A Probable First North American Record of the Greater Antillean Race of Black-whiskered Vireo

HENRY M. STEVENSON
Tall Timbers Research Station, Route 1, Box 160, Tallahassee, Florida 32303 USA

On 8 and 23 April 1977 James M. Stevenson collected and prepared single specimens of Black-whiskered Vireos on St. George Island, Franklin County, on the coast of northwest Florida. Noting a marked difference in the two specimens, he turned them over to me for closer examination. The specimen of 23 April closely resembled those of *V. a. barbatulus* available to me at the Tall Timbers Research Station and Florida State University, but the one collected on 8 April differed in having a more brownish head and back, buffier superciliaries, and a longer, more narrow bill. Later it was identified by Jon C. Barlow of the Royal Ontario Museum, Toronto. He indicated that the bird was undoubtedly *V. a. altiloquus* (not *V. a. barbatulus*, as are all other North American specimens known to me). According to Bond (1956. Check-list of the birds of the West Indies, Acad. Nat. Sci. Philadelphia), the subspecies *altiloquus* breeds in the Greater Antilles (except Cuba and the Isle of Pines) and the Virgin Islands, wintering mainly in northern South America. Barlow's identification was based on "the distribution of buff on the head, straightness and thinness of the bill, and length of the culmen."

According to Ridgway (1904, Birds of North and Middle America, Bull. U.S. Natl. Mus. No. 50, Part 3: 141–142), the exposed culmen of the Black-whiskered Vireo that breeds in Florida and Cuba, *V. a. barbatulus*, measures 14.0–15.5 ($\bar{x}$ = 14.9) mm in males and 12.5–15.5 ($\bar{x}$ = 14.4) mm in females, whereas *altiloquus* (*sub. nom. calidris*) measures 15.0–17.5 (16.3) mm and 15.0–16.0 (15.8) mm for the respective sexes. My measurements for the specimen of *V. a. altiloquus* (TTRS 3550) were: culmen 16.3 mm (as against 14.8 for the *barbatulus* specimen of 23 April), wing (flat) 84.0 mm, tail 61.4 mm. Because these specimens were prepared by injection with formalin, the sex of each was not determined. Other races of the Black-whiskered Vireo differ from *altiloquus* in color or bill length (see Ridgway op. cit.: 137–142).

Sightings of Black-whiskered Vireos with brownish upperparts and long bills have been reported on three previous occasions along the northern Gulf Coast (Duncan 1976, Amer. Birds 30: 658), suggesting the possibility that *V. a. altiloquus* may be a rare but regular visitor to the area.

I am most grateful to Jon C. Barlow for identifying the specimen and to him and Eugene Eisenmann for their advice regarding the manuscript. *Received 20 October 1977, accepted 9 February 1978.*

Stomach Contents of Clark's Nutcrackers Collected in Western Montana

MERVIN GIUNTOLI[1] AND L. RICHARD MEWALDT
Avian Biology Laboratory, San Jose State University, San Jose, California 95192 USA

Clark's Nutcracker (*Nucifraga columbiana*) has long been known as a food specialist which relies heavily on the seeds of coniferous trees (Bent 1946). Its distribution on the major mountain ranges of the interior of western North America is generally associated with the widely-distributed ponderosa pine (*Pinus ponderosa*) and white bark pine (*P. albicaulis*) and locally with such species as limber pine (*P. flexilis*), piñon pine (*P. edulis, P. monophylla*), Jeffrey pine (*P. jefferyi*), and Douglas fir (*Pseudotsuga menziesii*). A monotypic species, Clark's Nutcracker occurs commonly from the mountains of central British Columbia and southwest Alberta to northern New Mexico, central Arizona, and the southern Sierra Nevada of California. At intervals of several years it irrupts into intermountain areas, Pacific coastal areas (Davis and Williams 1957, 1964) and occasionally the Great Plains east of the Rocky Mountains, northern Mexico, and southern Alaska. It nests in March and April, often under winter conditions, when nestling nutcrackers are fed pine seeds (Skinner 1916, Mewaldt 1956).

This report provides a summary of the stomach contents of 426 Clark's Nutcrackers collected between 1,000 and 2,500 m elevation mostly in the mountains of Missoula and Ravalli counties in western Montana from October 1946 to May 1949. The skins of all specimens collected, field notes, and card files

[1] Present address: Science and Engineering Division, Canada College, Redwood City, California 94061 USA.

