

GENERAL NOTES

Sooty Tern feeding on moths.—While banding Sooty Terns (*Sterna fuscata*) at Bush Key, Dry Tortugas, Florida on 28 June 1970, an adult tern regurgitated two moths 1.5 to 2 cm long together with several unidentified fish. Later we found four more such moths among food items we had collected earlier from Sooty Terns. The moths were in poor shape and could be identified only to the family Noctuidae, of which at least two species were present.

Although the food of Sooty Terns at the Dry Tortugas has not yet been studied in detail, sizable collections of food regurgitated by birds caught for banding show that this population feeds on fish and squid as is reported for other colonies (Ashmole, Ibis, 103b: 333, 1963; Ashmole and Ashmole, Bull. Peabody Mus. Nat. Hist., 24: 33–34, 1967). In 13 years of tern banding at the Tortugas by the second author, this is the first time an insect has been found as part of the Sooty Tern's diet. The only other record of a Sooty Tern feeding on an insect that we are aware of is that of a hurricane-blown bird collected in New Jersey that had grasshoppers in its throat and stomach (Woolfenden, Wilson Bull., 69: 181, 1957).

Sooty Terns normally capture their prey at the sea surface or in the air just above it (Ashmole and Ashmole, op. cit.; 76–77). Presumably the Sooty Terns captured these moths as they flew near the water in an area where Sooties were feeding actively on their more usual prey. The Noctuidae are a large group and at least 20 species have been collected at Dry Tortugas (Kimball, Arthropods of Florida, vol. 1, Lepidoptera of Florida, Gainesville, Florida, Florida Dept. Agriculture, 1965).

H. A. Denmark, F. W. Mead, and C. P. Kimball kindly assisted in identifying the moths.—JAMES J. DINSMORE, *Department of Zoology, University of Florida, Gainesville, Florida 32601*, and WILLIAM B. ROBERTSON, JR., *Office of Natural Science Studies, U. S. National Park Service, Everglades National Park, Homestead, Florida 33030*. Present address of first author: *Department of Natural Science, University of Tampa, Tampa, Florida 33606*. Accepted 1 Apr. 71.

Wing clapping in territorial and courtship behavior of the Chuck-will's-widow and Poor-will (Caprimulgidae).—A frequent behavior of the European Nightjar (*Caprimulgus europaeus*) is a habit often called "wing clapping." This involves production of a sharp, repeated sound like the cracking of a whip or the snapping of a twig. Produced several to many times in succession, apparently always in flight, evidently it is made with the wings. A form of social behavior associated especially with courtship, wing clapping usually is done by the male, but rarely also by the female. Details and history are given by Coward (1928), Witherby et al. (1938: 252–253), Guggisberg (1941), and Bannerman (1955: 26).

Few records of this behavior exist for other species of goatsuckers. Hoyt (1953) referred briefly to the "strange clapping sound" in a recording of the Chuck-will's-widow (*Caprimulgus carolinensis*) made by P. P. Kellogg and Arthur A. Allen, and Sutton (1967: 268) wrote that he did not know how Chuck-will's-widows made "the sharp, several-times-repeated, cracking noise they sometimes produce at a favorite song perch, or just as they are leaving the perch." Harper (1938: 13) mentioned once hearing a "remarkable sort of wing popping sound" that seemed to come from a flying Chuck-will's-widow. Now more detailed observations may be added, involving two species.

Chuck-will's-widow.—Here we report six observations of wing clapping by this species.

1. At 23:00 (this and subsequent times are all local standard time) on 24 May 1964 (full moon, no wind, temperature 60°F) Mengel and his wife (Marion A. Jenkinson) heard a male Chuck-will's-widow singing the territorial song in a scrubby oak woodlot near Lecompton, Douglas County, northeastern Kansas. Playback of this song from 30 m caused the bird to stop singing and quickly to approach the sound source while "growling" softly without "clucking" (for terminology and discussion of these and other vocalizations mentioned herein see Mengel and Jenkinson, 1971, wherein sonograms are given for each named vocalization). As he passed over the loudspeaker at a height of about 3 m the bird produced in rapid succession (perhaps in 1 second) three sharp, snapping sounds that Mengel's field notes liken to the bill snapping of a huge flycatcher. This bird was netted and banded, but neither it nor any other Chuck was recorded in the same stand in 1964. Regularly occupied by a pair of Chucks in 1963, this stand was somewhat reduced by cutting in the meantime.

