TABLE 1

IRREGULAR AND INCOMPLETE WING MOLT IN FIVE OF SIX RED-TAILED HAWKS

			Primary										Secondary									
Band no.	Capture date		1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	10
877–12704	30 March 72	R:	All new										N	N	O	O	N	N	O	O	O	O
		L:	All new										N	N	O	N	N	N	O	O	O	N
	31 March 73	R:	N	N	N	N	N	N	O	O	N	N	O	O	N	O	O	N	N	N	N	N
		L:	N	N	N	N	N	N	O	O	N	N	O	O	N	N	N	O	N	N	N	O
877–12713	28 March 73	R:	N	N	O	N	N	O	O	N	O	N	O	O	N	N	O	O	O	N	N	N
		L:	N	N	O	N	N	O	O	N	O	N	N	O	N	N	O	O	O	N	N	N
877–12714	28 March 73		All new										All new									
877–12716	28 March 73	R:	N	N	N	N	O	O	N	O	N	O	O	O	O	O	N	N	N	N	N	N
		L:	N	O	N	O	N	O	N	N	N	N	O	O	O	O	N	N	N	N	N	N
877–12717	29 March 73	R:	N	N	N	N	O	N	N	O	N	N	N	N	N	O	N	N	N	O	N	N
		L:	N	N	N	N	O	N	N	O	N	N	N	N	N	O	N	N	N	O	N	N
877–12718	31 March 73	R:	O	N	O	N	N	O	O	N	N	N	O	N	O	O	O	O	O	N	N	N
		L:	O	N	O	N	N	O	O	N	N	N	O	O	O	N	O	N	O	N	N	N

[1] N = feather grown in during the last molt, O = feather not molted in the last molt.

readily apparent from the pronounced bleaching and wear of the vanes. The pattern of the previous molt was not sequential in four of the five (see Table 1).

Irregular molting of the primaries and secondaries has been reported (Stresemann and Stresemann 1960, J. Ornithol. 101: 373–403) for certain genera, including *Buteo*, of all Accipitridae subfamilies except Circinae, Milvinae, Perninae, and Elaninae. The Stresemanns suggested that this molt pattern evolved from the primitive pattern of molting primaries 1 through 10 in sequence in order to reduce the stress on ingrowing feathers and to minimize the loss of flight efficiency.

Certain large eagles are reported to take more than a year to complete a wing molt (Spofford 1946, Auk 63: 85), but I have seen no account of this phenomenon in *Buteo*. Presumably these birds stop molting sometime in the fall in order that no feathers will be growing in during times of food shortage. Several factors suggest that prey is abundant year-round on this island; these include the mild climate (snow cover rarely lasts more than a few days), the fact that the entire Red-tail population (between 10 and 20 pairs) appears to be nonmigratory, the large number of migratory raptors that winter on the island, and my own snap-trapping data. I would be very interested to compare data with anyone who has similar observations of resident or wintering raptors showing incomplete molts.

I thank Dean Amadon and Walter Spofford for their comments and suggestions on the manuscript. These observations were made while conducting a research project supported by the Harris Foundation.—RICHARD O. BIERREGAARD, JR., *c/o Felix Neck Wildlife Sanctuary, Box 1055, Oak Bluffs, Massachusetts 02577.* Accepted 15 Jun. 73.

Copulatory and vocal behavior of a pair of Whiskered Owls.—Many aspects of owl behavior are poorly known because of the birds' noctural habits. This is particularly true of Whiskered Owls (*Otus trichopsis*), which occur in the United States only in southeastern Arizona (A.O.U. 1957). Marshall (1957, 1967) adequately describes the species external morphology and some of its natural history, but Bent (1938) and Jacot (1931) present the most comprehensive reports. None of these accounts fully describes its vocal displays or copulatory behavior. The objectives of this brief report are to clarify the contexts in which vocal displays are used and to describe the copulatory behavior of one pair of Whiskered owls.

Observations were made along Cave Creek, elevation 5,400 feet, in the Chiricahua Mountains, Cochise County, Arizona, between 15 and 19 April 1972. Both the nesting and roosting trees the owls used were sycamores (*Platanus racemosa*). A complete habitat description is presented by Ligon (1968) and Marshall (1957).

Copulation was observed once on 16 April and twice on 17 April; all occurred after sunset between 18:00 and 19:00. The owls copulated approximately 20 feet above the ground on the lower bare branches of the nest tree or its neighboring tree. All three copulations occurred within 10 feet of the nest cavity. When I caught the female by hand in the nest cavity on 18 April I probably inadvertently dislodged an egg from the nest, as I found a fresh, cracked egg at the base of the tree when I was leaving. By palpating the female I surmised she contained an egg that was ready to be laid.

