

Such territorial defense was rare, as all gulls usually roamed over a heron's territory without assault, and some large gulls maintained feeding territories within that of a heron.

The purpose of the remaining 34% of heron assaults was not obvious, but seemed to be harrassment. These included three attacks by one heron on a pair of large gulls that were involved in courtship behavior (e.g., "Choking," and "Head-tossing," see Tinbergen 1972).

Attacks on herons without food.—Ninety-one percent of 47 gull attacks were by large gulls; the remainder were by Bonaparte's, Ring-billed, and California gulls. Gulls usually used the "Swoop-and-soar" display in attacking either flying or standing herons. Herons that were standing did not fly away but stayed and often directed "Full forward" displays at the attacking gull.

Gull attacks on herons were usually difficult to classify because no obvious purpose was apparent; however, in two interactions, herons that had initially disturbed gulls were out-manuevered and subsequently pursued by a gull. In five gull attacks, a large gull could have been defending its nest against an approaching heron. Heron attacks on gull chicks were never observed, and gull chicks were not found as food given to heron young (unpubl. data). Herons have rarely been reported to prey on larid chicks (Chapman and Forbes, *J. Field Ornithol.* 55:251–252, 1984). The threat to gull chicks, however, may not have been as much predation as disturbance, which may cause chicks to wander from the nest, fall into the water, and drown (see Bayer, *Murrelet* 64:87–91, 1983).

The purpose of the remaining gull assaults seemed to be harrassment of flying herons. These included instances where large gulls, Ring-billed Gulls, and Bonaparte's Gulls forced a flying heron to change direction, to land in deep water (where the heron swam), or to find a nearby perch. Although gulls have been reported to prey on or kill other birds that they force into the water (Colston et al., *Br. Birds* 52:312–313, 1959; Boshoff, *Cormorant* 8:15–16, 1980), the attacked herons I watched seemed unharmed.

Conclusions.—Overt interactions were probably uncommon because they were not directly important for survival; only 48% of the interactions involved food (Table 1). Interactions did not result in greatly increased food availability, nor was either species a predator of the other. Gulls and herons did not forage similarly, so their interactions can not be ascribed to direct competition as have some interactions between other species (Roth, *Wilson Bull.* 90:450–451, 1978; Tye, *Ibis* 126:95–101, 1984).

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Circumstantial evidence of foraging interference between two species of dabbling ducks.—In a recent article on competition in bird communities, Maurer (*Wilson Bull.* 96:380–395, 1984) presents a verbal model that predicts the types of competition that can occur in different ecological settings. Maurer also calls attention to passive interference, a type of interspecific competition that may be important, but difficult to detect, in many bird communities. In this type of competition, direct aggression is rare, but interference occurs as resources are temporarily depressed by the activity of foraging individuals. In general, conclusive documentation of any competitive interaction in natural communities is difficult to achieve. Among the strongest evidence that empirical data can provide for competition

TABLE 1
SHIFTS IN FEEDING DEPTHS OF TWO SPECIES OF DABBLING DUCKS AND NUMBERS OF DUCKS
DURING FOUR OBSERVATION PERIODS

Date of observation periods	Order of recording events	Average feeding depth (cm)		Individual number		
		Teal	Shoveler	Teal	Shoveler	Total ^a
27 July	1.	4.9 (65) ^b	13.5 (120)	3	10	19
	2. (60) ^c	4.7 (150)	16.0 (20)	15	2	28
	3. (85)	7.1 (45)	20.5 (12)	15	4	32
	4. (125)	17.0 (252)	20.2 (80)	15	1	24
28 July	1.	4.7 (60)		3	0	3
	2. (40)	10.9 (326)	19.9 (189)	35	6	45
	3. (120)	11.9 (157)	19.1 (139)	23	5	40
29 July	1.	8.3 (30)		3	0	3
	2. (25)	10.8 (479)	17.2 (217)	44	9	72
30 July	1.	8.2 (121)	16.5 (35)	24	7	32
	2. (120)	19.0 (609)	24.2 (206)	65	15	82

^a Individuals of dabbling duck species other than teal and shoveler are also included if present.

^b Number of feeding method observations; see Study area and methods for calculation of feeding depths.

^c Minutes since beginning of the first recording event; when calculating correlations a value of 0 was given to the first event.

is niche shifting, where the presence of a putative competitor gives rise to a shift in the resource use of the target species (cf. Werner and Hall, *Science* 191:404–406, 1976; Diamond, *Am. Sci.* 66:322–331, 1978; Thomson, *Am. Nat.* 116:719–726, 1980; Alatalo, *Oikos* 37:335–344, 1981). The purpose of this note is to provide an example of possible passive interference competition between two species of dabbling ducks, the Green-winged Teal (*Anas crecca*) and the Northern Shoveler (*A. clypeata*). I used shifts in depths at which the species fed as indicators of interaction.

