

HIERARCHY OF WATERFOWL FEEDING WITH WHISTLING SWANS

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THE wasteful feeding habits of swans have recently been described by Owen and Kear (1972). Some earlier authors (Bent 1925: 286, Bruette 1930) believed that swans wasted valuable food plants by rooting up more than they consumed. Sherwood (1960) suggested that by exploiting the feeding behavior of swans, other waterfowl are able to obtain food that would normally be unavailable to them. He reported Canada Geese (*Branta canadensis*), Snow Geese (*Chen caerulescens*), Mallards (*Anas platyrhynchos*), Pintails (*A. acuta*), Gadwalls (*A. strepera*), Canvasbacks (*Aythya valisineria*), Redheads (*A. americana*), and Buffleheads (*Bucephala albeola*), regularly feeding with Whistling Swans (*Olor columbianus*), in Utah. In the Chesapeake Bay wintering area, R. E. Munroe (pers. comm.) found Pintails, American Wigeons (*Anas americana*), Black Ducks (*A. rubripes*), Mallards, Gadwalls, Canada Geese, Canvasbacks, Common Goldeneyes (*Bucephala clangula*), Buffleheads, and American Coots (*Fulica americana*) taking advantage of Whistling Swan feeding activities. In Utah, Ryder (1959) noted coots defending a feeding area near the swans from Redheads.

From 30 April to 7 June 1972, we studied Whistling Swans and other waterfowl in feeding and loafing associations on the Delta Marsh in Manitoba. We were particularly interested in the degree of association by different species and the effect of interspecific aggression in determining a hierarchy of the species.

METHODS

Observations were made in a region of potholes, channels, and "borrow pits" on the Delta Marsh, 3 miles west of the village of Delta. This site was easily accessible by elevated dike roads that afforded a clear view without disturbing the birds. Observations were made from a vehicle or on foot, with the aid of a 20× spotting scope or 7 × 35 binoculars. Field notes were recorded on a portable tape recorder or by a helper. Neither swans nor ducks were collected for food examination, but presumably the swans were feeding on *Potamogeton* sp. common to the area. This food plant is highly rated as swan food by Owen and Kear (1972). The ducks were obviously feeding on material stirred up by the swans.

RESULTS

Ducks were seen associating with swans 33 times during the study period. Flock size varied from 1 to 53 swans attended by 2 to 136 ducks. Generally larger groups of swans attracted higher numbers of ducks.

Level of association.—Three significantly different ($P < 0.01$) levels

TABLE 1
RELATIVE OCCURRENCE OF DUCKS IN FEEDING ASSOCIATION WITH WHISTLING SWANS

Level					
1		2		3	
Species	% occurrence ¹	Species	% occurrence	Species	% occurrence
Canvasback	63	Mallard	18	Northern	
Redhead	66	Pintail	36	Shoveler	0
Gadwall	81	Blue-winged Teal	36	American Green-winged Teal	0
American Wigeon	72			Ruddy Duck	0
Lesser Scaup	75				

¹ Calculated from the number of times a species occurred in 33 associations.

of association were noted for the species of ducks common to the area at this time of year (Table 1). Group 1 species most readily accompanied swans during feeding and loafing periods. Group 2 showed more variation. For example Blue-winged Teals (*Anas discors*) loafed with swans but seldom participated in feeding activities. Group 3 did not associate although they were common in the immediate vicinity. Shorebirds and other water birds such as grebes did not join these feeding groups.

Windblown floating food material formed a feeding zone around the swans. This zone extended approximately 5 m downwind in the form of a "V." Floating food was most plentiful directly behind individual swans and competition for this position was intense among the ducks.

Rank in the hierarchy.—We recorded the outcome of all aggressive encounters in the feeding zone. These consisted of threats and chases across the top of the water with one bird usually retreating from the other. The dominant species commanded a position nearest the feeding swan. Other species were spaced according to their rank in the hierarchy. Table 2 shows the rank of each species as determined by the relative numbers of successful chases in the feeding zone.

Canvasbacks and Mallards consistently occupied the best position. They had the most successful encounters and fewest submissions of all species studied. Canvasbacks were particularly intolerant of intruders, dividing their time equally between chasing and pecking for food. Mallards, when present, were the only species exempt of Canvasback aggression.

