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THE BOOM-FLIGHT OF THE PACIFIC NIGHTHAWK

WITH DIAGRAMS

By ALDEN H. MILLER

THE VARIOUS notes of the Pacific Nighthawk (*Chordeiles virginianus hesperis*) and its close subspecific relatives have been referred to commonly in various ornithological publications. Yet certain things in connection with the production of these notes seem still to be in doubt. This is true chiefly of the booming or roaring note produced in the breeding season. Mr. J. H. Bowles in an article in the *Auk* (XXXVIII, 1921, p. 203) says that, in his opinion, the noise is most likely produced by the rush of air through the primaries. Undoubtedly this is the common belief held by many of those who have observed the note and accompanying flight. However, direct evidence for the theory seems lacking.

During June and July, 1924, while at Camp Lewis, Washington, I had an opportunity to take a few field notes on the behavior of the local nighthawks. The bird in western Washington I believe is considered *C. v. hesperis,* although intergrading toward *C. v. virginianus.* The region around Camp Lewis is typical of the Puget Sound country, with Douglas firs, oaks, and grass prairie alternating. The following is a resumé of my observations, as made principally on July 8, at about the height of the nighthawk's nesting season.

While returning to camp about 7:30 P. M., by way of the prairie, I happened to notice an unusual number of nighthawks feeding about over the open. A great many of the birds were booming as they flew back and forth in zigzag lines. Apparently the chief interest of the birds was in feeding; the diving and booming occurred at intervals of about 300 yards. There was no attempt to tower for the dive, as is sometimes done; so it would seem that these birds were not near any nest locations and were simply playing. Several were circling over me at about forty feet height, when it occurred to me to wave my hat to attract their attention. One bird immediately dove down about ten feet from me and at ten feet from the ground swerved up. No boom was produced and the wings were held up in the characteristic V-like position used in soaring. The turn upward was evidently accomplished entirely by the tail as no perceptible change in the wings was seen until the beating was started after a twenty-foot rise. The dive was quite as steep as in the booming dives previously witnessed, and I thought at the time that the bird would boom. I waved my hat again and the same individual circled about and again dove in a similar way. The bird descended head toward me with wings up. Suddenly, the wings were bent sharply down to a position similar to the habitual soaring pose of the Spotted Sand-

piper, and at the same instant the boom was produced. The bird then swung upward, but with wings in normal position. Flapping was resumed, as before, after a twenty foot rise.

I continued waving my hat and the bird repeatedly dove. Every boom was in exact coördination with the downward turn of the wings. Viewing the dive from the side, the turning of the wings seemed neither to check the speed nor affect the height of the rise later. Soon another bird took to diving close by, and its actions were seen to be similar. Both birds were now diving without the stimulus of the hat. For at least twenty times the first bird dove, and the other, five or six. Occasionally they dove and turned without booming, and as before, the wings were held up throughout.

On the spot, I attempted estimates of the angles and distances of the plunges. The height seemed to vary from 100 feet to as little as 15 feet; the descent was made at a 70 degree angle with the ground; the turn was quite sharp considering the size of the bird, and the ascent was on an angle of 60 degrees for 15 or 20 feet, whereupon the normal flight zigzag was resumed; the turn was usually 10 feet from the ground and occasionally much more.

The two birds that had been diving for me now left and continued their feeding course over the prairie. Birds were continually passing over, but I obtained no more results with the hat. I did, however, take more careful note of the diving and this led me to observe that one particular bird on attempting a very short dive of 15 feet barely produced an audible sound. In a few seconds the same bird took a dive of perhaps 35 feet and produced a normal boom. This bird was turning at a height of 30 feet from the ground, as was the general case on this evening.

As regards the character of the sound when heard at close range, the main explosive boom seems to be preceded by a brief, lesser, vibrating sound which bursts forth into the full bellow. Both parts seem to have a distinct element of pitch. The latter part is lower with of course greater resonance and depth of quality. In fact, the whole character of the combined note gives the impression of feathers vibrating as though starting rapidly in short motion and quickly changing to a long heavy vibration. The bird that made the short dive of 15 feet seemed never to gain the full vibration normally attained. Suffice it to say, that the complete note certainly sounds as though it would rack and tear the bird to pieces.

