without a break, this category of discards is liberated all the time. In this case the

Table 1. Listing of observations.

No.	Date	Position	Pod composition					Time of day (GMT)	Period of occurrence in minutes	A	N	T
			♂	♀	sub-ad	calf	ad.?					
1	22-10-92	61.14°N-0.33°W	2	3	2			15.45	60	x		
2	23-10-92	61.26°N-0.03°E	2	2				7.15	65	x	x	
3	26-10-92	61.09°N-0.25°W	1					8.30	1	x		
4 ¹	29-10-92	60.53°N-0.55°E	3	5	5	1	16	9.30	120	x	x	x
5	31-10-92	61.28°N-0.38°E					1	1.30	5	x	x	x
6 ³	31-10-92	61.39°N-0.34°E	5	7				10.30	80	x	x	
7	02-11-92	61.43°N-1.30°E	1	1				9.15	37	x		
8 ²	02-11-92	61.48°N-1.25°E	1	1				10.40	20	x		
9 ^{2,3}	02-11-92	61.51°N-1.14°E	5	5				11.54	120	x	x	
10	02-11-92	61.51°N-1.13°E	5	5				14.00	5	x		
11	02-11-92	61.51°N-1.14°E	5	5				17.00	60	x	x	x
12	03-11-92	61.58°N-0.52°E	1	2				14.00	1	x		
13	04-11-92	61.43°N-0.04°E	4	5	2	1		10.05	110	x		

¹—14 animals stayed close to the ship for some time, later on joined by the 16 animals that are not further described (ad?). This group of about 30 killer whales moved away from the ship.

²—also associated with 1 (obs. no. 8) and 2 (obs. no. 9) freezer trawlers that stayed within a range of 3 km.

³—also observed joining for a few minutes a pod of pilot whales.

♂=male, (sub-)adult.

♀=female, (sub-)adult.

sub-ad=male/female, sub-adult.

calf=very young specimen, staying close to an adult female.

ad?=male/female, (sub-)adult.

A=swimming behind-, next to-or around the ship.

N=being at the net when it was hauled.

T=observation of a Killer whale actually taking fish.

total amount must have been several tens of tons, mainly herring (*Clupea harengus*).

3. Discards that are released when letting down the net

Fish may get stuck in the meshes. During hauling they get seriously damaged and the remains fall through the meshes when the net is shot again.

4. A whole catch is discarded

This happens very rarely, for example when—unexpectedly—the storing rooms run out of capacity. The amount can be tens of tons at a time.

Observations

Individual observations are listed in Table 1. It is difficult to say which part of the observations apply to the same animals, therefore it is certain that the observations are biased. The pod of observation no. 1 may have been part of the pod seen during observation no. 4. The observations no. 4 (partly) and no. 13 probably apply to the same pod, the same may be valid for the observations no. 9, 10

and 11. The animals in observation no. 6 may have been part of the 16 animals that are not further described in observation no. 4. A realistic assumption is that two more or less tight pods stayed in the area, existing of 10 and 14 animals. At the same time at least another 6 animals were roaming on their own, in small groups or joining the pods.

All observations are applying to animals that were associated with the site-vessel. This means they stayed, followed, came up to or were swimming around the ship, or they were next to the net when it was being hauled. Observations no. 5 and no. 11 occurred after sunset. Three times it was observed that a killer whale actually took fish.

Observation no. 4: an adult male took three mackerel of about 35 cm a meter below surface.

Observation no. 5: a haddock (*Melanogrammus aeglefinus*) of about 50 cm, thrown overboard by a crew-member, was taken.

Observation no. 11: two animals took about 5 mackerel that were thrown towards them by the author.

These are the only observations of killer whales actually taking fishes. However it was obvious that

the greater part of fish that fell into the water when the catch was dragged on board in the presence of the animals, was captured. The animals often came so close, that the only way to sight them was leaning over the stern-end of the ship. In observation no. 11 the animals lay quietly at the surface on moments that no fish fell overboard. Often the net was touched (possibly they were taking fish that got stuck in the meshes).

