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PREDATION ON VERTEBRATES BY CLARK'S NUTCRACKERS

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Bent (1946) and Goodwin (1976) have suggested that various species in the family Corvidae are "opportunistic" feeders and that predatory behavior is not unusual among crows. Of 29 species in eight genera of North American corvids for which Bent gave data on diet, 25 (86%) sometimes kill their own prey; of these 25, 13 (52%) occasionally kill small mammals. Here we report 13 observations of Clark's Nutcrackers (*Nucifraga columbiana*) attacking vertebrates in the central Sierra Nevada. We also saw the birds feeding on road kills 16 times.

Although conifer seeds are the main food of these birds (Vander Wall and Balda 1977, Tomback 1977), they frequently eat meat. For example, the stomachs of 426 nutcrackers from Montana contained, by volume, 83% conifer seeds, 13% arthropods, and 3% mammal remains; 98% of them contained seeds, 59% contained arthropods, and 12% contained mammal remains (Giuntoli and Mewaldt 1978). Cottam (1945) reported similar stomach contents from ten birds. Sometimes the meat is carrion (Bradbury 1917, Munro 1919, Cottam 1945, Bent 1946), but often nutcrackers kill their own prey: molluscs (Decker and Bowles 1931), insects (Skinner 1916, Decker and Bowles 1931, Bent 1946), birds' eggs (Munro 1919, Bent 1946, French 1955), nestlings (Rowley 1939, French 1955), adult birds (MacCracken 1949), and small mammals (Bainbridge 1956, Dixon 1956).

We observed predation by Clark's Nutcrackers while studying Belding's Ground Squirrels (*Spermophilus beldingi*) on a subalpine meadow at Tioga Pass, Mono County, California (elevation about 3,000 m). The study area was described by Morton (1975) and Sherman (1977). During May-August of 1974-1977, 16 observers spent 3,817 hours watching squirrels and as many non-observation hours at the study area. We saw nutcrackers attack vertebrates 13

times (Table 1). At least six attacks were successful; on the other occasions, the prey escaped by entering a burrow or bush.

Belding's Ground Squirrels were attacked most frequently (54%), but because our observations were concentrated on that species the nutcrackers' apparent preference for them may be exaggerated. Predation attempts on the squirrels were most successful in 1977 (Table 1), perhaps due to unusual weather. From 30 April until 26 May 1977 it stormed daily, with intermittent snowfalls, subfreezing temperatures, and high winds (Morton and Sherman 1978). More than 60% of Tioga Pass *S. beldingi* perished during the storm. Most either starved or were preyed on by conspecific ground squirrels or nutcrackers. Usually when nutcrackers landed near adult ground squirrels the latter did not flee, give aerial predator alarm calls (Turner 1973), or otherwise alter their behavior. These observations suggest that Clark's Nutcrackers infrequently prey on the squirrels, for they were not regarded as predators. Probably nutcrackers are especially likely to attack ground squirrels successfully when the latter are weak, ill, or behaving abnormally, as they were during the 1977 spring snowstorm (Table 1).

A typical nutcracker attack on a squirrel occurred on 15 May 1977, at the height of the storm. The ground squirrel, an emaciated adult female (Morton and Sherman 1978) was foraging near her burrow when a nutcracker landed about a meter away. When the bird swooped down, the mammal ceased foraging, looked up, then continued to feed. The nutcracker pecked at the ground and moved closer to the squirrel, alternately facing away from and sideways to it. Suddenly the bird flew to the ground squirrel's side and jabbed the animal's head with its bill. In contrast to Dixon's (1956) account of a "battle" between a nutcracker and a (healthy?) ground squirrel, there was no struggle in this instance. The weakened animal apparently was killed instantly by the nutcracker's blow near its eye. After repeatedly pecking its victim's skull, the bird ate most of the side of the squirrel's face and brain before we chased it off to recover the carcass. The speed and accuracy of the bird's attack suggests that Clark's Nutcrackers are familiar with preying on at least some small vertebrates. Gill (1974) made a similar suggestion about Gray Jays (*Perisoreus canadensis*) after observing the

TABLE 1. Predation attempts by Clark's Nutcrackers on vertebrates observed during 1974-1977 at Tioga Pass, Mono Co., California.

Date of attack	Species attacked	Age of prey	Prey killed?
23 May 1974	Mountain Vole (<i>Microtus montanus</i>)	Adult	Yes
19 May 1975	Mountain Vole	Adult	Yes
2 June 1975	Belding's Ground Squirrel (<i>Spermophilus beldingi</i>)	1-Year	No
3 August 1975	Belding's Ground Squirrel	Juvenile	No
2 May 1976	Pocket Gopher (<i>Thomomys monticola</i>)	Adult (?)	No
10 May 1976	Mountain Vole	Adult	Yes
25 May 1976	Belding's Ground Squirrel	1-Year	No
15 May 1977	Belding's Ground Squirrel	Adult	Yes
17 May 1977	Belding's Ground Squirrel	Adult	No
20 May 1977	Belding's Ground Squirrel	Adult	Yes
20 May 1977	Belding's Ground Squirrel	1-Year	Yes
31 May 1977	Yosemite Toad (<i>Bufo canorus</i>)	Adult	No
11 July 1977	White-crowned Sparrow (<i>Zonotrichia leucophrys</i>)	Nestling	*

* Fate unknown; carried off.

nearly instantaneous death of a Red-backed vole (*Clethrionomys gapperi*) following a jay's bill-jab to its skull.