The Redhead ranked second in the hierarchy. Redheads chased all other species except Mallards and Blue-winged Teals. Occasionally Redheads chased Canvasbacks but Canvasbacks won significantly more ($P < 0.01$) interactions between these two species.

Pintails placed third in the hierarchy as they chased only Gadwalls,

TABLE 2
HIERARCHY OF SPECIES FEEDING IN ASSOCIATION WITH WHISTLING SWANS¹

Species Submitting ²	Species chasing							
	Canvasback	Mallard	Redhead	Pintail	Gadwall	American Wigeon	Lesser Scaup	Blue-winged Teal
Canvasback	21 ³	—	3	—	—	—	—	—
Mallard	—	—	—	—	—	—	—	—
Redhead	15	—	3	—	—	—	—	—
Pintail	5	1	1	3	—	1	—	—
Gadwall	4	4	2	7	6	15	—	—
American Wigeon	10	6	5	6	29	23	1	—
Lesser Scaup	10	—	15	4	2	2	—	—
Blue-winged Teal	—	3	—	—	—	1	—	—

¹ Determined from the number of successful aggressive encounters in the feeding zone.

² Listed in order of rank in the hierarchy.

³ The number of aggressive encounters observed in 33 observation periods.

wigeons, and Lesser Scaups (*Aythya affinis*), but submitted to the three higher ranking species. During one study period a male Pintail responded aggressively to a threat issued by a male Mallard in the feeding zone. In the fight that followed the Mallard drove the Pintail from the feeding ground.

Gadwalls were fourth in the hierarchy. They chased wigeons and scaups but submitted to higher ranking species. We also watched a fight between a male Gadwall and a male Pintail in the feeding zone, in which case the Pintail successfully drove off the Gadwall.

We recorded 44 encounters between wigeons and Gadwalls in the feeding zone. Gadwalls were significantly ($P < 0.05$) more successful in these bouts. Wigeons rarely chased any other species but, because of their unique feeding behavior, they were frequently chased by higher ranking birds.

Lesser Scaups placed sixth in the hierarchy because they were chased by almost all higher ranking species. Only one successful chase was recorded for scaup. This encounter was between a male scaup and a male wigeon.

Blue-winged Teals avoided encounters with other ducks. They occupied a position in the feeding zone farthest away from the swans.

The most aggressive species were not necessarily highest ranking in the hierarchy. Ranking the species according to the number of aggressive gestures made, the order is as follows: Canvasback, Gadwall, Redhead, American Wigeon, Pintail, Mallard, Lesser Scaup, Blue-winged Teal. Females of all species were significantly less aggressive than were the males.

Canada and Snow Geese have been reported feeding in association with swans (Sherwood 1960). On seven occasions during our study, one to three Canada Geese joined a feeding group. The swans paid little attention to the geese, but the ducks avoided them. Geese immediately assumed the best position behind the swans and pecked for food. The geese could have fed independently of the swans but preferred not to in each case.

Swans were remarkably tolerant of ducks crowding around them. No aggressive encounters were recorded between swans and any other waterfowl, but sudden movement by a swan made ducks and geese retreat.

A Spearman rank correlation with adult male body weights (Kortright 1942: 383) yielded a coefficient of 0.97 ($P < 0.01$) with the heaviest species assuming the highest position in the hierarchy. Evidently dominance in the hierarchy is determined to a great measure by body size.

Feeding behavior.—Keen competition for food maintained a high level of excitement among the birds participating in the feeding association. Each species demonstrated a unique method of exploiting the feeding situation. The wigeon was the most opportunistic. This alert duck patrolled the feeding zone, actively searching the surface for food and darting close to the swan where it was frequently chased away by larger birds. Wigeons did not steal food directly from Canvasbacks as noted by Bent (1923: 195), nor did they attempt this behavior with the swans or other ducks.

Pintails and Gadwalls hunted the surface in a manner similar to the wigeons, but at a slower pace. Blue-winged Teals remained entirely at the feeding zone perimeter. These small ducks seemed to exhibit considerable caution when approaching the feeding zone.

