

Opportunistic sightings of killer whales from Scottish pelagic trawlers fishing for mackerel and herring off North Scotland (UK) between 2000 and 2006

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Received 12 April 2006, Accepted 4 October 2006

Abstract – Killer whale (*Orcinus orca*) encounters from commercial pelagic trawlers as well as other types of vessels have been documented in several regions of the northeast Atlantic; however, very little published information is available regarding such encounters in mackerel (*Scomber scombrus*) and herring (*Clupea harengus*) fisheries, in the waters between northern Scotland and Norway. Mackerel and herring are the two main fish species targeted by the Scottish pelagic fleet, primarily during October to March and June to September, respectively. Encounters with killer whales were recorded during January and February 2006 by observers on a pelagic trawler fishing for mackerel in this area. These recent data, along with historical records collected since 2000, demonstrate the existence of frequent encounters between commercial pelagic trawlers and killer whales. We describe the foraging behaviour displayed by the whales during fishing operations. Killer whales approached the vessels during retrieval of the net, and remained there until this was completed. They were sometimes sighted during steaming and towing, although there was no observed contact with the boat or net at these times. There is no evidence that the presence of killer whales reduced the amount of fish caught by the trawlers or that killer whales ever become entangled in the nets. We suggest that, during the mackerel fishing season, the whales may obtain a significant proportion of their daily energy requirements from this source.

Key words: *Orcinus orca* / *Scomber scombrus* / *Clupea harengus* / pelagic trawler fishery / Shetland and Orkney Islands.

Résumé – Recensement d'orques, à partir de chalutiers pélagiques écossais, à l'occasion de la pêche au maquereau et au hareng, au large du nord de l'Écosse, entre 2000 et 2006. Les observations d'orques (*Orcinus orca*), à partir des chalutiers pélagiques ou d'autres types de bateaux, sont relevées dans plusieurs régions de l'Atlantique Nord-Est; cependant, très peu d'informations sont disponibles, en ce qui concerne ces observations dans les pêches de maquereaux (*Scomber scombrus*) et de harengs (*Clupea harengus*) dans les eaux entre le nord-est de l'Écosse et la Norvège. Maquereau et hareng sont deux principales espèces recherchées par la flotte pélagique écossaise, d'octobre à mars, et de juin à septembre, respectivement. Les observations d'orques ont été enregistrées durant janvier et février 2006 par des observateurs embarqués à bord de chalutiers pélagiques pêchant le maquereau dans ce secteur. Ces données récentes, avec celles récoltées depuis 2000, démontrent l'existence de fréquentes rencontres entre chalutiers et orques. Nous décrivons le comportement « fourrageant » de ces orques, manifesté lors des opérations de pêche. Les orques approchent les bateaux durant les opérations de tri du chalut, et restent là jusqu'à la fin. Ils sont vus aussi lors du relevé du chalut bien qu'aucun contact avec le bateau ou le filet n'ait été observé alors. Il n'y a pas de certitude que la présence des orques réduise la quantité de poissons capturés par les chalutiers ou même que les orques s'empêchent dans les filets. Nous pensons que durant la saison de pêche au maquereau, les orques tirent de cette source, une part significative de leurs besoins énergétiques journaliers.

1 Introduction

The killer whale (*Orcinus orca*) occurs throughout all oceans and contiguous seas (Dahlheim 1981; Leatherwood and Reeves 1983), from equatorial regions to the polar pack ice zones; nevertheless, they are most numerous in coastal

waters and cooler regions where productivity is high (Jefferson et al. 1993; Dahlheim and Heyning 1999). In UK waters, killer whales are present all year round (Reid et al. 2003), although sightings close to the coast occur mainly between April and October (Evans 1988, 1992). In waters off the North East of Scotland, between Shetland and Norway, killer whales have also been regularly recorded during November to March (Reid et al. 2003). Sightings of killer whales have also been regularly

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recorded off Shetland since around 1990, where they make up between 9% and 47% of all cetacean sightings records each year (Shetland Biological Records Centre, unpublished data). Sightings in the eastern North Atlantic gave rise to rough estimates of around 3100 killer whales for the area comprising the Norwegian and Barents Seas, as well as Norwegian coastal waters, and some 6600 whales for Icelandic and Faroese waters (Reyes 1991), although it is not clear whether animals seen off Scotland are part of this population.