Although nutcrackers are gregarious, often foraging in small groups (Bent 1946), more than one was involved in only 3 of 13 predation attempts we observed. However in all six cases of successful predation, at least one nutcracker other than the killer arrived at the carcass soon after the kill; twice, two additional birds and once three birds arrived. Familial relationships among these birds were not known. Occasionally several nutcrackers shared a carcass. More often the birds were antagonistic, competing for meat by jerking the carcass away from each other and attempting to fly off with it.

Why did nutcrackers prey on vertebrates in 1974-1977? First, snow cover may encourage or facilitate predation by making potential prey more visible, as suggested by Gill (1974). Seven of 13 predation attempts we witnessed took place on snow-covered ground. Snow cover probably also enhanced our ability to observe predator-prey interactions. It also is possible that deep snow or ice covered nutcrackers' seed "caches" (Bock et al. 1973, Vander Wall and Balda 1977, Tomback 1977) in the springs of 1974-1977, forcing the birds to search for foods alternative to conifer seeds. For 10 of the 13 attacks the study meadow and the area surrounding it were at least 75% snow covered, and mean snow depth at attack sites was 30 ± 10 (SD) cm.

Second, during 1974-1977 the birds' seed caches could have been inadequate, because of either local conifer seed scarcity or cone crop "failure" in the Sierra Nevada (Davis and Williams 1957, 1964). However conifer seed crops, in particular those of Whitebark Pine (*Pinus albicaulis*)—the major nutcracker food source at Tioga Pass (Tomback 1977)—were not significantly lower in the study years than "normal" (Eden 1973, 1974, 1975, unpubl. data, pers. comm.).

Third, Dixon's (1956) observations suggest that Clark's Nutcrackers may regularly feed their young meat. If so, attacks in the early spring (Table 1) might be due to the presence of hungry nestlings (Bradbury 1917, Mewaldt 1956).

Finally as suggested by Bent (1946) and Tomback (1977), Clark's Nutcrackers are "opportunistic" feeders. Changes in the non-vegetable portion of their diets probably are influenced by the availability of prey. Our observations suggest that nutcracker predation was unusual in 1974-1977 but that nutcrackers, like many other corvids (Bent 1946, Goodwin 1976), are omnivorous and prey on small vertebrates whenever possible.

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PHOTOGRAPHIC RECORD OF THE LITTLE STINT (*CALIDRIS MINUTA*) FOR MAINLAND NORTH AMERICA

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The Little Stint (*Calidris minuta*) breeds on arctic tundra from northeastern Scandinavia eastward to central Siberia, occurring only casually east of the Indigirka River at 150° E (Dement'ev, G. P., N. A. Gladkov, and E. P. Spangenberg, *Birds of the Soviet Union*, vol. 3, p. 149-153. Israel Program for Scientific Translations, 1969). The only published Nearctic record for this species is an individual photographed in Bermuda 10-12 June 1975 (K. Pellow, *Am. Birds* 30:918, 1976). Probably because of the remoteness of its nesting area, this species is the only *Calidris* sandpiper that has not been recorded from mainland North America. In this note we report on its occurrence near Barrow, Alaska.

On 28 June 1976 we took several color photographs of a small *Calidris* sandpiper as the bird moved about with a Semipalmated Sandpiper (*C. pusilla*) 3 km south of the Naval Arctic Research Laboratory near Barrow. The bird was photographed in good light at less than 8 m with a 400 mm lens and extension tubes. These photographs showed features that allowed us to identify the bird as a Little Stint:

bill and legs black; bill short, slightly tapered, straight; upper parts decidedly rufous with scapulars black centrally, rimmed by foxy buff or terminally white; pale fringes on feathers of the mantle formed an obvious "V" down the back; crown streaked dark, head suffused with chestnut wash; faint darker eyestripe forward of eye; pale supercilium less distinct over eye; chin and throat white, sides of throat and chest streaked, pattern growing stronger laterally to wings; belly pure white, no flank streaks; wings did not extend beyond tail. The richness of color and well-defined pattern indicate that the bird was in full nuptial plumage. It foraged close to the Semipalmated Sandpiper for 20 min, which afforded an excellent comparison of size, and revealed that the unidentified bird was slightly smaller. Thus size and plumage pattern are consistent with the bird's being a Little Stint, eliminating the most similar species (Semipalmated and Rufous-necked (*C. ruficollis*) sandpipers) or any other calidridine. Its call note was squeaky, decidedly fuller than that of the Western Sandpiper (*C. mauri*), but much thinner than the calls of Semipalmated or Rufous-necked sandpipers.

Copies of the slides were submitted to D. I. M. Wallace, an European ornithologist familiar with Little Stints in the field (Wallace, *Br. Birds* 67:1-17, 1974). He confirmed our identification (Wallace, pers. comm.). Copies of the slides have also been sent to Daniel Gibson (University of Alaska Museum), and Stanley Anderson (Photoduplicate File, U.S. Fish and Wildlife Service, Laurel, Maryland).