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Atlantic Brant—human commensalism on eelgrass beds in New Jersey

RONALD E. KIRBY and HOLLIDAY H. OBRECHT III

Waterfowl often take foods made available by the activities of other birds. Perhaps the most notorious of these commensal feeders in North America is the American Wigeon *Anas americana* (Knapton & Knudson 1978). As expected, however, this behaviour has been reported for most other species of largely or partially herbivorous Anatidae (cf Bailey & Batt 1974). Brant (Brent Geese) *Branta bernicla* associate with other waterfowl, especially geese and diving ducks (*Aythyini*) and have been observed gleaning food brought to the surface by these birds (Einarson 1965). They have also been observed to exploit plants brought to the surface in the wake of oyster *Crassostrea virginica* dredges in the eastern United States (Cottam *et al.* 1944). The purpose of this note is to present observations of commensal feeding by Atlantic Brant *B. b. hrota* unusual in that humans were directly and closely involved. These data were gathered incidentally during an investigation of Atlantic Brant winter ecology by the US Fish and Wildlife Service and the University of Maine.

On 20 April 1979 at 0900, we observed Atlantic Brant on Barnegat Bay, in the vicinity of the town of Brant Beach, NJ, feeding among shellfishermen approximately 50 m from shore (Figure 1). The fishermen had seven anchored boats. One operator was using tongs to lift clams (largely *Mercenaria mercenaria*) in approximately 1·5 m of water at low tide. Seven other shellfishermen, each wearing a diver's wet suit, were in the water, treading the bottom to feel the bivalves. When found, they were lifted by hand to small rafts made of netting and truck tyre innertubes. Each clammer moved slowly about with little talking, although there was con-

Figure 1. Atlantic Brant feeding on eelgrass brought to the surface by the activities of shellfishermen in Barnegat Bay, New Jersey. Note two men in wet suits in the water (one left centre, one by rearmost boat) and the man fishing with tongs in the right foreground. The Brant are clustered down current from each of the three shell-fishermen in the photo (*Holliday H. Obrecht, III*)

siderable splashing with the lunges below the surface to retrieve the clams. Brant flew to the vicinity of the fishermen, and then swam to positions 3–5 m downcurrent from the men in the water where they immediately began picking floating vegetation in a continuous darting and milling movement. During five hours of observation, the number of birds feeding in this manner increased to 50. None was observed to leave or cease feeding. By mid-morning, the combination of turning tide and rather constant light winds halted and then reversed surface currents. The Brant responded by feeding closer to the swimmers, and then downcurrent again on the opposite side from that previous.

Spring vegetation in this portion of Barnegat Bay consists almost entirely of eelgrass *Zostera marina* and various red and brown algae, most of which are epiphytes on the eelgrass stems and leaves. We raked the bottom at depths comparable to that where the Brant were feeding in order to simulate the disturbance of clam removal. We found that vegetation torn from the bottom moved in a consistent manner. Eelgrass stems, leaves and entire plants floated slowly to the surface; all other material sank or remained below the surface. With the early morning currents, the *Zostera* surfaced within 3 m of the disturbance site, the minimum distance to which the Brant then approached the men. The fact that some Brant advanced to within 2 m of the divers as the tide turned was, in our view, a direct result of the availability of eelgrass. Our studies of the seasonal physical condition of Atlantic Brant, the distribution and quality of their food resources, and their seasonal behaviour on the wintering grounds provide a background for these observations.

Atlantic Brant in the area south of Atlantic City, New Jersey (approximately 90% of the wintering New Jersey population) feed almost entirely upon sea lettuce *Ulva lactuca* in early winter. In its absence, and later in the year, they shift to saltmarsh grasses (largely *Spartina alterniflora*) and various algae in pans, especially *Enteromorpha* spp. *Zostera* is scarce in this region. Brant in the area north of Atlantic City, which includes the remaining wintering population and our observation site, feed on eelgrass, and in its absence, *Spartina*. Previous studies (Penkala 1975) have shown the rather complete dependence upon eelgrass of those Brant using Barnegat Bay, where *Ulva* is largely absent.

Comparative data are available for three of the Brant foods we have been studying. We have determined early spring energy values for *Ulva*, *Zostera*, and *Spartina* to be 3478, 3496 and 4283 cal/g dry weight with 87, 85 and 87% moisture, respectively. Using these data, a rough estimate of gross intake of 655 kcal/day (determined by Ebbinge *et al.* (1975) for the slightly larger Barnacle Goose *Branta leucopsis* during winter), and assuming a gross retention figure of 34% (Ebbinge *et al.* 1975), the Atlantic Brant would have to ingest either 4262 g of *Ulva*, 3676 g, of *Zostera*, or 3459 g of *Spartina* per day, assuming equal digestibility. Digestibility by geese is known to be not equal for all plant materials. Mattocks (1971) has suggested that the percentage crude fibre in the diet approximately equates to digestibility, since geese are not capable of efficient cellulose digestion. It is certainly true that the digestibility by Brant of the three foods we have been studying is relatively low and that large quantities of food must therefore be consumed.

Brant cannot obtain equivalent amounts of these three foods with equal expenditures of energy. *Ulva* was only available at low tide in widely scattered localities. *Zostera* was no longer available in wrack on the beach, but could nevertheless be efficiently ingested at low tide. *Spartina* was abundant everywhere, but in stems mostly less than 5 cm in length. On low vigour (short) marsh, where most Brant feed, *Spartina* had a biomass of only 298 g/m^2 in April. Obtaining floating *Zostera* such as that brought to the surface by the shellfishermen would clearly be one of the most efficient food gathering opportunities open to the Brant in this area, even if possible only infrequently. Additionally, in the incident we observed, the birds were able to feed in an area normally without available brant foods.

That geese show certain preferences for various foods at different seasons has been shown by Owen (1976) and others. Owen (1975) and Owen *et al.* (1977) have suggested that these preferences relate to nutritional quality, although the proximate cues for food choice and differences in fibre content may obscure differences in food value (Burton 1961). The work of Ranwell & Downing (1959) specifically suggested a nutritional basis for selection of foods by *Branta bernicla*. As Reed (1976) has emphasized: 'Strong selective pressures toward increased efficiency in

selecting, exploiting and utilizing food resources must operate during the critical stage of late winter and spring'. Although Atlantic Brant appear to be responding to environmental changes in clearly predictable ways, the details of this response and its ultimate effect upon individual survival continue to be a subject of major investigation.

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Summary

Atlantic Brant *Branta bernicla hrota* in Barnegat Bay, New Jersey, have established a commensal feeding relationship with man. Small flocks feed 3–5 m from clam fishermen on *Zostera* torn from the sea bottom by the fishing activities. Background material on the availability and digestibility of different brant foods is presented. This commensalism gives the Brant an efficient food gathering opportunity and permits them to exploit *Zostera* which might otherwise be unavailable to them.

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Ronald E. Kirby and Holliday H. Obrecht, III, US Fish and Wildlife Service, Migratory Bird and Habitat Research Laboratory, Laurel, Maryland 20811, USA.