Killer whales diets may vary locally and seasonally (Heyning and Dahlheim 1988), influenced by the migration of fish and other target prey. A wide range of prey species has been documented for killer whales that includes cephalopods, bony and cartilaginous fishes, marine turtles, seabirds, small marine mammals and even great whales (Caldwell and Caldwell 1969; Felleman et al. 1991; Jefferson et al. 1991; Baird et al. 2006). Nevertheless, in high latitude areas in both the Northern and Southern Hemispheres, some coastal populations are known to develop very specialized foraging strategies (Lopez and Lopez 1985; Heimlich-Boran 1988; Similä and Ugarte 1993; Similä 1997), targetting certain prey species, such as fishes or marine mammals (Baird et al. 1992; Similä et al. 1996). Studies of killer whale pods resident in the coastal waters of the north-eastern Pacific and south-western Atlantic have demonstrated that they have learned how to take advantage of seasonally abundant prey within their home range, which might cover thousands of km² (Bigg 1982). Resident killer whales in Pacific Northwest waters use regions of high relief topography along salmon (*Oncorhynchus* sp.) migration routes, whereas “transient” whales forage for pinnipeds in shallow protected waters (Dahlheim and Heyning 1999).

Interactions between killer whales and fisheries are known from many parts of the world. Recently, killer whale depredation of long-line catches in the South Atlantic and Southern Ocean has attracted attention (Purves et al. 2004; Kock et al. 2006). In some regions of the northeast Atlantic, killer whales are known to follow pelagic trawlers, as well as other fish-processing vessels, for many miles. As the trawlers bring aboard quantities of mackerel (*Scomber scombrus*), killer whales consume fish that slip from the net during hauling and pumping operations. In the Bering Sea, the same pod of whales was reported to follow a vessel for 31 days over approximately 1600 km (Dahlheim and Heyning 1999). In Norwegian waters, killer whales appear to have modified their foraging strategies to take advantage of the presence of the herring (*Clupea harengus*) fishing fleet, feeding on herring that fall from the nets (Simila et al. 2005). In some cases (e.g. depredation on long lines) these interactions clearly reduce fishery catches, although none of the studies suggested that the whales were harmed by the interaction. Nevertheless, other cetacean species (notably dolphins and porpoises) suffer by-catch mortality due to entanglement during similar interactions (Morizur et al. 1999; López et al. 2003).

Scottish pelagic fisheries are divided into two main components, separated by species and time. The mackerel fishery starts in the northern North Sea, generally in October, and concentrates on pre-migration fish along the edge of the Norwegian Deep in the NE North Sea. These fish occur mainly within the Norwegian Exclusive Economic Zone

(EEZ), which is inaccessible to Scottish boats. Thus, Scottish pelagic trawlers tend to sit along the EEZ line, generally close to the 200 m contour and wait for fish to cross when they start migrating westwards. Then, normally around December, the fleet will move with them although this can be as late as February. By February or March, most catches are being taken west of Scotland, and as far south as west of Ireland. The fishery then ends for Scottish vessels. As there is an annual quota, most boats retain quota after March to allow them to fish again in the autumn. The same pattern of mackerel fishing is also prosecuted by the substantial Irish pelagic fleet. Other nations such as Norway and Russia have quota in the mackerel fishery although Norway tends to fish within its own EEZ and at different times of year whereas Russia mostly fishes in international waters north of Shetland in the third quarter. The UK quota (mainly taken by Scottish vessels) is currently 127 600 tonnes (30% of TAC), worth around 150 million euros (Keltz and Robb 2006).

The Scottish North Sea herring fishery takes place from June to September and is concentrated in the northern North Sea, around the Shetland Islands, on pre-spawning aggregations. It also tends to follow the migration south towards spawning areas around Shetland and off NE Scotland. Danish, English and Dutch vessels also take part in the fishery. The UK quota (again mainly taken by Scottish vessels) is currently around 70 000 tonnes (13% of TAC), worth around 7.5 million euros, i.e. only around 5% of the value of the mackerel fishery (Keltz and Robb 2006).

Couperus (1993) recorded killer whales associated with purse seiners targeting mackerel off the North East coast of Scotland, and whales were observed taking fish from the nets (Reid et al. 2003). Although purse seiners dominated the Scottish pelagic fleet in the early 1990s, the present (smaller) fleet consists of pelagic trawlers and little is known about their interactions with killer whales. A previous small-scale study of by-catches in Scottish pelagic fisheries in early 2001 reported incidental sightings of minke whales (*Balaenoptera acutorostrata*) but there were no confirmed sightings of killer whales and no cetaceans were sighted by fishery observers during 16 days at sea with the mackerel fleet (Pierce et al. 2002).