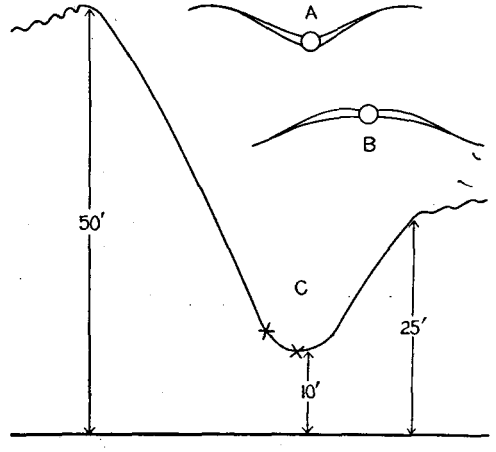

Fig. 39. a, THE WING POSITION IN SOARING; b, THE WING POSITION OF THE BOOM; c, LATERAL VIEW OF THE DIVE, WITH THE TWO X'S MARKING THE DURATION OF THE BOOM.

By this time, approximately 8:15 P. M., the light was growing poor and observations for the evening were discontinued. Notes made on other days simply bear out the facts already stated. There is, nevertheless, the diving directly over the nest vicinity which I did not chance to witness at Camp Lewis. But, from brief notes on birds seen diving near nests in the Tahoe region, I would add that they often dive as far as 200 feet and that the turn may possibly be less than 10 feet from the ground.

Also, the staccato, fricative, vocal note is sometimes given with the boom and the same vocal note is usually repeated in quickening cadence while the bird is mounting for a long dive. These longer dives were all observed in full daylight.

It may, then, be concluded that the boom note of the nighthawk is produced by the vibration of the wing feathers, probably the primaries. The vibration is caused by the down turning of the wings at the bottom of the boom dive. The intensity of the sound is more or less proportional to the speed attained. The character of the sound is such as to suggest the vibration of feathers. The dive may be made and checked without the boom or the turning of the wings, and entirely at the bird's pleasure. The dive is usually at an angle of 70 degrees with the ground, ending in a sharp turn and upward glide at a 60 degree angle; but the turning point, height, and vocal notes accompanying vary with the occasion. If the performer is on exhibition, he makes the most of himself, while if playing, the act is more haphazard.

There are, of course, still many facts in connection with the boom flight not yet known, and further experimentation on the curiosity of the nighthawks may lead to interesting results. Seemingly the birds fell for an army hat, and perhaps another style would affect them differently. Lastly, it should be understood that some of my conclusions could not be made entirely on my own observations; therefore, I have considered information before published in order to substantiate my opinion.

Los Angeles, California, February 6, 1925.

THE WINKING OF THE WATER OUZEL

By CHARLES W. TOWNSEND

IT IS COMMONLY stated that the Dipper (*Cinclus mexicanus unicolor*) winks with its nictitating membrane. Thus, Grinnell and Storer, *Animal Life in the Yosemite,* p. 544, say: "The nictitating membrane or 'third eyelid' is whitish in the Dipper, and when drawn backward across the eye, as it is frequently when the bird is above water, can be seen at a considerable distance. This membrane probably is drawn over the eyeball when the bird is working beneath the surface of the water." Dawson, *Birds of California,* II, p. 733, says of this bird: "Ever and again he delivers a slow wink, upside down, with the white nictitating membrane."

I hesitate to disagree with such authorities; but my observations, made under very favorable circumstances and mainly with this point in view, lead me to think that the winking is done with the upper eyelid. My studies of other birds, to be detailed later, confirm me in the belief that it is not the nictitating membrane of the Dipper which makes such conspicuous and easily seen winks.

On November 28, 1924, I studied three Water Ouzels at Pecos River, New Mexico, and on March 7, 1925, one at the Merced River in Yosemite. In both cases I was able to watch them with eight-power binoculars within twenty or twenty-five feet. The part moved is pure white and it contrasts strongly with the dark plumage. As the movement in every case seemed to me to be from above downwards, it was apparent that it was the upper eyelid that winked and not the nictitating membrane; for the movement of the latter is from the inner angle of the eye outwards. In the Yosemite bird, which was winking constantly and at the same time singing *sotto voce,* I noticed several times that a narrow upper white edge of the eye was noticeable momentarily after the winking, as if the upper lid at these times was not at once returned to its place.