TABLE 1. Stomach contents of 426 Clark's Nutcrackers from western Montana expressed as volume (%) and frequency (%) by months

Year	Month	Number	Volume (and frequency) as percentages					
			Ponderosa pine	White bark pine	Douglas fir	Misc. plants	Arthropods	Mammals
1946	Oct	6	48 (100)	5 (17)	45 (67)		2 (50)	
	Nov	5	2 (80)		98 (100)		T (20)	
	Dec	8	1 (38)		99 (100)		T (12)	
1947	Jan	7	55 (72)	3 (14)	42 (43)		T (29)	
	Feb	10	37 (100)	28 (60)	34 (50)	1 (10)	T (70)	
	Mar	25	24 (68)	5 (32)	69 (80)	T (16)	1 (44)	1 (44)
	Apr	16	46 (88)	9 (25)	36 (69)	1 (6)	8 (62)	
	May	22	31 (64)	29 (77)	14 (36)	T (5)	25 (96)	1 (5)
	Jun	8	16 (25)	46 (88)			38 (100)	
	Jul	9	2 (10)	62 (100)		T (33)	36 (100)	
	Aug	13		84 (100)		1 (8)	14 (100)	1 (8)
	Sep	6		87 (100)			13 (33)	
	Oct	13	55 (93)	13 (46)			32 (85)	
	Nov	16	56 (94)	38 (88)			4 (44)	2 (19)
	Dec	18	47 (95)	33 (89)			4 (33)	16 (28)
1948	Jan	11	48 (100)	52 (91)		T (9)	T (27)	
	Feb	12	40 (100)	56 (100)			4 (42)	
	Mar	12	51 (100)	37 (100)		1 (8)	9 (83)	2 (8)
	Apr	17	39 (94)	23 (59)		8 (47)	22 (71)	8 (24)
	May	12	30 (83)	38 (92)		T (8)	26 (100)	6 (17)
	Jun	4	6 (50)	51 (75)			30 (100)	13 (25)
	Jul	20	1 (5)	19 (70)		T (5)	76 (100)	4 (5)
	Aug	0						
	Sep	3	95 (100)				5 (67)	T (33)
	Oct	0						
	Nov	41	96 (100)			T (5)	2 (32)	2 (5)
	Dec	0						
1949	Jan	21	91 (100)			T (5)	T (5)	9 (38)
	Feb	24	94 (100)				3 (37)	3 (17)
	Mar	24	86 (100)				4 (46)	10 (33)
	Apr	23	85 (100)				15 (91)	
	May	20	82 (100)			T (5)	18 (90)	
Weighted summation[a]			52.4 (80)	19.3 (42)	11.2 (15)	0.7 (6)	13.3 (59)	3.1 (12)

[a] Volume percent = $S_w{}^v = \Sigma (N_1V)/N_2$ when $S_w{}^v$ = weighted summation of volumes, N_1 = number that month, V = percent of volume that month, and N_2 = 426 samples. Frequency percent = $S_w{}^f = \Sigma (N_1F)/N_2$ when $S_w{}^f$ = weighted summation of frequencies, and F = percent frequency that month

with detailed findings are in the Museum of Birds and Mammals, San Jose State University. Further detailed information on the biology of these same specimens and the populations from which they were collected may be found in Mewaldt (1948, 1952a, 1952b, 1956, 1958).

Stomachs were removed and preserved in formalin usually within a few hours of collection. Later, we (Giuntoli 1963) soaked the stomachs in water, opened them, and washed and examined the contents in 70% ethanol. For each bird we approximated (Martin et al. 1946) the volume percent of each kind of food as of the time of ingestion (Table 1). Reference materials for identification of seeds and arthropods came from the Herbarium (Allen W. Jacobs) and the Entomology Museum (J. Gordon Edwards) at San Jose State University.

Conifer seeds made up 83% of the food ingested and were present in 98% of the 426 nutcrackers (Table 1). In the vicinity of Missoula and on the east slope of the Bitterroot Range of Ravalli County, the most commonly taken food was seed from the ponderosa pine. Its production in 1946 was only moderate, and a bumper crop of Douglas fir seeds provided the bulk of the diet during the 1946–47 fall, winter, and spring seasons.

During the balance of the collection period, no seeds of the Douglas fir were taken by the nutcrackers. In 1947 seed crops of the Douglas fir and the ponderosa pine failed, but the white bark pine crop was at least moderate. In the 1948–49 fall, winter, and spring periods a very abundant 1948 ponderosa pine seed crop was eaten by the nutcrackers to the exclusion of at least moderate crops of white bark pine and Douglas fir seeds.