The aim of this paper is to describe encounters between killer whales and commercial pelagic trawlers off North-East Scotland, based on new observations by marine mammal observers during the 2006 mackerel fishery and historical sightings from the mackerel and herring fisheries during 2000–2005. We investigate the spatial and temporal distribution of encounters within the fishing area. We describe the whales’ feeding behaviour during the whole fishing operation and investigate whether there is any evidence that these encounters have adverse consequences for the whales or for the fishery.

2 Material and methods

2.1 The sampled fleet

The Scottish pelagic fleet consists of 26 vessels. These are generally large stern trawlers. The average length is 61 m (45–76 m) with an engine of around 5700 HP

(1800–11000 HP) and refrigerated sea water capacity of 1500 m³. Eight of the vessels are based in Shetland, and the remainder in NE Scotland. In addition there are three vessels based in Northern Ireland that also prosecute this fishery. The fleet all use large pelagic fishing nets, with a mouth circumference between 1300 m and 1700 m (depending on whether the boats are fishing singly or in pairs). The nets are towed at speeds between 4 and 5 knots (Keltz and Robb 2006).

2.2 Data collection

A fishery observer was present on-board during 13 fishing trips by pelagic trawlers engaged in the mackerel fishery in the northern North Sea (ICES area IVa), during January–February 2006, with an additional dedicated marine mammal observer present during two trips. Fishing trips usually last around one week. A large proportion of this time is spent steaming and scouting for fish, with an average of one trawl set (duration 2 to 5 hours including hauling) per day.

The observers were stationed on the bridge (5 m above sea level), scanning visually by eye or using 10–30x binoculars over 360 degrees. When both observers were on-board and visibility was good, continuous observations were carried out from 07.00 h to 17.00 h in 2-hour blocks. Both observers were present during the first, third and fifth blocks, and each observer worked for one hour during the second and fourth blocks. When only the fishery observer was on board, continuous observations were not possible as the observer was sometimes required to be on the deck to sample the catch. In periods of reduced visibility, observations were made only during hauling of the net, which typically lasts for around 1.5 h.

When an encounter with killer whales took place, data on number of individuals within the group, sex, age groups (calf, juvenile and adult) and behaviour were also collected. The behaviour of whales during an encounter was described and later categorized (after Jacobsen 1986; Ford 1989; Similä 1997; Sautilis et al. 2000) as foraging (tail-slapping, releasing blasts of bubbles, etc., behaviours associated with pursuing, handling and catching prey), resting or “other behaviour” (including travelling, spy-hopping, breaches and flipper slaps).

2.3 Historical records

We also summarise data on marine mammals sighted by fishery observers during previous fishing trips in the herring and mackerel fisheries from 1997 to 2005. As these sightings were not collected by dedicated marine mammal observers, it is likely that cetaceans were not recorded rigorously on every occasion that they were present.

To identify areas of overlap between whale presence and the fishery, data on the distribution of reported mackerel and herring catches in 2005 (the most recent data available and thought to be representative of the normal distribution of the fishery) were extracted from the Fisheries Research Service (FRS) database, Marine Laboratory Aberdeen and all data sets mapped using ARCVIEW software.

In addition, we mapped sightings records of killer whales in the Shetland area provided by the Shetland Sea Mammal

Group (1989–2006). Most records include date, location and number of animals, so it is possible to examine interannual and seasonal trends.

3 Results

The presence of killer whales was recorded during 33 hauls over 13 trips in January to February 2006 (during the first quarter fishery), with a total of 513 killer whales observed (Table 1). During this time a total of 97 hours of fishing effort was achieved and 8527 tonnes of mackerel were caught.

The whales were always seen in groups, with group size ranging from 3 to 40 individuals (mean = 17.4; st dev = 12.5, excluding one event described below). Most groups included calves, juveniles and adults of both sexes. On 4th February 2006 (61° N, 1° 30' W), when ten pelagic trawlers were fishing in close proximity at the same time, around 200–300 killer whales were present. These whales were in groups of 10 to 40 animals, following the nets and feeding off mackerel. During the event, some of the pelagic vessels were hauling whereas others were still towing the nets.