2. At 22:00 on 25 May 1964 (moon just past full, light southwest wind, temperature 68°F), at a point about ½ mile east-southeast of the preceding locality, Mengel and Jenkinson saw a female Chuck sitting in the gravel road, apparently dust bathing. She flushed and flew rapidly but erratically away down the road. Within 30 seconds a male Chuck that had been singing at a regular song post in a scrubby growth of oak and other trees some 150 m to the east across a wheat field, ceased singing and soon appeared low overhead, foraging and growling softly. He moved rapidly out of sight in the direction taken by the female. Shortly, about 100 m away in that direction, the observers heard several deep growls followed by several of the clapping sounds.

3. At 20:30 on 9 May 1968 (light overcast, no wind, temperature 62°F) Mengel and Jenkinson played Chuck territorial song to a singing male Chuck in hickory second growth 2 miles west of Lawrence, Douglas County, Kansas. Singing intermittently, the bird moved steadily nearer from an initial point a quarter of a mile away. Upon playback of territorial song he stopped singing at a point nearby, whereupon five rapid, clapping sounds were heard from the woods. Shortly afterwards, in response to continuous playback, he appeared in the open and circled above the observers in figure eights at distances of 20 to 60 feet and, *while in plain view*, twice gave sequences of four or five clapping sounds.

4. During the spring of 1969, while at Archbold Biological Station near Lake Placid, Highlands County, Florida, where Chucks are common breeding birds, Woolfenden several times heard "cracking slaps" emanate from the sand pine scrub and slash pine-turkey oak habitats, always in the evening near dusk. The wintering Whip-poor-wills (*Caprimulgus vociferus*) had left by this time. At dusk on the clear, still evening of 12 May 1969 Woolfenden heard wing clapping four or five times and saw it once, while standing on a dirt road bordered by sand pine scrub. His notes state:

A Chuck was singing steadily nearby at its regular cadence of about 4 songs in 10 seconds, when suddenly it increased the cadence to about 8 songs in 10 seconds [such increases usually indicate the arrival of another bird; Mengel and Jenkinson, 1971: 173]. Then the bird uttered a low, growling "quok" and next I heard about 4 "wing claps." Shortly thereafter a Chuck began singing from a pine nearby. The tempo of the singing increased, and again the rapid singing lasted less than 10 seconds. I then heard a single growling note as the bird flew across the clearing within 50 feet of me. As it passed I could see it was a male because the tail was

rather widely spread and the white showed plainly. The bird was followed at a distance of a few feet by another, whose tail was less widely spread but perhaps enough to show white if present—and none was discernible. Almost immediately after they passed, the lead bird produced 3, perhaps 4, cracking slaps.

5. In 1968 Robert B. Payne told Mengel of an incident that occurred on 4 May 1968 at 20:00 at Salt Plains National Wildlife Refuge, Alfalfa County, north central Oklahoma. There, in response to playback of territorial song, a male Chuck flew over Payne's head uttering at least eight deep, growling sounds and made three sharp, snapping sounds.

6. Concerning the clapping sound referred to by Hoyt (1953) and recorded by Kellogg and Allen, Kellogg kindly informed Mengel (letter, 3 June 1965) that this recording was made on 23 April 1950 on Richmond Naval Airbase, now the south campus of the University of Miami, just south of Miami, Dade County, Florida. The recording (Kellogg, 1969) is flawed by background noise and seems inadequate for good sonographic representation, but it clearly records the following sequence: A Chuck-will's-widow is singing the territorial song nearby. Shortly the tempo of his song accelerates, suggesting the arrival of another bird. Immediately four clapping sounds are heard, rendered in just over one second. These are followed by the simultaneous singing of two males close together.

Poor-will (*Phalaenoptilus nuttallii*).—Only one record of wing clapping by the Poor-will seems to exist. On 20 June 1966 Sharpe was collecting birds 6 miles north of Harrison, Sioux County, in the Pine Ridge region of northwestern Nebraska. At dusk many Poor-wills were singing. Approaching one, Sharpe mimicked it by whistling. Shortly the bird flew directly towards him, silhouetted against the evening sky, and in clear view produced the wing clapping sound (Sharpe's notes render it "whop-whop-whop"). The bird swerved within 10 feet of Sharpe, landed on a bare, horizontal limb of a pine, and sang.

Discussion.—The exact behavioral functions of wing clapping are uncertain at present, even in the comparatively well-known *Caprimulgus europaeus*. Nevertheless incidents 1, 3, 5, and 6 above of the Chuck-will's-widow and the sole one of the Poor-will suggest that such behavior is involved in territorial defense. In all of these reports males evidently responded to the song or simulated song of other males. On the other hand, a role in courtship also may be suggested by Chuck observations numbered 2 and 4, where males seem to have been interacting with females. In the European literature the role in courtship has been emphasized to the exclusion of the role in territorial defense.