Only nine nutcrackers (2%) had no conifer seeds in their stomachs. Seven of these, containing insects only, were collected in June and July of 1948; one collected in December 1947 contained only mammal remains, including the foot of a small rodent; and one stomach contained only fragments of pine needles.

Miscellaneous plant materials in the stomachs were usually non-food items such as fragments of wood, pine needles, and cone scales. Small seeds encountered in fewer than 4% (15) of the stomachs and accounting for well less than 1% of food volume came from several unidentified flowering plants. Some small seeds may have been ingested as berries.

Arthropods accounting for 13% of food volume were most commonly taken in the summer months, reflecting availability. Spiders were found in 17% of stomachs and included at least some wolf-spiders (Lycosidae). Insects present in 56% of the sample included 117 with Coleoptera (Buprestidae, Carabidae, Cerambycidae, Lathridiidae, Otiorhynchidae, Scrabaeidae, and Tenebrionidae); 90 containing Hymenoptera (especially Apidae and Formicidae); 24 with Orthoptera (Acrididae and Gryllacrididae); 9 with Lepidoptera (Phalaenidae); 6 with Diptera; 2 with Plecoptera; and 1 with Homoptera (Cicadidae).

Remains of mammals were found in 53 (12.4%) of the birds but come to only 3.1% of the food volume. Rodent (Rodentia) remains were most common. One shrew (Insectivora) mandible was recovered. Several stomachs contained maggots along with substantial amounts of large mammal hair and meat suggesting carrion. None contained the remains of birds.

Because grit was present in 158 stomachs (37%), it was likely present to assist reduction of the conifer seeds, the major food. Seed hulls, nearly always present, may also have helped to grind up seeds in the muscular stomach.

Forty (9%) of the nutcrackers collected had food items in their sublingual pouches (Bock et al. 1973, Swanberg 1951, Vander Wall and Balda 1977). Twenty contained a mean of 25 ponderosa pine seeds (range 1–92). Seeds were usually intact, but one bird (20 February) carried 34 shelled seeds and another (11 May) carried 20 shelled seeds out of a total of 24 seeds. White bark pine seeds (1–46; mean = 8) were present in the sublingual pouches of 13 nutcrackers, most in the fall and winter of 1947–48. Seven of these taken in the fall of 1947 were from birds apparently transporting seeds from higher elevation to storage at lower elevation. Nine of the 13 birds were taken below 1,600 m, well into the ponderosa pine zone during the food-scarce fall and winter of 1947–48. During that winter, 85% of the nutcrackers collected in the ponderosa pine zone had recently consumed white bark pine seeds.

Spiders were present in five sublingual pouches. Four nutcrackers taken together on 10 April 1949 at one place contained collectively in their sublingual pouches 54 spiders, 2 caterpillars (Lepidoptera), 4 beetles, and 3 ponderosa pine seeds. Pouches of two nutcrackers contained bones, flesh, and fragments of hide from rodents.

In the fall of 1947, after failure of the ponderosa pine and Douglas fir seed crops, nearly all hatching-year and most older Clark's Nutcrackers left the study areas (Mewaldt 1948) in what was probably an irruptive movement such as described by Davis and Williams (1957, 1964). In that winter and the following spring, the remaining adults apparently lived on old caches of ponderosa pine seeds (probably from 1946) and white bark pine seeds stored in convergent storage areas (Tomback 1978) on the lower south-facing slopes of the mountains. The white bark pine seeds had been transported from higher elevations down to the ponderosa pine zone probably in the late summer of 1947.

The scarcity of food in the 1947–48 winter season had a significantly depressant effect on body weights when compared to the two winters of relatively abundant food (conifer seeds) in the winter seasons of 1946–47 and 1948–49. The 51 adult males collected October to March 1947–48, with a mean body weight of 136 ± 5.6 g, were significantly lighter ($P < 0.05$) than 48 adult males collected October to March 1946–47 plus 1948–49, with mean weight of 149 ± 7.0 g. Similarly, the 30 adult females collected in the same months of 1946–47, with mean weight of 122 ± 7.0 g, were significantly lighter ($P < 0.05$) than 27 adult females collected October to March 1946–47 plus 1948–49, when mean collection weight was 134 ± 8.7 g. These weight data dramatically confirm the importance of pine seeds as food to the Clark's Nutcracker. They further suggest that in central western Montana, ponderosa pine and the Douglas fir, being relatively far more abundant than white bark pine, are the principal food sources of Clark's Nutcracker.