Vocalizations were recorded on a Nagra III BH recorder at 7½ ips, using an Altec 633 A microphone mounted on a 24-inch parabolic reflector. Spectrograms were produced on a Kay Electric Company Sonagraph (6061 B) equipped with a

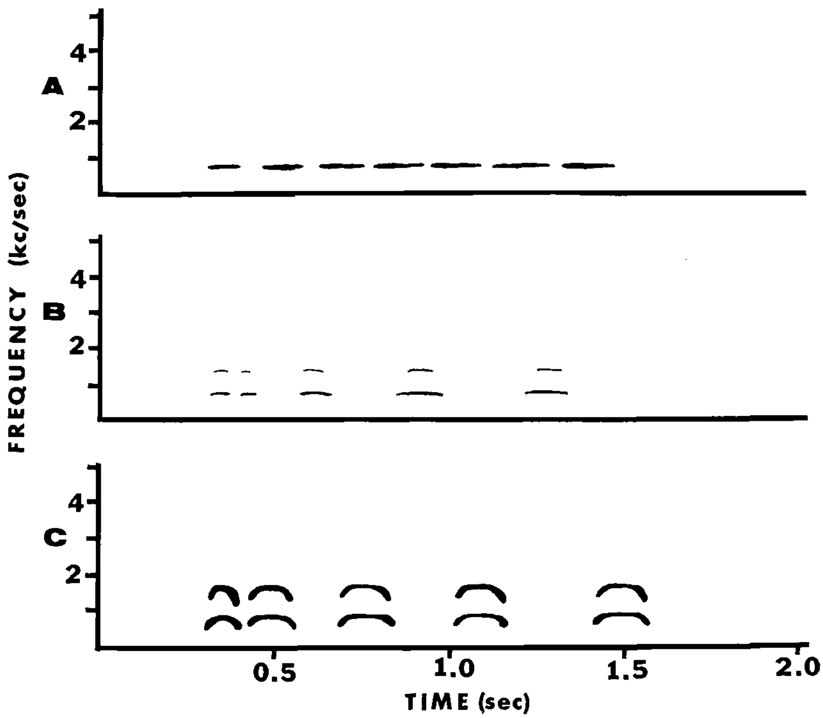

Figure 1. Tracings of male and female Whiskered Owl songs. A, male's territory song; B, male's syncopated song; C, female's syncopated song.

Tandberg (series 15) input recorder. Those presented herein and those used for frequency analysis were produced at a narrow band-pass setting. Those analyzed for temporal components were produced at a wide band-pass setting.

Whiskered Owls have two vocalizations that have been called song (Jacot 1931, Marshall 1967). The more commonly heard is a series of about six rather evenly spaced "boot" or "boo" notes (Figure 1A). The number of notes per song commonly varies from four to eight. Both sexes give this song. The female's version is slightly higher in frequency than the male's. Marshall (1967) stated the song was used for territory defense, whereas Jacot (1931) considered its primary function to be mate attraction. Apparently the song serves both functions. During territory establishment and pair formation it is the most prevalent vocalization, but its use declines with the onset of copulatory behavior and egg-laying. I found it extremely difficult to induce either sex of two pairs of owls to sing this song during the egg-laying period, even by using playbacks of the song. During these later stages if a mate is lost the remaining owl will again use the song until it secures a new mate (Jacot 1931).

The second song is a syncopated vocalization consisting of two short and closely spaced notes followed by two to five longer and more distantly spaced notes (Figure 1B, 1C, 3C). Both sexes give this song.

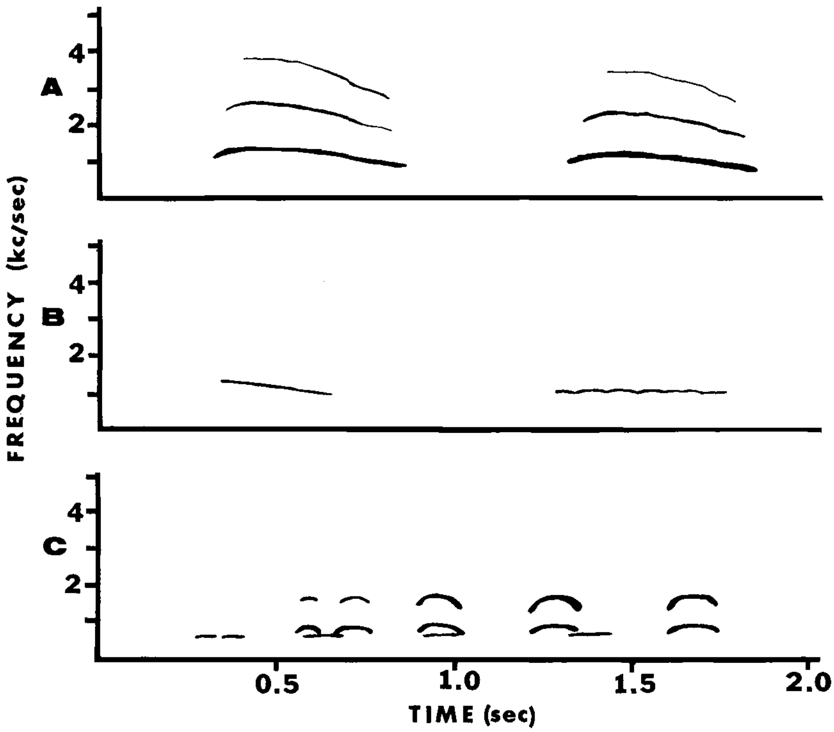

Figure 2. Assorted Whiskered Owl vocalizations. A, female's "meeow" calls; B, shortened and undulating female "meeow" calls; C, syncopated duet. Male's song is lowest in frequency, female's is higher and has a harmonic.

The female's version is approximately 0.75 kc/second and higher in frequency than the male's and the notes are arched higher in the pair of owls I studied (n = 10) (Figure 1B, 1C). Greater frequency range and harmonics make the female's song the more melodious.

Jacot (1931) stated the owls uttered the syncopated song when they were "greatly disturbed." Apparently he considered the song indicated distress. Rather than distress my observations suggest that this vocalization denotes excitation, usually sexual, a view shared by J. D. Ligon (pers. comm.). The male gave this song as he presented food to the female, while in flight as he approached the female, when he perched beside her prior to copulation, and during copulation. The female gave this song in response to the male's song as he approached her, and prior to copulation as a duet with the male. This song appeared paramount in copulatory behavior and may function in individual recognition. Although this

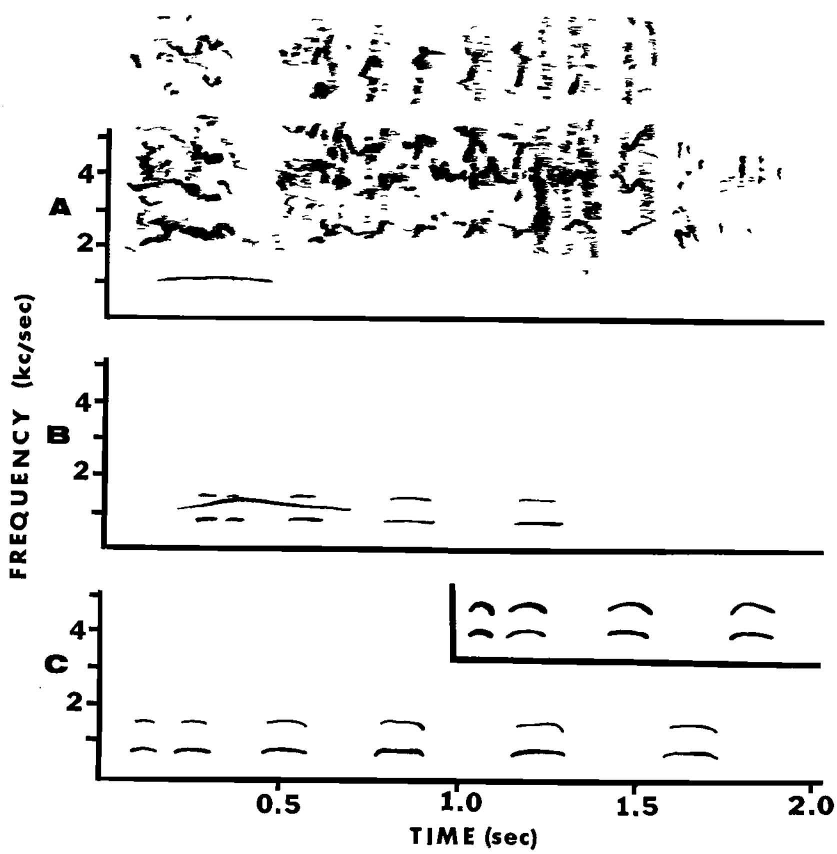

Figure 3. Whiskered Owl vocalizations. A, male's scream call during copulation; a female's "meeow" call is also present at lower left. B, male's syncopated song during copulation; a female's "meeow" call is also present. C, variations of syncopated song.

song did not appear very important in territory defense, it should be acknowledged that both male and female Whiskered Owls are territorial and the song can be provoked from either sex.

Three other calls have been reported for the Whiskered Owl. A worried "chang" was described by Jacot (1931), a trill by Marshall (1957), and a "shee" type call by Ligon (1968: 23). The trill display appears to be a distress call elicited by an attacking conspecific. The "chang" call, which resembles a cat's "meeow," (Figure 2A) is given mostly by the female (Jacot 1931). She gives it during copulation (Figure 3A, 3B), and also from inside the nest cavity, and while perched outside awaiting the male's arrival with food. The average frequency of the fundamental is 1.19 kc/second and it is approximately 0.46 seconds in duration ($n = 10$). The call may be similar to the "eep" call of female Burrowing Owls (*Speotyto cunicularia*) (Martin 1973).

The "chang" or meeow call appears to stimulate the male to forage and may also serve as a location cue. This behavioral context parallels that of the Burrowing Owl's "rasp" call (Martin 1973) and the location call of Elf Owls (*Micrathene whitneyi*) (Ligon 1968: 17). Male Whiskered Owls give the call infrequently while presenting food to the female.

The male once gave a high-pitched scream call of wide frequency spectrum while copulating (Figure 3A). The frequency varied from 1.0–8.0 kc/seconds and had some noise components. The undulations apparently were produced by thoracic muscle contractions associated with wingflapping while the male was mounted upon the female. Male Burrowing Owls also give a similar copulation call (Martin 1973). Male Elf Owls (Ligon 1968) and Little Owls (*Athene noctua*) (Haverschmidt 1946) do not have a high pitched copulatory call, but females of both species produce such a call while the male is mounted and flapping his wings. No immediate significance could be assigned to the call. Ligon (1968: 23) described a "shee" type call during copulation that I failed to hear.

The three copulations I witnessed showed very little variation. The male fed the female throughout the night, but he presented no food when he approached to copulate. Neither male Burrowing Owls (Martin MS) nor Screech Owls (*Otus asio*) (McQueen 1972) present food to the female owls prior to copulation. A synopsis of all three coitions is presented here. Before two of the copulations the female gave the "meeow" call. Prior to the third copulation she had just left the nest cavity. In each case the male flew towards the female giving the syncopated song. The female always answered the male with her syncopated song. Both owls continued this duet for a short period after the male had landed beside the female (Figure 2C). Then just prior to or as the male mounted, the female began to give the "meeow" call. As the male mounted and while mounted he continued to utter the syncopated song; the female continued to give "meeow" calls (Figure 3B). The male then dismounted and flew off, once silently and twice giving the syncopated song. The female usually continued to "meeow." During one coition the male stopped singing and gave the scream call (Figure 3A). I could not determine if this was a commonly used call. It would be of interest to investigate whether the female's switch from syncopated song to "meeow" calls functions as a releaser or signal for the male mounting behavior.

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Abnormal bill of a White-winged Crossbill.—Crossbills (*Loxia*) depend on the special shape of their bill to extract seeds from conifer cones. In interior Alaska the predominant crossbill is the White-winged (*L. leucoptera*), which feeds on the seeds of spruce (*Picea*). Observations show it prefers the white spruce (*P. glauca*) over the black spruce (*P. mariana*) or tamarack (*Larix laracina*). During the winter of 1972–1973, White-winged Crossbills were relatively abundant in the Fairbanks, Alaska area (64° 54′ N, 147° 48′ W), which correlated with a good spruce cone crop.

On 11 February 1973, I found a green plumaged (sex undeterminable) White-winged Crossbill behind some sheets of plywood next to my house in Fairbanks. The bird had been dead for some time and had undergone freeze-drying in the winter cold so that it weighed only 9 g. There were no signs of insect attack or other evidence that the bird died during the warmer summer months (i.e. before 1 September). The bird's bill was grossly deformed (Figure 1) so that the upper mandible extended 15.2 mm beyond the lower mandible. It is hard to imagine how the bird could have survived as long as it did. The gizzard contained only grit.

There are altogether three smooth worn sections along the length of the upper mandible that were probably formed by the continual rubbing action of the two mandibles. From Figure 1, one can see that the bird first utilized the most distal surface, then as the bill grew longer, the second, and at the time of its death was wearing away a third surface.

There is no question that this bird's bill is of unusual shape. In a comparison with measurements made of 16 adult male and female White-winged Crossbills from the Biological Collections of the University of Alaska, which were collected in interior Alaska and adjacent Yukon Territory, the upper mandible of the abnormal individual is almost 10 mm longer and 0.6 mm narrower while the lower mandible