The method of wing clapping is still highly controversial. Wing clapping sounds are produced by species of various families, including owls and pigeons (Coward, 1928) and certain swifts (Collins, 1968), but the functions and the methods of production may not be the same as in the goatsuckers. Many authors interested in the last group have argued that the sound is produced by actual contact of the wing tips or, alternatively, of the bony wrists (see Coward, 1928—and commentary thereupon in *Brit. Birds*, 28: 171, 218, 267–268, 1928–29; Whittaker, 1928; Witherby et al., 1938: 252; Guggisberg, 1941; Bannerman, 1955: 26), or rather by some sort of flicking or snapping motion of the primaries, without contact (as maintained by Coward, Guggisberg, and Whittaker). Some question also exists as to whether contact, if it occurs, takes place above or below the body, although most authors favor the former.

Our own independent observations all strongly suggest that whatever happens takes place *above* the body rather than below. Beyond that, uncertainty increases. Mengel, Woolfenden, and Sharpe have each independently "seen" birds wing

clapping, yet none of us is exactly sure what he "saw." Mengel's notes, relating to Chuck observation number 3, contain the following account of his and Jenkinson's impressions:

[Just before clapping] the wings are held up at a sharp dihedral and fluttered, at the tips only, in a curious way. Then [upon clapping] whatever happens happens very fast. We are agreed that the wings are held sharply *above* the body. Neither of us thought that the wrists were actually struck together. Mengel detected some sort of sharp agitation of the bird synchronous with the claps, and he had the distinct feeling that the primaries were somehow snapped like fingers or, more precisely, like fans [this agrees with Guggisberg, 1941: 122, concerning *C. europaeus*].

Woolfenden's observations, numbered 4 above, were somewhat similar:

The flight of the bird was lighter than what I consider typical of the species, and the upstroke seemed to begin higher than usual. It also appeared that the body bobbed more than usual.

Yet witness Sharpe, on the sole observation of the Poor-will:

I saw the bird flying directly toward me. The sound seemed to be produced by the bird's wings. As it flew, the wrists touched above the bird's back, and each time they touched the *whop* sound was emitted [this recalls the suggestion of Witherby et al., 1938: 252].

We think that these arguments will be resolved only with stroboscopic photography.

The taxonomic distribution of wing clapping probably is far from fully known in this group of furtive, nocturnal birds. Wing clapping is obviously a regular and conspicuous habit in the European Nightjar, which is by far the best known caprimulgid. It evidently does not occur nearly so frequently in the Chuck-will's-widow. In the years 1964 through 1968 Mengel and Jenkinson spent hundreds of hours studying Chuck-will's-widows and Whip-poor-wills, including much playback of territorial song to singing birds and numerous observations of birds in courtship and territorial situations, yet they noted wing clapping only three times. If this behavior occurs in the Whip-poor-will, probably the most studied American caprimulgine (see Tyler, 1940), it must be much rarer still, as it remains undetected. The Poor-will has been rather thoroughly studied at various times and places (e.g., Aldrich, 1935; Orr, 1948; Brauner, 1952; see also Bent, 1940), but the present report seems to be the first to mention wing clapping by that species. This behavior, therefore, must be comparatively rare in the Poor-will.

Wing clapping should be recorded and reported wherever discovered. The distribution of the character might have taxonomic significance. Sound recordings permitting good sonograms are still to be made. Particularly desirable—and doubtless difficult to obtain—are stroboscopic photographs of any species in the act of wing clapping.

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Copulation by California Condors.--Koford (Res. Rept. No. 3, Natl. Audubon Soc., 1953) observed sexual display among California Condors (*Gymnogyps californianus*) on more than 30 occasions, yet only once did he see what he thought was copulation. Some of the displays he watched were quite intricate, with considerable posturing and "male" aggression, but no such activity preceded this copulation. The birds sat several feet apart for over 1 hour, then one climbed onto the other's back, staying there $\frac{1}{2}$ minute and flapping gently at the apparent moment of coition. Afterward they sat quietly $\frac{1}{2}$ hour before flying away. This led Koford to state (p. 79) that "possibly in *Gymnogyps* copulation is not immediately preceded by display."

We have records of 8 California Condor copulations, 5 of which are similar to that described above. The three other occasions began similarly, with the birds sitting quietly, but then the "male" displayed briefly before the "female" with wings half spread and head drooping forward. This elicited no apparent response, but the male immediately walked behind and mounted the female. The apparent moment of coition was accompanied by gentle wing flapping in all instances.

Thus, obvious display may or may not occur at the time of copulation. The