Most killer whale sightings in 2006 took place north and east of Shetland (Fig. 1a). Only two killer whale sightings occurred west of 3° W, although this may simply reflect the concentration of fishing effort (and observer effort) in the eastern part of the fishery area, in January and February. On most occasions (see Table 1 for details), the whales approached the vessel during retrieval of the net, as fish were being pumped aboard, and remained there until this action was ended. Occasionally, they were observed during steaming and towing. There was no observed contact with the boat or net at any time. Killer whales did not seem to try to avoid the fishing vessels (allowing good quality photographs to be taken, e.g. Fig. 2). No evidence of entanglement and damage to the nets was seen during 2006.

The most frequently observed foraging behaviours were tail-slapping and the release of blasts of bubbles, which were observed during 17 out of 19 encounters. Resting was seen during 11 out of 19 encounters. Animals switched from one activity to another frequently throughout the encounters and it was not possible to quantify the number of individuals involved in each specific behavioural category or the time spent in each. Apart from these two basic types of behaviour, others such as spy-hopping, breaches and flipper slaps were also performed sporadically by a few members of the groups.

Regarding the historical data, no killer whale sightings were recorded prior to 2000 (Table 2). During 2000–2005, killer whales were seen on 33 occasions, all during the mackerel fishery, in the months of October to February. On all but nine occasions the whales were seen swimming around or alongside the ship, most frequently (14 times) during pumping.

In contrast, no killer whale encounters were recorded during fishing for herring (June to September). Other cetacean species such as pilot whales, minke whales and porpoises, were however sighted on several occasions (see Table 2), confirming that the absence of killer whale sightings is not entirely due to absence of observer effort, although none approached the boat during fishing operations. Seals were seen alongside

Table 1. Killer whale observations during 2006. Data recorded included date, time, position, number of animals in the group spotted (pod size), boat activity, and behaviour (F: Foraging – tail-slapping; releasing bubbles; R: resting; O: other – spy-hopping; breaches, flipper slaps, swimming) (Jacobsen 1986; Ford 1989; Similä 1997; Sautilis et al. 2000). Time is reported in hours (1st 2 digits) and minutes (second two digits), latitude and longitude in degrees and minutes.

Date	Time	Latitude	Longitude	Pod size	Boat activity	Behaviour recorded and comments
2 January 2006	1600	5946 N	0408 W	8	Hauling	F,O,R
4 Jan.	1230	6043 N	0217 W	40	Pumping fish	F,O
4 Jan.	2100	6047 N	0221 W	12	Pumping fish	F,O,R
16 Jan.	2100	5830 N	0719 W	4	Hauling and pumping fish	F,O
4 Feb.	0800–1600	6100 N	0130 W	200–300	Hauling and towing net	O
7 Feb.	1930	6145 N	0007 W	40	Pumping fish	F,R,O
7 Feb.	2210	6143 N	0004 W	40	Hauling	F,R,O; dumping herring by-catch
10 Feb.	1430	6137 N	0133 E	6	Hauling and pumping fish	F,R,O
30 Jan.	1030	6145 N	0123 E	24	Hauling and pumping fish	F,R,O
30 Jan.	1300	6147 N	0124 E	4	Before shooting net	O
30 Jan.	1545	6152 N	0121 E	18	Pumping fish	F,R,O
30 Jan.	1540	6137 N	0133 E	20	Pumping fish	F,R,O
30 Jan.	1730	6137 N	0133 E	10	Pumping fish	F,R,O F,O
27 Jan.	1000	6147 N	0029 E	3	Hauling	Following net whilst herring was being slipped. Orcas quickly lost interest
27 Jan.	1600	6141 N	0131 E	4	Steaming	O: swimming
28 Jan.	1030	6134 N	0139 E	20	Pumping fish	F,O
31 Jan.	1800	6133 N	0137 E	20	Hauling and pumping fish	F,R
3 Feb.	2300	6058 N	0140 W	20	Hauling and pumping fish	F,O
4 Feb.	1130	6116 N	0122 W	20	Hauling and pumping fish	F,O

during pumping on seven occasions – and seals were caught in the pipe during pumping in six of these cases, with a total of 16 mortalities. The historical data also show most killer whale sightings to be concentrated in the eastern part of the mackerel fishery area (Fig. 1b). During the herring fishery, most marine mammal sightings were of seals, mainly to the east of the Orkney Islands (Fig. 1c). Figure 1 also makes clear the strong overlap between the herring and mackerel fishing areas.

