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**Prolonged parental care and foraging of Greater Snow Goose juveniles.**—The importance of prolonged parental care in geese and swans (see Kear 1970) in the foraging behavior of juveniles recently has received close attention from researchers. Scott (1984) has shown that Mute Swan (*Cygnus olor*) juveniles still with their parents spend more time feeding in their daily activity budget than do juveniles which have left theirs. Similarly, Gregoire (1985) found that in foraging flocks of Lesser Snow Geese (*Chen caerulescens caerulescens*), lone juveniles fed less and moved more than family juveniles. In foraging flocks of Barnacle Geese (*Branta leucopsis*), family juveniles feed for longer, uninterrupted periods than do juveniles that have been separated from their parents (Black and Owen, in press a). Furthermore, within these flocks, families are more likely to feed in the leading edge of flocks, where the biomass is higher, than do lone juveniles (Black and Owen, in press b). In all instances, these results were related to the lone juveniles' low status in the dominance hierarchy. The purpose of this study was to compare the foraging activities of lone juveniles and those of juveniles belonging to families in Greater Snow Geese (*C. c. atlantica*).

We conducted field observations in the springs of 1985 and 1986 along the south shore of the St. Lawrence river estuary between Montmagny and St-Jean-Port-Joli, Québec. Some 40,000 Greater Snow Geese stage along this stretch of shoreline from late March until about 20 May, when they depart for their high-arctic breeding grounds (Gauthier et al. 1984a, 1984b). Most ten-month-old juveniles are still with their parents at that time of the year. Although the birds have recently turned to feeding in cultivated lands to some extent (Bédard et al. 1986, Gauthier et al. 1988), they still obtain well over half of their energy intake from the tidal marshes (Bédard and Gauthier, in press) where they dig up rhizomes of three-square bulrush (*Scirpus americanus*) (Giroux and Bédard 1988). We studied only geese feeding in marshes. In early April, the ice has just started to disappear, leaving a marsh surface almost totally devoid of aerial vegetation.

We watched (Y.T. and one assistant) the foraging geese from dawn to dusk, from permanent blinds and vehicles located near the edge of the marshes, using 15-45× spotting scopes.

Our daily schedule was dictated by the semi-diurnal tidal pattern, the marsh being inaccessible to geese at high tide. We scanned through the flock and chose in succession a lone juvenile and then families of size ranging from three (two adults and one juvenile) to ten (two adults and eight juveniles). For families of size four and over, we randomly selected only one juvenile for observation. As determining exact family size required some time (up to 25 min), selection of a family for observation was at first based upon a rough estimate of its size: final diagnosis of status was based on cohesion shown during movements.

We recorded the behavioral state of each focal juvenile on a mechanical counter every 6 sec, using an electronic metronome, during 10-min periods (instantaneous sampling; Altmann 1974). We classified behavioral states as follows: (1) *Digging*. Includes all activities directly oriented toward the consumption of rhizomes at a given digging site: removing mud with the bill, softening the mud with the feet, and pulling, washing, and swallowing rhizomes. This also includes drinking, a rare event. (2) *Searching*. Refers to displacements made with the head lowered and the bill pointed toward the ground, typical of a goose looking for potential digging sites, and occasionally probing the mud with the bill. Toward the end of the season, this also includes occasional grazing of the new shoots piercing the mud surface. (3) *Walking*. Refers to displacements made with the head raised. (4) *Alert*. Refers to situations where a goose is not moving, head raised. (5) *Others*. Refers to all other behaviors not described above, including agonistic encounters and comfort movements.

We wanted to compare the foraging activities of the birds rather than their total time budgets. Therefore, a small number of focal sequences were discarded when they contained 5% or more of the time devoted to the following behaviors: comfort movements, sleeping, or swimming. This screened out birds with a low feeding drive. We also recorded the number of attacks to which the focal juvenile was subjected. In the case of family juveniles, we pooled aggressions in which the focal juvenile was a victim and those in which it was involved as a secondary participant (aggression originally directed toward another member of its family). The flocks observed were very large (over 1000 individuals), and as we used several observation locations along the 20-km shoreline, we considered the data to be totally independent. We carried out statistical analysis using the SAS package (SAS Institute Inc. 1985a, 1985b).

Digging accounted for most of the recorded behaviors in all categories of juveniles (Table 1). However, juveniles of all categories did not spend the same amount of time digging (Kruskal-Wallis test,  $P < 0.0001$ ; Table 1). A Noether (1976) multiple comparisons test (with  $\alpha$  fixed at 0.05) revealed that the only prevailing difference was between lone juveniles and family juveniles taken as a unit. When compared to family juveniles as a whole, lone juveniles spent more time searching (Wilcoxon two-sample test,  $P < 0.0001$ ; Table 1) and

TABLE 1  
PERCENTAGE OF TIME (MEAN  $\pm$  SE) SPENT IN THE FOUR MAIN CATEGORIES OF BEHAVIOR  
BY FORAGING GREATER SNOW GOOSE JUVENILES

Status	N	Digging	Searching	Walking	Alert
Lone juveniles	104	70.5 $\pm$ 1.8	23.6 $\pm$ 1.5	3.6 $\pm$ 0.6	1.9 $\pm$ 0.8
Juveniles from families of 3	90	78.0 $\pm$ 1.9	17.2 $\pm$ 1.6	3.3 $\pm$ 0.6	0.9 $\pm$ 0.2
Juveniles from families of 4	99	81.3 $\pm$ 1.7	14.5 $\pm$ 1.3	2.7 $\pm$ 0.6	1.2 $\pm$ 0.3
Juveniles from families of 5	83	80.2 $\pm$ 2.0	15.9 $\pm$ 1.9	2.2 $\pm$ 0.4	1.5 $\pm$ 0.3
Juveniles from families of 6+	110	79.1 $\pm$ 2.0	15.1 $\pm$ 1.5	3.5 $\pm$ 0.8	1.5 $\pm$ 0.3

TABLE 2  
NUMBER OF ATTACKS RECEIVED PER H BY FORAGING GREATER SNOW GOOSE JUVENILES

Status	N	Mean ± SE
Lone juveniles	98	9.18 ± 1.10
Juveniles from families of 3	88	0.55 ± 0.21
Juveniles from families of 4	103	0.41 ± 0.15
Juveniles from families of 5	82	0.51 ± 0.19
Juveniles from families of 6+	110	0.37 ± 0.19

walking (Wilcoxon two-sample test,  $P < 0.01$ ; Table 1). However, both groups spent the same amount of time alert (Wilcoxon two-sample test,  $P > 0.10$ ; Table 1). Also, lone juveniles were about 20 times as frequently attacked as were family juveniles (Wilcoxon two-sample test,  $P < 0.0001$ ; Table 2). Lone juveniles were most often attacked when digging (80%: 177 of 221 cases) as were family juveniles (85%: 35 of 41 cases). Attacks usually resulted in the departure of the victim both for lone juveniles (98%: 225 of 229 cases) and family juveniles (79%: 33 of 42 cases). If the victim was digging and the aggressor victorious, the latter generally used the digging site it had stolen (84%: 147 of 175 cases).

Therefore, we conclude that when foraging, lone juveniles spend less time digging because they are more often attacked than are family juveniles. Furthermore, the fact that family juveniles can solicit and obtain their parents' digging sites (Turcotte and Bédard, in press), thereby reducing their searching time, may increase the gap between the two groups. To conclude that energy budgets of lone juveniles are directly affected, we would have to show that they do not make up for their deficit in digging time by devoting a larger fraction of their time budget to feeding. Finally, we also conclude that our data provide no evidence that belonging to a larger family results in more time being available to a Greater Snow Goose juvenile for foraging.

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**Posthatch brood amalgamation by Mallards.**—Eadie et al. (*Can. J. Zool.* 66:1701-1721, 1988) reviewed the occurrence of brood amalgamation by North American anatids and the hypotheses advanced to account for it. Posthatch brood amalgamation (e.g., creching, gang-brooding, or kidnapping) has been reported more frequently among species of geese (*Anserini*) and sea ducks (*Mergini*) than among puddle ducks (*Anatini*). It has never been reported for Mallards (*Anas platyrhynchos*; Eadie et al. 1988). Here we report two observations of short-term creche formation by Mallards on wetlands in southern Gotland, Sweden (57°00'N, 18°10'E).

Between 07:45 and 08:15 h on 23 May 1988, while observing waterfowl with a spotting scope on a wetland 1.3 ha in size and 30 cm deep, JDB observed two distinct Mallard broods, each 14-18 days of age (Class IC; Gollop and Marshall, 1954, p. 27 in: *Bellrose, Ducks, Geese and Swans of North America*, Stackpole Books, 1976). Each brood was attended by a single hen and was feeding in a different part of the wetland. One had 14 ducklings, the other eight. At 08:15 h, the broods were within 10 m of each other. Very soon thereafter, a large brood formed that was attended by a single hen; no other hens were visible. At this time, a Hooded Crow (*Corvus corone cornix*) swooped to within 20 cm of the brood. Hooded Crows are predators of ducklings (P. Lundberg pers. comm.; K. Sjöberg