SOME OBSERVATIONS OF MINKE WHALE (*BALAENOPTERA ACUTOROSTRATA)* FEEDING BEHAVIOUR AND ASSOCIATIONS WITH SEABIRDS IN THE COASTAL WATERS OF THE ISLE OF MULL, SCOTLAND

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INTRODUCTION The Hebridean Whale and Dolphin Trust and Sea Life Surveys, a commercial whale watching business, have been conducting research in the coastal waters of the Isle of Mull, on the west coast of Scotland, since 1990. The main focus of the research is the minke whale (*Balaenoptera acutorostrata*), and data collection has involved recording sightings, photo-identification, and noting behaviour. The main behaviour noted is feeding behaviour, in particular lunge feeding, often in association with many seabirds.

Most survey effort is dedicated to the photo-identification project which concentrates on obtaining close-up photographs of the whale. However, occasionally sequences of photographs are taken of feeding behaviour, in particular, lunge feeding. Data on seabird species in the vicinity of encountered whales was recorded for the period 1992-1995.

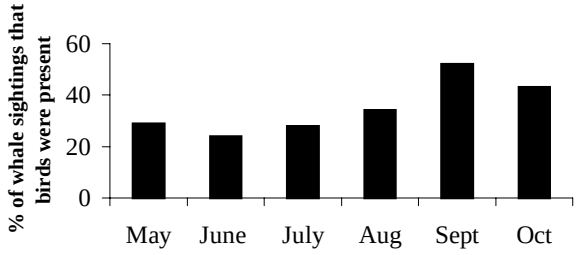
The aim of this study is to make some general comments on feeding behaviour from the photographs, and to analyse the data collected on associated seabird species.

METHODOLOGY Surveys were conducted from May to October each year, covering the inshore waters of Northwest Mull, Coll, Tiree and the Small Isles (Rum, Eigg and Muck). When a minke whale was encountered, details of this sighting were logged on a laptop computer on the boat using the LOGGER program (Leaper *et al*., 1997). The general behaviour of the whale was recorded as actively feeding, milling, travelling or breaching. The presence of any birds in the vicinity of the whale was noted. If birds were present, an estimate of the numbers and species were recorded (only available for 1992-1995). Bird species were divided up into auks (razorbills and guillemots), gulls (kittiwakes, herring gulls, lesser black-backed and great black-backed gulls), Manx shearwaters, gannets, common terns and great skuas.

Bird data were analysed to determine the number of encounters in which birds were present, the relative proportion of each species of bird by month, and the associated behaviour of the whales. Photographs from 1992-1998 were analysed to investigate which bird species showed the greatest degree of association with the whales. Photographed sequences of feeding behaviour were studied to determine the different type of lunges observed.

RESULTS **Bird Association:** A total of 654 minke whale sightings between 1992 and 1995 were recorded, and birds were present in the vicinity of the whale(s) during 223 (34%) of these sightings. The species of birds recorded were Manx shearwaters *Puffinus puffinus*, herring gulls *Larus argentatus*, great black-backed gulls *Larus marinus*, lesser black-backed gulls *Larus fuscus*, kittiwakes *Rissa tridactyla*, gannets *Sula bassana*, great skuas *Stercorarius skua*, common terns *Sterna hirundo*, guillemots *Uria aalge* and razorbills *Alca torda*. Figure 1 shows the percentage sightings where birds were present by month. This shows that sightings during September and October show the highest presence of birds.

Fig 1. The percentage of whale sightings that birds were present by month



The total number of birds recorded, during the 223 sightings of whales when birds were present was 38,629. The number of birds per whale sighting by month is shown in Figure 2, which demonstrates that the greatest number of birds per whale sighting occurs during the month of August.

Fig 2. The number of birds per whale sighting by month

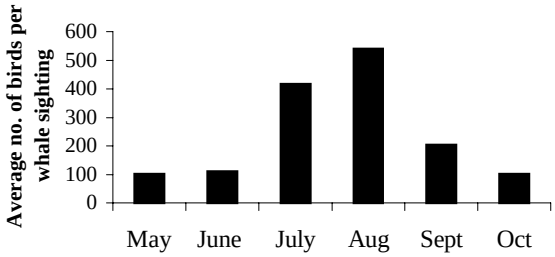


Figure 3 shows the relative proportion of each species of bird by month, and demonstrates that Manx shearwaters predominate during the months of June, July and August, and gulls predominate in numbers during the months of May, September and October.

Figure 3. The percentage frequency of each bird species by month

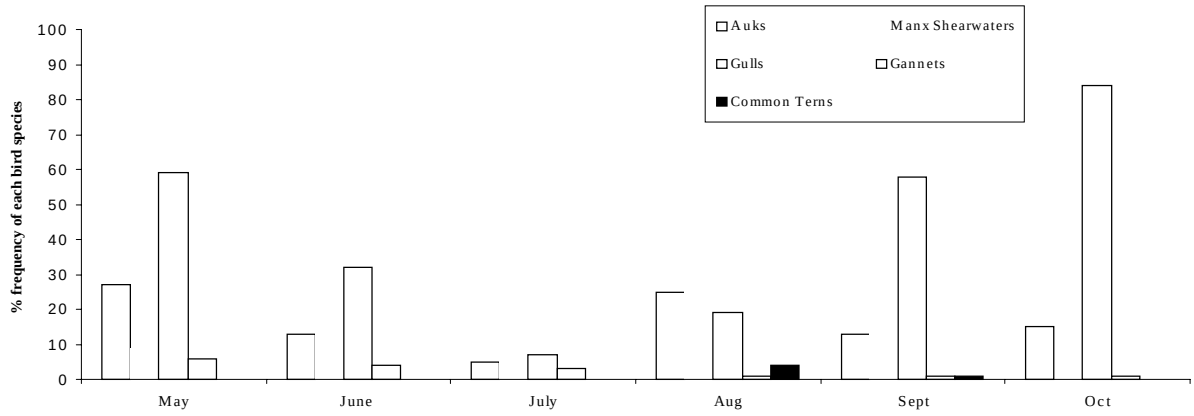


Figure 4a summarises the behaviour of the whales when birds were present compared with sightings when they were absent (Fig. 4b). This shows that when birds were present, the whales were mainly feeding and milling. When birds were absent, the whales were milling and travelling.

Fig. 4a. Whale behaviour in the presence of birds

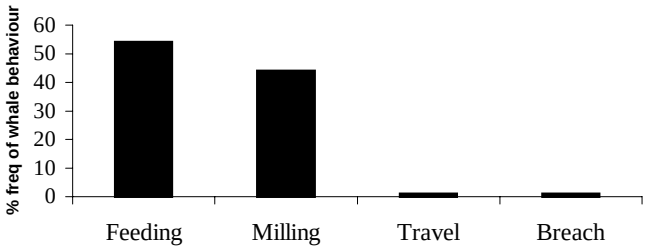
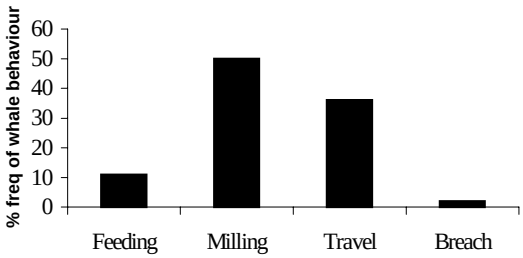


Fig. 4b. Whale behaviour in the absence of birds



By studying photographs which reveal the bird species in very close proximity to the whales, and from personal observations in the field, two types of association were apparent.

Manx shearwaters tended to hover over whales, following their surfacings very closely, and this was seen during July and August. Gulls (mainly herring gulls and juvenile gulls) tended to clump and form feeding groups on the surface of the water, often numbering hundreds of birds. In this case, it was the whale that approached these groups, lunging up through the birds. This type of association was seen more often during the months of September and October.

Feeding Behaviour Photographed: The following lunges could be described from the photographs.

Dorsal/ventral lunges: The whale lunged from the water in the dorsal/ventral plane. The angle that the head left the water varied, sometimes the whole head emerged with throat grooves and baleen showing. On other occasions, only part of the upperlip and rostrum showed. Water was often seen spilling from each side of the mouth.

Lateral or side lunges: The whale lunged out of the water with the axis of its body at right angles to the horizontal plane. The degree to which the whale left the water again varied and on occasions the throat grooves, one flipper and the tail flukes could be observed. On other occasions, only splashing could be seen, with just the tip of one fluke exposed.

Twisting lunges: The whale initially lunged out of the water in the dorsal/ventral plane and then twisted its body so that it leant to the right or left. Then at the same time that its dorsal fin was showing, one tip of the tail fluke was exposed.

DISCUSSION The inshore waters of the Hebrides are rich in marine life, and many top marine predators inhabit the area in the summer months to feed. Minke whales and many species of birds are likely to be exploiting the same prey species, in particular, shoaling fish such as herring (*Clupea harengus*), sprat (*Sprattus sprattus*) and sandeels (Ammodytidae) (see review by Evans, 1982). Whales may pursue fish to the surface waters making them more accessible to birds that feed only from the surface or just below. In this study, Manx shearwaters were observed following the whales' movements and so must benefit from this association. Whales approaching groups of feeding gulls may be an indirect association in that the whales are pursuing fish that the birds have already grouped over. This suggests that shoaling fish are already concentrated at the surface, perhaps by predatory fish, which the whales and birds then exploit.

More dedicated studies of feeding behaviour and associating birds, in relation to fish abundance and distribution, should be conducted in future to provide some valuable insights into the local ecosystem. Concurrent photo-identification studies may reveal the feeding strategies of individual whales.

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