

Meanwhile, the chorus was reduced in volume, and many toads were in amplexus very close to land where the shallow water was filled with strings of toad eggs. Some pairs would move away when gently prodded with a stick, but others would not move. We had no difficulty picking up a pair of toads in amplexus.

McAtee (U.S. Dept. Agric. Bull. No. 720, 1918) found that 90.53% of the stomach contents of wild Mallards is vegetable matter; the remains of frogs were found in 19 of 1578 Mallard stomachs examined. The Black Duck (*Anas rubripes*) consumes more animal food than the Mallard, about 25%, mostly molluscs (McAtee 1918), and may eat small toads (Bent, Life Histories of North American Waterfowl, Pt. 1. U.S. Natl. Mus. Bull. 126, 1923).

Our observations are most remarkable since large toads are generally avoided by predators (Lutz, in *Venomous Animals and Their Venoms*, Vol. II, W. Bucherl and E. Buckley, eds., Academic Press, New York, New York, 1971). They secrete anti-predator venoms, bufotenine and 5-OH tryptamine (Low, in *Evolution in the Genus Bufo*, W. F. Blair, ed., Univ. Texas Press, Austin, Texas, 1972), through orifices over the parotid glands (Chen and Chen, J. Pharm. Exper. Therap. 47:281–293, 1933). The Mallards captured and swallowed the large toads with avidity. We saw no evidence that the toads were distasteful or irritating to the ducks, nor did we observe any regurgitation of toads that had been swallowed.

These observations were made while I was conducting research supported by the National Science Foundation, Grant PCM79-00582.—NANCY S. MUELLER, *Dept. Biology, North Carolina Central Univ., Durham, North Carolina 27707. Accepted 20 Aug. 1979.*

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Dipper swallowed by trout.—On 24 June 1976, we caught a Dolly Varden trout (*Salvelinus malma*) in Big Creek, a stream adjacent to the University of Idaho's Taylor Ranch Field Station. The stomach of the fish contained a Dipper (*Cinclus mexicanus*). Predation by fish on Dippers has, to our knowledge, never been reported. The predacious Dolly Varden eats fish (Roos, Trans. Am. Fisheries Soc. 88:253–260, 1959), small mammals and birds (Dymond, The Trout and Other Game Fishes of British Columbia, Can. Dept. Fisheries, Ottawa, Ontario, 1932). Since Dippers feed on fry (Bent, U.S. Natl. Mus. Bull. 195:103, 1948), they would be in frequent contact with predatory fish.—CHARLES L. ELLIOTT AND STEVE PECK, *Coll. Forestry, Wildlife and Range Sciences, Univ. Idaho, Moscow, Idaho 83843. (Present addresses: CLE Dept. Botany and Range, Brigham Young Univ., Provo, Utah 84602 and SP 240 Parkview Dr., Burlington, Wisconsin 53105.) Accepted 24 Sept. 1979.*

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Team-hunting and food sharing in Parasitic Jaegers.—Parasitic Jaegers (*Stercorarius parasiticus*) breed regularly in arctic Alaska (Bailey, Colorado Mus. Nat. Hist. Popular Ser. No. 8, 1948; Pitelka, Arctic and Alpine Res. 6:161–184, 1974). They take a wide variety of animals as prey, but during the breeding season specialize either on birds, or birds and small mammals (Maher, Pac. Coast Avif. 37, 1974). At other breeding locales Parasitic Jaegers are known to rely heavily on kleptoparasitism of seabirds (Arnason and Grant, Ibis 120:38–54, 1978).

Parasitic Jaegers regularly team-hunt in pairs or small groups. Team-hunting occurs as: (1) three or more jaegers hunting near one another, but acting singly (group hunting), or (2)

two birds hunting cooperatively by assisting each other. Both group and cooperative hunting are known from the breeding grounds (Anderson, *in* Bent, U.S. Natl. Mus. Bull. 113, 1913; Gabrielson and Lincoln, *Birds of Alaska*, Wildl. Manage. Inst., Washington, D.C., 1959; Parmelee et al., Natl. Mus. of Canada Bull. 222, 1967; Maher 1974; Eisenhauer and Paniyak, *Auk* 94:389–390, 1977; Arnason and Grant 1978; Martin and Barry, *Can. Field-Nat.* 92:45–50, 1978), but the extent to which the jaegers depend on these techniques and the conditions under which they are exhibited are unknown.

During the summers of 1977, 1978 and 1979 I observed Parasitic Jaegers foraging daily over tundra at Prudhoe Bay and Franklin Bluffs, Alaska (70°15'N, 148°20'W). The jaegers often hunted in pairs, notably towards the end of summer after the hatching of resident shorebirds and passerines. Typically, 1 bird would fly a few meters above the tundra and the other about 10 m above and slightly behind. Group hunting involving 3–5 birds was most commonly observed during spring and fall migration, but occasionally also during mid-summer.