Typically the swans fed in water too deep for dabbling ducks. None of the five dabbling species "tipped up" or otherwise probed for food while feeding with the swans. The ducks pecked at floating food objects dislodged from the bottom. Canvasbacks and Redheads also pecked for food although they were capable of diving to the bottom. When feeding with swans these two species dived half as frequently as when feeding alone. Lesser Scaups preferred to dive directly under feeding swans rather than peck for food at the surface.

Frequently, birds crowded so close to a "tipped up" swan that the big bird landed on them while righting itself. Lesser Scaups often dived as soon as the swan submerged its head. This resulted in an occasional underwater collision and the startled swan would rapidly lift its head.

Loafing behavior.—Loafing situations differed from feeding associations in that interspecific aggression was negligible. The ducks appeared

randomly spaced about the swans on loafing bars and intermingled regardless of their position in the hierarchy.

Ducks showed a definite preference to loaf with swans rather than on other suitable sites in the same water body. When the swans loafed in water too deep for ducks to stand, the ducks used the nearest shoreline or mudbar.

During some observation periods, opportunity was available to watch a group of ducks and swans feeding and a group loafing simultaneously. Ducks moved freely between each group. Each instance of exchange illustrated an interesting change in the birds' behavior. Ducks coming from the feeding group lost their aggressiveness and loafed peacefully among other birds. Ducks leaving the loafing site became intolerant of others once in the feeding zone.

DISCUSSION

Swans did not appear to benefit from associations with ducks. Swans attracted ducks from the vicinity but there was little evidence that they were drawn to water bodies occupied by other waterfowl. Advantages of this behavior are more apparent for the ducks. Primarily the swans provide a readily gathered source of food. This increases the efficiency of the ducks' feeding patterns and may be of particular importance during the early season when low temperatures occur and food is probably not plentiful.

The advantages for ducks loafing with swans are not clear. Swans may be more efficient sentinels. We believe the ducks are waiting for the swans to feed so they can take immediate advantage of the food.

The stage in the reproductive cycle of each species may have influenced the level of association. All highly associated species (group 1) were at the prenesting stage. High energy requirements at this time may have been satisfied more efficiently by feeding with swans.

With the exception of the Blue-winged Teal, group 2 species were actively involved with nesting duties during the observation period. Birds bounded to certain areas at this time are less apt to participate in associations. Nesting waterfowl are not generally gregarious during nest initiation and laying (McKinney 1965). This may account for the total lack of participation by the Northern Shoveler (*Anas clypeata*) as our observation period corresponded with the shoveler's nesting cycle. During most of the nesting season, the shoveler is a highly aggressive bird (McKinney 1970).

We believe interspecific dominance in the feeding zone is dependent upon mean body weight of each species. Our observations were limited to species common to the Delta Marsh in the spring. As other species

of ducks are known to associate with swans, we suggest they would rank in the hierarchy primarily according to their body weights.

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LITERATURE CITED

- BENT, A. C. 1923. Life histories of North American wild fowl. U.S. Natl. Mus. Bull. 126.
- BENT, A. C. 1925. Life histories of North American wild fowl. U.S. Natl. Mus. Bull. 130.
- BRUETTE, W. 1930. American duck, goose and brant shooting. New York, Charles Scribners and Sons.
- KORTRIGHT, F. H. 1942. The ducks, geese and swans of North America. Washington, D.C., Amer. Wildl. Inst.
- McKINNEY, F. 1965. Spacing and chasing in breeding ducks. Wildfowl Trust Ann. Rept. 16: 92-106.
- McKINNEY, F. 1970. Displays of four species of blue-winged ducks. Living Bird 19: 29:64.
- OWEN, M., AND J. KEAR. 1972. Food and feeding habits. Pp. 57-77 in *The swans* (P. Scott, Ed.). London, Fletcher & Son Ltd.
- RYDER, R. A. 1959. Interspecific intolerance of the American Coot in Utah. Auk 76: 424-442.
- SHERWOOD, G. A. 1960. The Whistling Swan in the west with particular reference to Great Salt Lake Valley, Utah. Condor 62: 370-377.

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