From 1989 to 2006, the Shetland Sea Mammal Group recorded 539 sightings of one or more killer whales (totalling over 2900 animals sighted) inshore around Shetland. Sightings were recorded in every year but with a peak ($N = 73$) in 2000. As can be seen from Figure 3, numbers of sightings are highest in the second and third quarters of the year and lowest in the first quarter. Most records were from June and July. Clearly, since records are submitted by volunteers, these results are not corrected for effort. However, it may be noted that killer whale sightings in inshore Shetland waters are frequent during the period of the herring fishery and rare during the mackerel fishing season.

4 Discussion

4.1 Spatial and temporal distribution of encounters within the fishing area

Almost all historical sightings of killer whales adjacent to pelagic trawlers, during the mackerel fishing season, took

place to the east of Scotland even though the fishery extends around to the west coast in spring. There were no killer whale sightings in March and, at least from the data collected to date, it appears that killer whales do not follow the migration of mackerel westward. Sightings in the first two months of 2006 were all to the north of Shetland. These findings are consistent with killer whale distribution records in Reid et al. (2003).

Observations from the summer herring fishery, although small in number, suggest that killer whales do not presently interact with this fishery, as no encounters were recorded. However, killer whales are apparently present in the area over the summer, being recorded regularly in May and June along the continental slope north of Shetland during surveys in 1979–1999 (Pollock et al. 2000). Furthermore Shetland's fishermen have reported aggregations of hundreds of killer whales close to the continental shelf during summer months. There have been over 500 recorded sightings of killer whales in Shetland coastal waters over the last 17 years (Fisher et al. 1998 and Shetland Sea Mammal Group, unpublished data), mainly from April to September. Fisher et al. (1998) note that killer whales may feed on mackerel shoals in inshore waters and that they also take seals. Thus the seasonal pattern of sightings may reflect feeding migrations between inshore waters (summer) and offshore waters (winter). In any case, killer whales are seen least frequently around Shetland during the (offshore) mackerel fishery, consistent with sightings from the pelagic fleet.

In Norwegian waters, killer whales target the herring fleet as it fishes on overwintering herring during October to January,

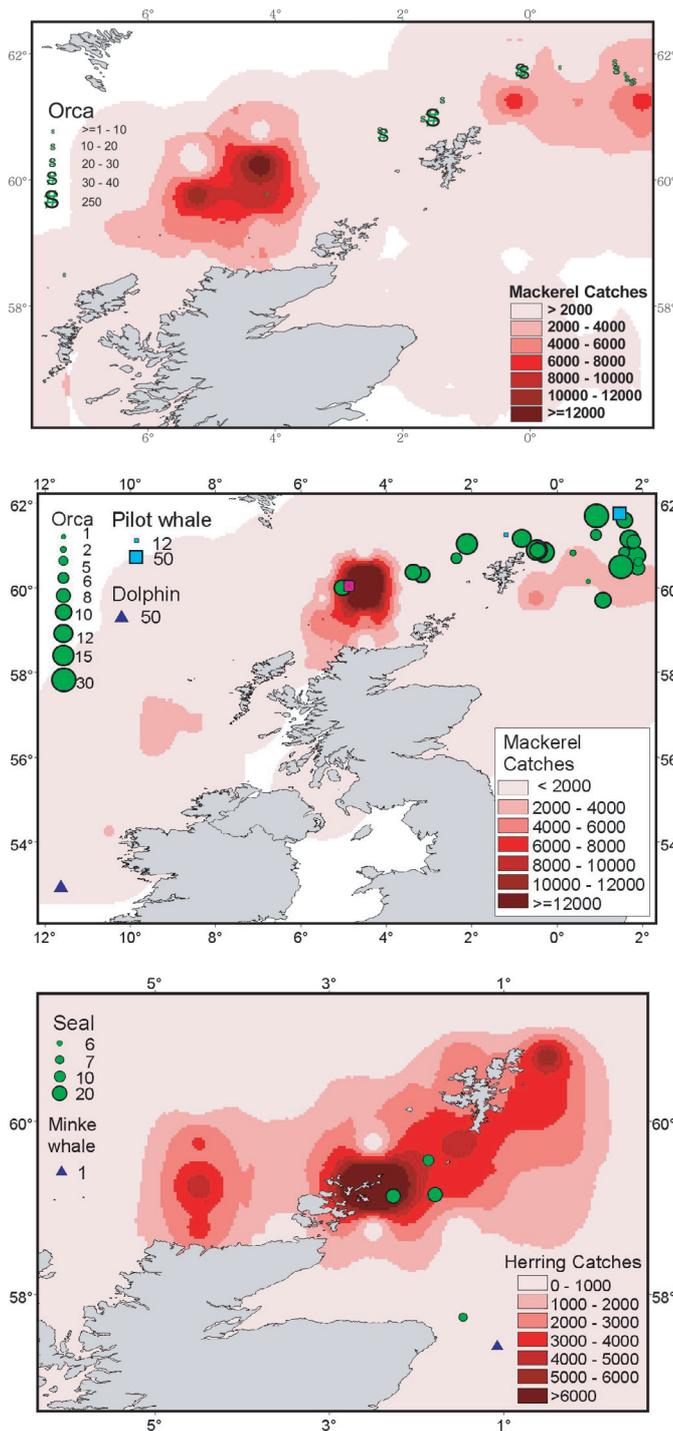


Fig. 1. Geographical distributions of pelagic fish catches and cetacean sightings from pelagic boats. Catches are based on reported data for each ICES rectangle. Data interpolation has been used to generate contours. Killer whale sightings refer to number of times a pod of orcas was sighted.
 (a) Mackerel catches by the Scottish pelagic fleet in 2005 (tonnes) vs. marine mammal sightings during January and February 2006.
 (b) Mackerel catches by the Scottish pelagic fleet in 2005 (tonnes) vs. marine mammal sightings during mackerel season (October to March), 1997–2005.
 (c) Herring catches (tonnes) by the Scottish pelagic fleet in 2005 vs. marine mammal sightings during herring season (June to September), 1997–2005.

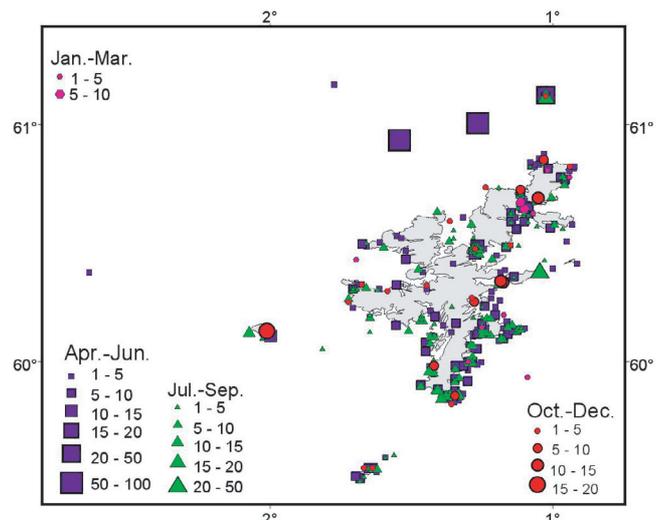


Fig. 3. Locations of killer whales sightings around Shetland from 1989–2006 ($n = 539$, data from the Shetland Sea Mammal Group) showing the seasonal pattern of sightings.

overlapping in time with the killer whale-mackerel fishery interactions described here. The movement and aggregation of killer whale pods in Norwegian coastal waters has been found to be associated with the seasonal movements and spawning of shoaling fish (Christensen 1988). Thus these two examples of interactions apparently involve different groups of killer whales and may represent independently learned feeding strategies that take advantage of readily accessible and energetically valuable food sources.

Mackerel in the North Sea and west of Britain spawn in the summer (May to July; Muus and Nielsen 1999) and their fat content will thus be high in spring and lowest in late summer. Thus there is no apparent reason why mackerel should become less attractive a food item for killer whales in March.

The fact that the whales apparently do not interact with the Scottish summer herring fishery, and do not seem to follow the mackerel fleet when it moves west in spring, could indicate that this type of interaction is seasonal in nature. Although, killer whales do not have a fixed breeding season, in the North Atlantic mating occurs mainly in October and November (Jefferson et al. 1993). Given a gestation period of 17 months, this means that most births will occur around March and April, and it is during April to October that killer whales have most commonly been recorded close to the coast. Caution is however needed in interpreting the historical sightings data, since no dedicated marine mammal observers were present on the Scottish herring boats.

4.2 Killer whales feeding behaviour during fishing operations

The behaviour observed from the boats was mainly “foraging”, with the killer whales feeding on spilled or discarded fish from pumping operation, without touching the net. Tail-slapping, releasing blasts of bubbles and flashing the white ventral side of their bodies were also recorded. Feeding on



Fig. 2. Photograph of male killer whale alongside a pelagic trawler fishing for mackerel, during hauling of the net.

Table 2. Sightings recorded onboard of pelagic trawler vessels fishing for mackerel and herring in the northern North Sea, 1997-2005. Total numbers of killer whales are based on summed counts, across all sightings (D = dolphins, M = minke whales, P = porpoises, PW = pilot whales, S = seals).

Year	Hauls	Hauls with killer whales present	Total number of killer whales observed	Other marine mammals observed
Fleet:				
<i>Mackerel</i>				
1997	1	0		
1998	4	0		
1999	5	0		
2000	14	2	24	
2001	29	1	8	
2002	23	1	6	
2003	22	5	46	2 PW
2004	16	7	93	1 D
2005	22	17	244	
Fleet:				
<i>Herring</i>				
1997	1	0		
1998	15	0		
1999	0	0		
2000	16	0		
2001	20	0		3 S
2002	20	0		2 P, 2 S
2003	14	0		
2004	12	0		1 S
2005	13	0		1 M, 1 S
Total	247	33	421	

spilled and discarded fish represents a relatively effortless feeding option. Behavioural adaptation to exploit such opportunities seems to be a notable element of the development of feeding strategies in this species (Lopez and Lopez 1985; Hückstädt and Antezana 2003; Similä et al. 2005).

Thus, there were no observations of killer whales from the boats in the Scottish mackerel fleet during 1997–1999, the interaction between killer whales and trawlers targeting mackerel is perhaps of recent origin in this area, although previously known in the Bering Sea (Dahlheim and Heyning 1999). However, as noted above, killer whales were known to interact with purse seiners in the same area during the early 1990s (Couperus 1993). As such, the whales' precise foraging strategy in the presence of mackerel boats may still be evolving and at the same time spreading through the population. Thus continued study of feeding displays coupled with photo-identification of individual whales could yield interesting results.

The use of acoustic monitoring equipment (e.g. towed hydrophone arrays) and/or underwater (e.g. net-mounted) cameras would enable use to determine whether killer whales remain in association with the vessels throughout the fishing operation or if they approach the boats only once pumping begins.

4.3 Consequences for the whales and the fishery

Our observations suggest that killer whales do not usually approach the trawlers during towing of the net when they might be at higher risk of entanglement in the net. No instances of entanglement or contact with the net were observed during the present study. Killer whales are probably not at risk from by-catch mortality in pelagic trawls although several instances of seals being caught in the pipe during pumping were recorded. By-catches of small delphinids and seals by pelagic trawlers have been recorded in other areas of the northeast Atlantic (e.g. Morizur et al. 1999; López et al. 2003).

There was no evidence of damage of the net caused by whales during fishing operations. Furthermore, since the whales fed on discarded or spilled fish, which would mostly be dead or moribund, this interaction neither reduces the catch nor contributes to mortality of the fish. The fact that whales follow the boats for long periods, as previously recorded by Dahlheim and Heyning (1999) suggests that, at least for short periods, the whales may obtain a high proportion of their daily energy needs from the fishery. However, we do not at present know what proportion of the whales' feeding takes place away from the pelagic trawlers or if they regularly take free-swimming mackerel. Thus, the possibility remains that the whales and the fishery are competing for food. Further studies are needed on the importance of mackerel and herring in killer whale diets, and also on the impact of killer whales as a top predator on the mackerel stock.

Further work is required to determine whether the seasonal movement of killer whales reflects a response to the distribution of mackerel and herring within the region. According to Similä et al. (2005), the herring fishery has become a major factor influencing the movement pattern, habitat use and behaviour of killer whales in Norwegian waters.

Acknowledgements. We would like to thank all the participating skippers and crew members for their support during this study, in particular those from the Lunar Fishing Company of Peterhead. We thank Paul Harvey from the Shetland Biological Records Centre and the Shetland Sea Mammal Group for providing access to their unpublished sightings records. We also thank two anonymous referees and the journal editor for helpful comments on the manuscript.

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