I saw 3 instances of cooperative hunting attacks and 1 group hunting attack at close range. The first observation, on 1 August 1977, involved 2 dark-phase jaegers and an immature female Pectoral Sandpiper (*Calidris melanotos*). When first seen, the jaegers were chasing the sandpiper in level flight. The jaegers pursued the sandpiper to a gravel road where it took refuge in the grass. The leading jaeger forced the sandpiper up, and after a quick series of alternate stoops by both jaegers, 1 caught the sandpiper in its bill, just above the grass. The jaeger carried the flapping sandpiper about 20 m, landed on the tundra and then placed the prey under its feet. The jaeger killed the victim by stabbing with its beak at the head and thorax region; both jaegers then plucked the sandpiper. Two min later, the first jaeger (the captor) picked up the sandpiper in its bill and allowed the second jaeger to tear bits of meat from the prey. After a few bites, the jaegers reversed roles and the first jaeger fed while the second jaeger held the sandpiper. After another 4 min and 2 more reversals, the jaegers had effectively divided up the catch.

The second and third instances, on 11 August 1977 and 7 August 1979, respectively, both involved chases of Lapland Longspurs (*Calcarius lapponicus*). In each case the longspur sought refuge near a gravel road and did not flush from the grass despite rapid stoops by both jaegers, who soon gave up the chase.

The group hunting attack was seen on 3 August 1978. Three jaegers were seen flying together about 15 m high when a Semipalmated Sandpiper (*C. pusilla*) flushed beneath them. All 3 jaegers took chase but 1 quickly turned back. The remaining 2 jaegers dove to the level of the sandpiper and chased it in level flight. The jaegers were 2 m apart and positioned above and below the sandpiper. After approximately 250 m the lower jaeger caught up to the sandpiper and grabbed it in its bill as the sandpiper tried to dodge right. This jaeger carried the bird 200 m and then landed. The second jaeger followed the first and then veered off and flew away. During this chase there was no cooperation between the 2 jaegers; the successful jaeger was the first to catch up with the fleeing sandpiper.

The dates of my observations on cooperative hunting were after the hatching of eggs for nesting Parasitic Jaegers (Maher 1974). At least one of the pairs of jaegers observed is known to have been nesting and I suspect it of the others. Maher (1974) found that nesting jaegers frequently left the nest-site together after the eggs hatched and that both adults were absent for about 50% of the time, presumably hunting together.

Because nesting jaegers are intraspecifically territorial (Maher 1974) it is unlikely that non-mated pairs would hunt cooperatively and share food. However, in group hunting, in which each jaeger takes advantage of the group but acts independently with respect to the prey, migrating and unmated jaegers may tolerate each other's presence. Also, in coastal areas where group hunting significantly increases the success of Parasitic Jaegers engaging in

kleptoparasitism (Arnason and Grant 1978) mated birds may leave their nesting territory to hunt in groups with other jaegers.

Several other workers have made observations on cooperative and group hunting in Parasitic Jaegers resembling those above. During the 3 summers of my work I received reports of no fewer than 15 instances of the hunting procedure from 3 different areas in Alaska. Cooperative hunting may be an important contribution to the success of Parasitic Jaegers in hunting birds. The Long-tailed (*S. longicaudus*) and Pomarine (*S. pomarinus*) jaegers prey much less on birds than does the Parasitic Jaeger (Maher 1974) and no reference could be found describing cooperative hunting in either of the former species. Sharing of food, however, has been recorded in all 3 species (Andersson, *Ornis Scand.* 2:35–54, 1971; Martin and Barry 1978; Pitelka, unpubl. data). This behavior may facilitate pair bond maintenance and the tearing of prey into small pieces which would make swallowing easier (Andersson 1971).

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Incubating Wood Duck and Hooded Merganser hens killed by black rat snakes.—Wood Duck (*Aix sponsa*) nest boxes (N = 78) were erected 2–8 m above high water level in seasonally fluctuating river swamp ecosystems on the Department of Energy's Savannah River Plant, a 81,000-ha area occupying portions of Aiken, Allendale and Barnwell counties, South Carolina. Protection from predators was provided by 42 cm wide wrap-around shields placed 0.5 m below the nests boxes. Nest boxes were inspected bi-weekly during the nesting seasons of 1973, 1974 and 1975 and monthly during the nesting seasons of 1976 and 1977.

The black rat snake (*Elaphe obsoleta*), an excellent swimmer, readily circumvented predator shields and was the only known nest predator during the 5 years of observation. This species destroyed 24 of 76 nests (32%) initiated from 1973–1975. Noteworthy is evidence that nesting Wood Duck and Hooded Merganser (*Mergus cucullatus*) hens may also be killed during rat snake nest depredations. The following 4 incidents were observed: (1) On 26 March 1974, I found a 162 cm long rat snake which had eaten 10 of 12 eggs in a nest box with a dead female Wood Duck. The Wood Duck's neck was twisted, possibly broken. (2) On 3 April 1975, I found a large black rat snake which had consumed several eggs in a nest box with a dead female Wood Duck. Again the Wood Duck's neck was twisted. (3) On 17 April 1975, I found a dead female Wood Duck with a twisted neck in a nest box. No snake or eggs were present. (4) On 15 April 1977, I found a large rat snake which had consumed several eggs in a nest box containing a dead female Hooded Merganser. The carcass was so decomposed that condition of the neck could not be determined.

These data suggest that large rat snakes occasionally kill incubating Wood Duck and Hooded Merganser hens. I believe the deaths to be the result of circumstance rather than active defense by the hen or pursuit by the snake. Wood Duck nest boxes have 1 hole which serves as entrance and exit. After the snake has partially entered the nest box, the hen may attempt to leave the box through the hole occupied by the snake. The rat snake may react to this apparent attack by striking and coiling its body around the bird (with the coils ultimately ending up around the hen's neck). The hen's death is possibly caused by her attempts to escape.