The original collections were made when Mewaldt was a graduate student at the University of Montana under the thoughtful guidance of Philip L. Wright. Assistance and companionship in the field were also provided by Clinton H. Conaway, Fletcher E. Newby, Ludvig G. Browman, and Frances L. Mewaldt. We are grateful to Diana F. Tomback and Russell P. Balda for helpful comments on this paper. This study was supported in part by a Louis Agassiz Fuertes Research Grant from the Wilson Ornithological Society.

LITERATURE CITED

BENT, A. C. 1946. Life histories of North American jays, crows, and titmice. U.S. Natl. Mus. Bull. 191.

BOCK, W. J., R. P. BALDA, & S. B. VANDER WALL. 1973. Morphology of the sublingual pouch and tongue musculature in Clark's Nutcracker. Auk 90: 491–519.

DAVIS, J. & L. WILLIAMS. 1957. Irruptions of the Clark Nutcracker in California. Condor 59: 297–307.

———. 1964. The 1961 irruption of the Clark's Nutcracker in California. Wilson Bull. 76: 10–18.

GIUNTOLI, M. 1963. An analysis of the food habits of the Clark Nutcracker, (*Nucifraga columbiana*). Unpublished M.A. thesis, San Jose, Calif., San Jose State Univ.

MARTIN, A. C., R. H. GENSCH, & C. P. BROWN. 1946. Alternative methods in upland game bird food analysis. J. Wildl. Mgmt. 10: 8–12.

MEWALDT, L. R. 1948. Nesting habits and some general notes on Clark's Nutcracker (*Nucifraga columbiana* WILSON). Unpublished M.A. thesis, Missoula, Univ. Montana.

———. 1952a. The incubation patch of the Clark Nutcracker. Condor 54: 361.

———. 1952b. Reproduction and molt in Clark's Nutcracker *Nucifraga columbiana* WILSON. Unpublished Ph.D. thesis, Pullman, Washington State Univ.

———. 1956. Nesting behavior of the Clark Nutcracker. Condor 58: 3–23.

———. 1958. Pterylography and natural and experimentally induced molt in Clark's Nutcracker. Condor 60: 165–187.

SKINNER, M. P. 1916. The nutcrackers of Yellowstone Park. Condor 18: 62–64.

SWANBERG, P. O. 1951. Food storage, territory and song in the Thick-billed Nutcracker. Proc. Xth. Intern. Ornith. Congr.: 545–554.

TOMBACK, D. F. 1978. Foraging strategies of the Clark's Nutcracker in the eastern Sierra Nevada. Living Bird, in press.

VANDER WALL, S. B., & R. P. BALDA. 1977. Coadaptations of the Clark's Nutcracker and the piñon pine for efficient seed harvest and dispersal. Ecol. Monogr. 47: 89–111.

Received 18 April 1977, accepted 27 July 1977.

Observations and Reinterpretation of Kingfisher-Raptor Interactions

RONALD E. KIRBY
U.S. Fish and Wildlife Service, Migratory Bird and Habitat Research Laboratory, Laurel, Maryland 20811 USA

MARK R. FULLER
Department of Veterinary Biology, College of Veterinary Medicine, University of Minnesota, St. Paul, Minnesota 55108 USA

Reported observations of Belted Kingfisher (*Megaceryle alcyon*)-raptor interactions have ranged from brief encounters where the kingfisher escaped the raptor and the hawk subsequently flew away to repeated chases (Johnson 1925, McCabe and McCabe 1928, Skinner 1928, Smith 1963). In some repetitive chases, kingfishers appeared to initiate the interaction (McCabe and McCabe 1928, Skinner 1928).

On 25 August 1971 in north-central Minnesota an adult male kingfisher was observed fishing on a 4.5-ha beaver (*Castor canadensis*) flowage at 1740. At 1748 an immature Cooper's Hawk (*Accipiter cooperii*) landed quietly in a dead tree approximately 50 m from the kingfisher's perch. The kingfisher immediately began a loud rattling call and within 30 s flew directly at the hawk. When the kingfisher flew closely over its head, the hawk left its perch and began pursuit. The kingfisher dodged rapidly between standing dead trees and landed on a limb after the hawk had given up the chase. Chases were then repeated three times in the next 4 min. The kingfisher repeatedly approached the hawk and retreated when the hawk gave chase until the hawk left at 1910. In all instances, the kingfisher initiated the interaction by approaching the hawk on the wing or through a series of short moves through the trees. When not being harrassed by the kingfisher, the hawk attempted to capture five different Black-capped Chickadees (*Parus atricapillus*) and two immature Hairy Woodpeckers (*Picoides villosus*).