Study area and methods.—The study was conducted at a shallow (0.5 to 0.7 m), eutrophic bay of Lake Simpele in SE Finland (61°33'N, 29°33'E). More detailed information on the study area can be found in Pöysä (*Oikos* 40:295–307, 1983a). All the data are from a small (ca. 0.67 ha) and closed bay of open water, where the submerged vegetation is rich from the bottom to the surface (feeding habitat type A in Pöysä 1983a). The data for this note were gathered between 27 and 30 July 1980. The use of such a short time period minimized possible intrinsic changes in food resource conditions, making the interpretation of changes in the foraging behavior of the ducks more accurate. Each day, during an observation period of from 25 to 125 min, I recorded at an average of 56 ± 13 -min intervals, the numbers of foraging individuals present for each species and their feeding methods.

Dabbling ducks in the study area comprised 6 species, the other 4 being Eurasian Wigeon (*A. penelope*), Mallard (*A. platyrhynchos*), Northern Pintail (*A. acuta*), and Garganey (*A. querquedula*) (Pöysä 1983a; Ornis Scand. 14:317–326, 1983b); however, as the number of observations was too low for these 4 species, they were not included here. Feeding methods included up-ending, neck submerged, head submerged, bill submerged, picking from surface, and straining from surface. The average number of feeding method observations per individual at a given recording event was 11.2 ± 1.8 in the Green-winged Teal and 23.0 ± 7.9

in the Northern Shoveler. Average feeding depths of the species at a given recording event were calculated on the basis of feeding method and morphological (body length, neck length, skull length, bill length) data, following the procedure described in Pöysä (1983b). For the birds picking and straining from surface, I assumed a feeding depth of 1.0 cm.

Results.—During each observation period the average feeding depth of the species increased from the first recording event onward (Table 1). Both in teal and shovelers, a significant positive correlation existed between the average feeding depth and the time since the start of the observation period ($r = 0.72$, $N = 11$, $P < 0.05$ for teal; $r = 0.76$, $N = 9$, $P < 0.05$ for shovelers) (Table 1). The average feeding depth of teal also correlated significantly with the number of teal present ($r = 0.70$, $N = 11$, $P < 0.05$) as well as with the total individual number of dabbling ducks present ($r = 0.63$, $N = 11$, $P < 0.05$), but not with the number of shovelers present ($r = 0.41$, $N = 11$, $P > 0.05$). By contrast, the average feeding depth of the shoveler correlated significantly with the number of teal ($r = 0.76$, $N = 9$, $P < 0.05$), but not with the number of shovelers ($r = 0.20$, $N = 9$, $P > 0.05$) or all dabbling ducks ($r = 0.57$, $N = 9$, $P > 0.05$).

Discussion.—The results demonstrate an increase in the feeding depth of shovelers with the presence and increasing numbers of teal. In teal, however, the negative effect of shovelers was minimal, possibly due to the low number of shovelers present; and significant interference was observed only intraspecifically. Moreover, the longer individuals of both of these species spent foraging in the patch, the greater was the shift toward greater feeding depths. These findings support the presence of an interactive shift in feeding depth, as during observation periods as short as those used here, intrinsic (i.e., not caused by the foraging ducks) changes in resource conditions should be minimal. Both passive interference and exploitation (cf. Schoener, *Am. Nat.* 122:240–285, 1983; Maurer 1984) might have been involved as mechanisms of interaction. When the average feeding depths of teal are compared between the first recording event of a particular observation period and the last recording event of the previous observation period, we see that the profitability of the surface layer has returned. Even though direct measurements of food availability and replenishment were not made, I tentatively suggest that the food resource was not replenished, but that availability of the prey was at least in part temporarily depressed as a result of disturbance of actively moving, foraging dabbling ducks. As the number of foraging ducks at most recording events was large (see Table 1), direct removal and consumption of prey by ducks also was probably important. Further examples of passive interference in other groups have been reported by Goss-Custard (*Ardea*, 68:31–52, 1980) for wading birds, and by Waite (*Behav. Ecol. Sociobiol.* 15:55–59, 1984) for corvids.

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Band-rumped Storm-Petrel occurrences in relation to upwelling off the coast of the southeastern United States.—In spite of several storm-related and stranding records of Band-rumped Storm-Petrels (*Oceanodroma castro*) in eastern North America since 1900 (reviewed by Clapp et al., *Marine Birds of the Southeastern United States and Gulf of Mexico*, Pt. 1, Gaviiformes through Pelecaniformes, U.S. Fish and Wildl. Serv., Washington, D.C., 1982), over 90% of the marine occurrences of the species have been recorded since 1980 (Haney, *Oriole* 48:21–32, 1983; Lee, *Am. Birds* 38:151–163, 1984; Sykes et al., *Fla. Field Nat.* 12: