18 years we have had Village Weaverbirds in outdoor aviaries at Los Angeles during the spring and summer, female Hooded Orioles (*Icterus cucullatus*) and Bullock's Orioles (*I. bullockii*) from the vicinity have repeatedly visited the aviaries, clinging to the wire sidewalls and peering at the birds within. Female Western Tanagers (*Piranga ludoviciana*), whose males are black, yellow and orange, were also attracted. No other local species of wild birds have been similarly attracted.

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# THE ASSOCIATION OF MARINE BIRDS AND FEEDING GRAY WHALES

CRAIG S. HARRISON

Feeding associations in which terrestrial birds scavenge from feeding terrestrial mammals are well-known. Examples include the Cattle Egret (*Ardeola ibis*) feeding with the domestic cow (Heatwole 1965), the honey badger (*Mellivora capensis*) with the Greater Honey-guide (*Indicator indicator*) (Skead 1951), and the House Sparrow (*Passer domesticus*) with man. Similar feeding associations between birds and mammals in the marine environment are largely anecdotal (for example, Murphy 1936, Ryder 1957, Wilke and Fiscus 1961), but are perhaps equally frequent. Evidence collected on aerial surveys in the northern Bering Sea (Fig. 1) leads me to conclude that a community of at least nine marine birds are partially supported by an association with feeding gray whales (*Eschrichtius robustus*).

Aerial surveys were flown during the months of June, August, and October 1976 over Bering and Chukchi seas to map populations of marine birds and mammals which may be affected by offshore petroleum development. A modified Grumann Turbo-goose with good forward and lateral visibility was flown at a groundspeed of 200 km/h and an altitude of 180 m (June) and 30 m (August and October). The aircraft was equipped with a Global VLF Navigation System (Karant 1976) which uses the very low frequency radio band and provides a continuous readout of longitude and latitude. Observations of marine birds, gray whales, mud tracks from the whales (Fig. 2), and periodic geographical positions were recorded on a cassette recorder. Birds were identified to the lowest taxon possible, but a large proportion of those seen in June were not identified to species due to the high altitude of that survey. In the analysis of these observations, gray whales that were too distant for us to detect the simultaneous presence of birds were eliminated. The presence of

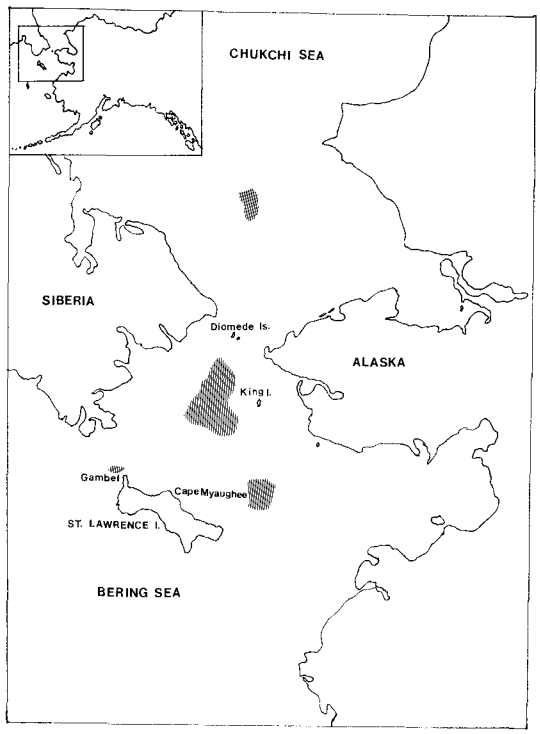


FIGURE 1. Northern Bering Sea, Alaska. Shading depicts areas where birds have been observed feeding in association with surfacing gray whales.

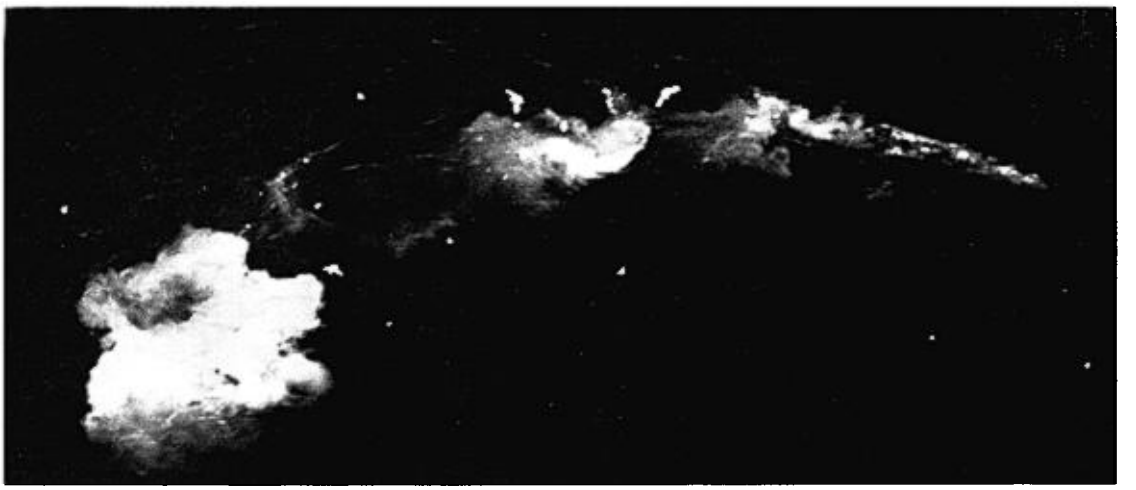

FIGURE 2. Surfacing gray whale with mud tracks and associated birds. Mud patches remain on the surface after a whale submerges and contain food for marine birds.

surface mud was counted as a whale even if the whale was submerged as the plane flew over it.

The northern Bering and southern Chukchi seas have long been known to sustain large summer populations of feeding gray whales, and several authors have noted that these whales frequently bring up mud when they surface (Scammon 1874, Wilke and Fiscus 1961, Pike 1962). In addition, this area has many seabird rookeries totalling at least three million auklets and one million murres (unpubl. U.S. Fish and Wildlife Service data), with substantial colonies at Gambel, Cape Myaughee, King Island, and the Diomedes (Fig. 1).

Mud patches in the water are easily visible from an airplane (Fig. 2) and are clearly loci to which feeding procellariids, gulls, phalaropes, and alcids are attracted. Most birds I saw feeding in association with gray whales sat on the surface of the water in the midst of a mud patch which had been brought to the surface by a whale, although the passage of the survey airplane prompted many to take flight. Nine species of seabirds were recorded feeding on surface mud patches during my study and four additional species have been reported by other observers (Table 1).

All common marine bird species in the northern Bering Sea except eiders (*Somateria* spp.) and murres (*Uria* spp.) have been reported feeding with gray whales. The Glaucous Gull was the most consistent species observed, but phalaropes, Least Auklets, Crested Auklets, and Parakeet Auklets were also important members of this association. Seabirds were recorded with 69% of the 89 whales observed, for an overall average of 12 birds/whale. Monthly differences in bird species associated with the whales were noted, with June having the fewest species and August the most. August had the greatest number of associated birds (20 birds/whale). October had the

TABLE 1. Marine birds associated with gray whales, June–October 1976, northern Bering and southern Chukchi seas (89 gray whale observations).

| Bird species | Number of bird-whale associations | Percent of whales with associated birds | Total number associated birds | Birds/ gray whale |
|---|---|---|---|---|
| Northern Fulmar (*Fulmarus glacialis*) | 3 | 3 | 5 | + |
| Short-tailed Shearwater (*Puffinus tenuirostris*) | 1 | 1 | 15 | 0.2 |
| Sooty Shearwater (*P. griseus*) | 2 | 2 | 6 | + |
| shearwater (*Puffinus* spp.) | 3 | 3 | 60 | 0.7 |
| phalarope (*Phalaropus* spp.) | 3 | 3 | 96 | 1.1 |
| Glaucous Gull (*Larus hyperboreus*) | 49 | 55 | 335 | 3.8 |
| Bonaparte's Gull (*L. philadelphia*)[a] | + | + | + | + |
| Mew Gull (*L. canus*)[a] | + | + | + | + |
| Black-legged Kittiwake (*Rissa tridactyla*) | 4 | 4 | 17 | 0.2 |
| Arctic Tern (*Sterna paradisaea*)[b] | + | + | + | + |
| Parakeet Auklet (*Cyclorrhynchus psittacula*)[c] | 9 | 10 | 240 | 2.7 |
| Crested Auklet (*Aethia cristatella*)[c] | 8 | 9 | 147 | 1.7 |
| Least Auklet (*A. pusilla*)[c] | 9 | 10 | 161 | 1.8 |
| Horned Puffin (*Fratercula corniculata*)[d] | + | + | + | + |
| TOTALS | 61[e] | 69[e] | 1082 | 12.2 |

[a] Reported by R. E. Gill, pers. comm.
[b] Reported in Wilke and Fiscus (1961).
[c] Unidentified auklets apportioned equally among species that occur in study area.
[d] Reported by W. H. Drury, pers. comm.
[e] Column does not sum to total because flocks of mixed-species composition occurred.

fewest, probably due to the general departure of seabirds from the northern Bering Sea by that month. This bird-whale feeding phenomenon does not appear to take place while the whales are migrating in the Gulf of Alaska (pers. observ., 77 sightings).

Gray whales apparently bring, from depths of 40–60 m, food that would otherwise be unavailable to seabirds. Rice and Wolman (1971), in analyzing Bering Sea gray whale stomach contents, stated, "the predominance of gammaridean amphipods, especially *Ampelisca macrocephala*, indicates that gray whales . . . are primarily, if not exclusively, bottom feeders." Zimushko and Lenskaya (1970) reached similar conclusions and noted that incidental food items included a few other benthic amphipods and crustaceans, polychaete worm tubes, shells, and gastropod opercula. A captive whale was seen to feed by sucking food off of the bottom while tipped at a 120° angle with its cheek nearly parallel to the bottom (Ray and Schevill 1974). A study of the stomach contents of associated birds would be necessary to determine prey identity and possible ecological segregation between bird species for food brought to the surface by gray whales. Bédard (1969) found infaunal gammarid genera in the stomachs of St. Lawrence Island auklets and raised the question of how the birds obtained them, apparently unaware of the feeding association between auklets and gray whales. It is unclear whether the food that birds take from the mud consists of items that the whales reject or incidentally spill while eating.

These observations may have significance beyond biological curiosity. The birds take negligible food because their average biomass is 0.02% that of the whales. On the other hand, feeding whales can provide seabirds from nearby colonies with a long-lasting, reliable food source. In summer, 10,000 gray whales are estimated to inhabit the Bering and Chukchi seas (J. D. Hall, pers. comm.). The benthic organisms brought to the surface by these whales may support several hundred thousand birds, including migrants, non-breeding juveniles from nearby rookeries, breeding adults, and fledglings. Since these calculations are based on instantaneous observations from an aerial platform, they represent a minimum estimate of seabirds associated with gray whales in this area. Although turnover rates in the feeding flocks are presently unknown, it is certain that some turnover must occur because individual birds are physically unable to forage continuously at an abundant food source. This would be especially true with breeding birds exchanging brooding and feeding chores. When food is scarce because of weather or sea conditions, this whale-induced upwelling of zooplankton from the deep may provide an especially important food source. Bédard (1969) pointed out that blooms of important prey items such as *Calanus* copepods and *Thysanoessa* euphausiids occur only seasonally near St. Lawrence Island. He also found that auklets flew at least 50 km from nesting sites to forage, suggesting that food availability may be a limiting factor for seabird populations in this area. I noted consistent, predictable feeding locations (Fig. 1) for gray whales throughout the summer, and colonial seabirds may learn to frequent these areas when foraging.

Tropical seabirds sometimes associate with schools of tuna which drive prey to the surface, thus making them available to birds (Murphy and Ikehara 1955, Ashmole and Ashmole 1967). This relationship is somewhat like that described here, showing that for seabirds it pays to be present when a large amount of food is being brought up.

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