grain faster than the others. A banded *G. conirostris* (largest bill of all species studied) was slowest. We suggest that the very large-billed finches may have difficulty in quickly positioning small seeds for cracking.

In the experiments conducted, the large-billed *G. conirostris*, *G. fortis*, and *G. scandens* showed no significant preference for large grains, nor did *G. fuliginosa* prefer small grains.

This research was financed by a grant from the McGill University Research Fund. We thank R. D. Montgomerie for comments on the manuscript.

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Accepted for publication 15 May 1974.

ORIENTATION OF ADÉLIE PENGUINS ON THEIR TERRITORIES

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Adélie Penguins (*Pygoscelis adeliae*) nest in dense colonies on the shores of the Antarctic continent and off-lying islands. Nests are situated in small nesting territories within the colonies. The position of established territories often influences the positioning of new territories, especially on uniform flat terrain (Spurr 1972). That is, behavioral interactions between penguins influence the arrangement of territories in a colony. This paper shows that behavioral interactions between penguins also affect the orientation of penguins on their territories.

Observations were made during the summer of 1968–69 at the University of Canterbury field station, Cape Bird, Ross Island, Antarctica (77° 13′ 10″ S, 166° 28′ 30″ E). I made two sets of observations to determine the effect of wind speed on orientation of penguins lying down and incubating eggs—one set on a calm day (wind speed 1.6 m/sec) and the other when a strong southerly wind was blowing (8.5 m/sec). Counts were made of the number of penguins facing into the wind or in other directions away from the wind. I read wind speeds from a small hand anemometer held 20 cm above the ground on the windward side of the colony.

Other observations were made at wind speeds less than 3 m/sec. The positions of 893 penguins, lying undisturbed on their territories during the incubation period, were plotted on colony maps. These were then analyzed with respect to geographical position and orientation of neighbors. Analyses were made with reference to eight compass directions (0, 45, 90, 135, 180, 225, 270, and 315 degrees).

The term, "central penguin," refers to a penguin that is surrounded by others. In Figures 1A and 1B, the central penguin is surrounded by eight others, corresponding to the eight compass directions. In the field, central penguins had no more than six neighbors; for analysis each was allocated to one of the eight compass directions.

The direction in which incubating penguins face is strongly influenced by wind speed (table 1). In strong winds, penguins incubating eggs tend to face into the wind. Thus, most penguins face in the same direction, usually either north or south (the predominant wind directions at Cape Bird). In calm conditions, or with light winds, orientation became random with respect to geographical position, but was strongly influenced by neighboring penguins. Fewer nests were located directly in front of a penguin (0° in table 2) compared to other locations (e.g. 45° from the front of a penguin). This means that penguins tend to face into inter-nest spaces, rather than directly towards another nest.

When penguins did face toward a neighboring nest, the orientation of the neighbor on that nest was significantly different from that of other neighbors (table 2). The neighbor directly in front never rested facing directly towards the central penguin, though penguins on other surrounding nests sometimes faced toward the central nest (fig. 1A), or in the opposite direction (180°) to the central penguin (fig. 1B). When penguins are undisturbed they show a significant tendency to avoid facing another penquin's head.

Penguins did not directly face one another when resting, but when a neighbor started rearranging nest stones near its boundary, a penguin would turn to face (and maybe threaten) that neighbor. When the neighbor stopped rearranging stones, the other pen-

TABLE 1. Orientation of penguins in relation to wind speed (X^2 probability < 0.01).

Wind speed (m/sec)	No. of penguins facing		
	into wind	with wind	other
8.5	48	8	5
1.6	2	2	56

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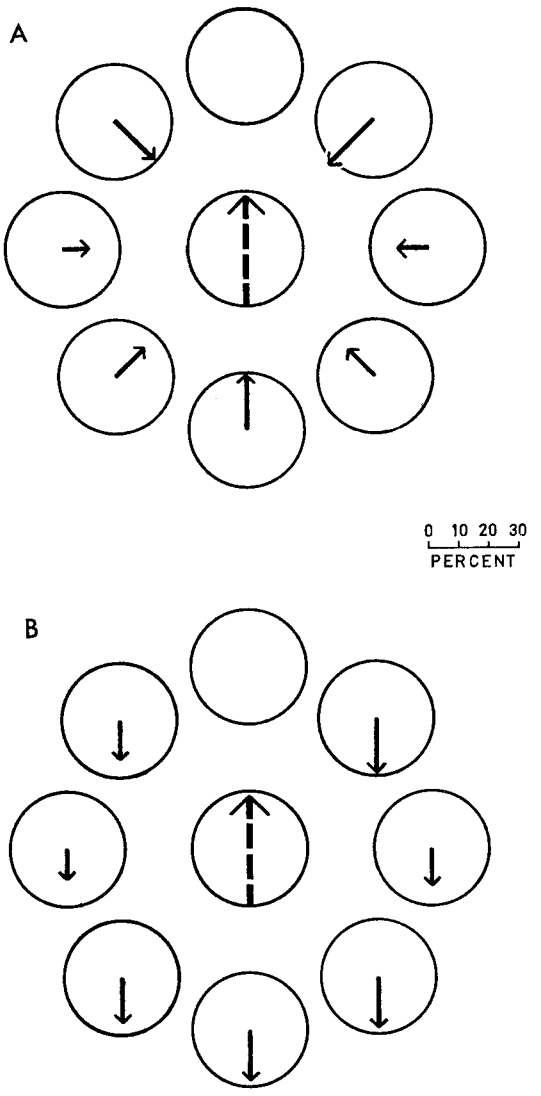

FIGURE 1. Frequency of neighbors facing (A) towards a central nest and (B) in the opposite direction to a central penguin. A broken arrow represents the facing direction of the central penguin, and solid arrows those for surrounding birds. The length of the solid arrows indicates the percent of total observations of those facing toward a central nest in A and those facing in the opposite direction to the central penguin in B.

guin would then turn and face into the wind (or face some other direction away from its neighbor).

The orientation of a penguin lying on a nest is thus determined by several factors, including the strength of the prevailing wind, behavior of the penguin itself, and location and behavior of neighboring penguins.

Penguins lying on their nests incubating eggs may, at different times, face any direction of the compass, as indicated by guano stains radiating around the nest (for example, see illustration by Penney 1968: 96). However, as shown above, the orientation of a penguin at any one time is not random, but is influenced by several factors.

The effect of wind on orientation of Adélie Penguins has been noted previously (e.g., Sladen 1958, Penney 1968). Yeates (1971) provided a quantitative analysis of orientation to the wind by penguins in lying, crouching and standing positions, and suggested reasons for the observed orientations. As in my study, he found a significant tendency for penguins lying down to face into the wind, a position which prevents the body feathers from being ruffled. To my knowledge, however, observations on orientation in response to surrounding penguins have not been published before.

The avoidance of another's frontal aspect has been reported in flocks of domestic hens (*Gallus gallus*) by McBride et al. (1963), and is probably common in other animals, including humans (McBride 1966). It is a response to crowded conditions that might otherwise place the animals under physiological stress. Such stress is reduced only by "avoiding" the incoming stressful stimuli, and if animals are not to withdraw but are to remain together, this can be achieved only by facing away from each other's head region.

The expression of visual avoidance may involve simple orientation of the whole body, as in flocks of domestic hens or colonies of Adélie Penguins, or it may involve more elaborate posturing. Thus, Chance (1962) postulated that, during social conflict, certain postures provide visual "cut-off" from the arousal components of other animals, and this enables individuals to remain together. Posturing may also be important in the Adélie Penguin, but this is more difficult to measure than body orientation. For example, in certain sexual appeasement displays,

TABLE 2. Orientation of penguins in relation to one another at low wind speeds.

Location of nests surrounding a central penguin	No. of surrounding nests	Number (and percent) of penguins facing		
		toward central penguin	opposite direction to central penguin	other directions
0°	90	0 (0.0)	0 (0.0)	90 (100.0)
45°	136	17 (12.5)	17 (12.5)	102 (75.0)
90°	108	11 (10.2)	8 (7.4)	89 (82.4)
135°	109	16 (14.7)	10 (9.2)	83 (76.1)
180°	96	16 (16.7)	15 (15.6)	65 (67.7)
225°	112	14 (12.5)	11 (9.8)	87 (77.7)
270°	106	9 (8.5)	7 (6.6)	90 (84.9)
315°	136	12 (8.8)	15 (11.0)	109 (80.2)
Total	893	95	83	715
X^2 probability	< 0.05	< 0.03	< 0.01	> 0.05

visual stimulation from the mate may be reduced by marked lowering or raising of the head.

In the crowded conditions of an Adélie Penguin breeding colony, a certain amount of interaction between penguins provides social stimulation that is probably necessary for successful breeding. Too much stimulation, however, may produce stress that could adversely affect reproductive performance. One way penguins overcome this is by avoiding visual contact with another penguin's head, thus reducing the probability of interaction and increasing the probability of resting. Furthermore, by facing into inter-nest spaces, rather than directly towards another nest, a penguin probably increases its apparent individual area, and so reduces the impression of crowding. Such a response has also been noted in penned male Turkeys (*Meleagris gallopavo*) that faced the wire fencing so that their individual areas ranged outside the pen (McBride 1966), as well as in penned Adélie Penguins (Spurr 1972). This avoidance orientation of Adélie Penguins probably enables them to nest at high densities without undue stress. It is to be expected that familiarity with neighbors would also reduce aggression, but Adélie Penguins reacted very readily to disturbances in neighboring territories. This further emphasizes the value of avoidance orientation. It would be instructive to determine if a similar adaptation exists in other colonial species.

This work was done while I was a member of the University of Canterbury Antarctic Research Unit. Field support was provided by Antarctic Division, D.S.I.R. (Christchurch, New Zealand), and logistic support by the U.S. Navy VXE-6 Squadron. Financial support was received from the Canterbury Branch of the New Zealand Antarctic Society. I am grateful to Professor E. C. Young for help and encouragement in the field, and to V. Benzie and my wife, Barbara, for critically reading the manuscript.

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Accepted for publication 6 August 1974.

FOOD HABITS OF NESTING BALD EAGLES IN SOUTHEAST ALASKA

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Murie (Condor 42:198, 1940), observing the food habits of Bald Eagles (*Haliaeetus leucocephalus*) in the Aleutian Islands, first concluded from pellet analysis that 58.9% of their diet was birds. Subsequently, however, based on a search of food remains at nests, he determined that 86% of the diet was birds. He thought this was representative of the Aleutian Bald Eagles in general.

Direct, continued observation (Herrick, Auk 41: 389–422, 517–541, 1924) may reveal a more accurate dietary picture since many species of fish can be totally consumed and digested by the eagles. This note presents the results of direct observations at three nests in southeast Alaska during 1971.

Three pairs of Bald Eagles were observed on Robert Islands, at the entrance of Port Houghton, 137 km S of Juneau, Alaska, for a total of 41 days (30 June–10 August) in 1971. The average observation period was 9.31 hr per pair. This area was selected for study because of the high density of nesting Bald Eagles. Each of the three nests was in an old-growth spruce tree (*Picea* sp.). These eyries were studied in order to ascertain the prey species brought to the nest and whether or not eyrie location might determine those prey species.

The total study area comprised about 19 km of beach. Nineteen nests were located within the entire area, with eight of those determined as inactive or alternate nests. One of the active nests was abandoned, the eagles having been disturbed by construction of an observatory.

Observations were made from blinds, using field glasses and spotting scopes. Blinds were constructed at a distance of over a mile away from all nests. These blinds were then moved into position on the ground near the nests.

More herring were taken by birds at nest 10 than by birds at nests 5 and 2 combined (see table 1). The high percentage of pink salmon (27.3%) at nest 2 was expected because of the salmon stream nearby.

The eagles from nest 2 caught most of their pink salmon from their hunting territory over the ocean. Only after the two species of salmon were well into the stream and spawning did the eagles change their hunting patterns.

Procurement of food appears to have been shared equally by both members of each pair of nesting eagles in the study area (table 2). Herrick (1924) found that the eagles he studied did not share equally in food procurement; the female brought in twice as much food as did the male. At nest 5, the female brought in food 20 times and the male 21 times. At nest 10, the female brought in food and nesting material 22 times and the male 20 times.

Herring schools were more obvious off nest 10 than any other area. Red squirrels were the most abundant rodent in the study area, but the eagles were not found to prey on them to any great extent.