It is not clear whether the killer whales fed on fish that had been sorted out (discards category 2). The animals that were hanging around the ship for some time (often within 50 m) might have taken this fish. Over the whole period this category of discards is a much more bulky feeding-source, compared to the other categories of discards. Complementary observations showed that most of the sorted out fish was not captured by birds, but sank and hence was available to aquatic organisms like killer whales: of 68 herring thrown overboard, 57 (83.8%) sank; of 25 mackerel 23 (92%) sank.

The killer whales never stayed long at the openings where these discards came out. If the animals fed on these discards, they did so away from the vessel and on a greater depth. The animals were less interested or not interested at all in these discards. Maybe the fact that the bulk of sorted out fish (mainly spent herring) was small and lean compared to the fishes in the total catch. Also this fish had been dead for a period up to 48 hours, whereas fish of discards category 1 were sometimes still alive.

The taking of damaged fish-remains that get liberated when the net has been let down cannot be excluded. Observation no. 3 applies to a killer whale following the ship while the net was shot.

In the area, during the same period, about 10 other mid-water trawlers were fishing on mackerel. Besides 5–15 purse-seine and pair-trawlers were active. The trawlers often remain together within a range of tens of kilometers to increase the chances of locating concentrations of fish. The killer whales visited other stern-trawlers as well, as appeared from two observations by the author and information from other fishermen on the radio. The crew of the site-ship was not surprised by the observations of killer whales and it did not seem to be unusual that the animals came so close to the net when it was hauled. However, they stated never to have seen so many on one fishing trip.

Discussion

According to Bloch & Lockyer (1988) in the years 1975–1987 killer whales were associated with the Faroe mackerel fleet (purse-seine) in an area west of the Orkneys, between 59–60.30°N and 04–08°W; see figure. The number of animals is reflecting the fish

abundance as the killer whales only appear where the mackerel occurs in large shoals. Using the sonar, the fishermen can track the whales and thus locate the mackerel. Feeding on discards is not mentioned. However it is said that when killer whales are close by and the purse-seine net is full, they tear the net to get to the fish. It is possible that the killer whales mentioned by Bloch & Lockyer are (partly) the same as the ones dealt within this paper, because the greatest activity of the mackerel fishery, together with the wintering shoals of mackerel, have been shifted during the last twenty years in north-easterly direction (Anon., 1990).

It is obvious that enough fish was available in the area for the killer whales to feed naturally. Therefore the presence of the animals in the area cannot only be attributed to the discards of the stern-trawlers and other fishing vessels. However, suppose there were 30–40 killer whales active in the area, then they must have spent quite some time close to the stern-trawlers. Is it possible that the mackerel that were released when hauling the net (discards category 1), was enough to feed them? For one stern-trawler the amount of these discards might be up to a few hundred kilograms per haul. We assume that this weight is about 500 kg per vessel a day. For each killer whale 500×10 trawlers/40 animals = 125 kg should be available per day. It is known that this quantity was captured only partly, for at only 6 of 26 hauls killer whales have been sighted.

The average weight of an eastern North Atlantic killer whale is 2350 kg (Christensen, 1982). Based on data of a female killer whale from the Sea Mammal Park in Harderwijk, the Netherlands (Kastelein & Vaughan, 1989), a killer whale of this weight should consume about 50 kg of fish every day at a water temperature between 15 and 22°C. Because of the lower water temperature in the area ($9^\circ\text{C} \pm 2^\circ\text{C}$), the energy-needs were probably larger. However, this might be compensated by the fact that mackerel at this time of year has a very high fat-content (16–22%; personal communication C. J. Weber, RIVO-DLO).

It is likely that a substantial part of daily feeding of killer whales present in this period consisted of mackerel that became available when hauling the net. Moreover, the discards of all categories together (consisting mainly of sort out fish) of all vessels present in the area, were certainly enough to feed several hundred killer whales.

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