

## OBSERVATIONS ON THE BEHAVIOR OF A CAPTIVE POOR-WILL

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Between June 15, 1949, and March 29, 1950, I was able to raise and observe a Poor-will (*Phalaenoptilus nuttallii*). This bird was taken from a nest which had been under observation in the Santa Monica Mountains, Los Angeles County, California. The initial object was to see if Poor-wills could be raised in captivity so that torpidity could be investigated under laboratory conditions. Since there is no published record of hand-raised Poor-wills, careful notes were taken on movements and actions of this individual.

The bird was kept indoors in an open, soil-filled wooden box near an east-facing window. It was allowed complete freedom. Although the bird would sit practically motionless all day in its box, if placed in a cage it would batter its bill and nostrils badly against the sides of the cage in an attempt to get out. Many of the actions were too rapid for the eye to follow. Some of these have been analyzed by high-speed stroboscopic photographs made with an exposure of approximately 1/5000 of a second.

*Acknowledgements.*—My initial interest in Poor-wills was stimulated by the late Adrian J. van Rossem through his advice and guidance. I am also indebted to George A. Bartholomew, Jr. for assistance and advice. The parasite was identified by John N. Belkin.

*Feeding.*—The Poor-will was approximately 15 days old when it was taken from the nest; it had been under observation for 11 days. Until it was 26 days old it had to be force-fed moths, beetles and chopped meat. From that age on, it would take food from the forceps. The speed with which the bird grasped the food was so great that the exact manner of grasping could not be determined with the unaided eye. After the bird was 111 days old, it caught food which was dropped from a height of two to three feet directly above its head. Unless such food as meat, mealworms or lettuce was dropped so that it fell within easy reach of the bird's mouth, the Poor-will would not move from its position to catch it. When a moth was dropped slightly off to one side, however, the bird would quickly waddle several inches and catch it. If the bird were hungry, it would fly up to meet the first few pieces of food which were dropped. Worms tossed diagonally downward to the bird from a distance of 6 to 8 feet were caught with ease.

The Poor-will was able to swallow large pieces of food. White-lined sphinx moths (*Celerio lineata*), with a wing expanse of 60 to 90 millimeters, were taken in one gulp. Even larger sphingids were taken in one swallow, but the tips of the wings stuck out of each side of the bird's mouth for a short time. Pieces of chopped meat or steak as big as a large unshelled almond were swallowed with ease. The swallowing of large pieces was apparently aided by short, quick flips of the wings. A number of kinds of food such as live house flies, freshly-killed bees, and hairy caterpillars were taken but immediately rejected. The Poor-will never used its feet to aid in food manipulation. On one occasion, the bird used the bend of its wing (wrist joint) to help move a long string-like piece of lettuce which it had started to swallow but which had become entangled in its rectal bristles.

The feeding of a captive Poor-will is not difficult, but it is time consuming. During the summer season, the bird was fed moths. When moths were no longer available the basic diet was mealworms, ground meat, and concentrated cod-liver oil. It was thought that occasional meal beetles (*Tenebrio molitor*), pieces of Jerusalem cricket (*Stenopelmatus longispina*), and grasshoppers were supplying sufficient roughage for the bird; however, these hard exoskeletons were completely digested. The bird was given water with a pipette only three times, on its 15th, 55th, and 66th days. It seemed to thrive, however, in spite of the lack of water.

When the bird was 162 days old, there were signs of dietary deficiency. The eyes began to close and the lips became fastened together by mucous strands. The bird's breathing accelerated and the feces became liquid. Orange juice was given to the bird for four days in addition to a multivitamin compound. Nevertheless, the bird became progressively more ill. On the 169th day, lettuce was offered for the first time and was taken avidly by the bird in spite of the handicapped vision. From then on, lettuce became a daily part of the diet. In three days the bird appeared to be normal. The foods taken by the Poor-will in addition to those mentioned were beef, steak, cow and chicken liver, and celery greens. The basic item in the Poor-will's diet was mealworms of which 16 to 82 were consumed daily. On many occasions the bird was seen swallowing small bits of gravel from its dirt pile.

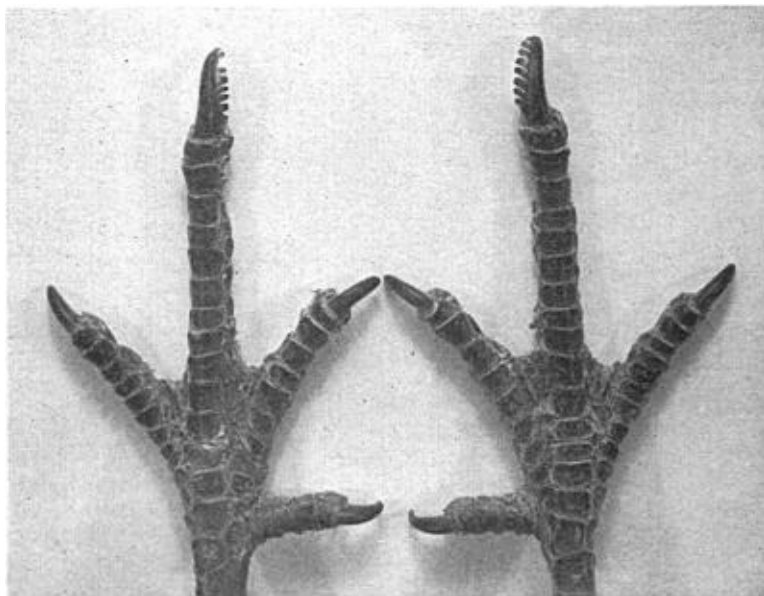


Fig. 1. Feet of freshly collected Poor-will showing pectens on inner side of middle claws.

*Scratching.*—For many years ornithologists have debated the use of the pecten on the inner side of the claw of the middle toe of some of the caprimulgids (fig. 1). Such a device is also found in the Barn Owl (*Tyto alba*) and in true herons (Ardeidae). Coues' (1903:138) statement that the comb "occurs only on the inner edge of the middle claw" is erroneous; the comb is on the outer side of this claw in the true herons. Alden H. Miller (personal communication) stated that Joseph Grinnell called it a "louse comb" when referring to the analogous structure in beavers.

Early in the 19th century, there appeared arguments and counter-arguments as to the use of the pectinated claw. Swainson (1830:188) argued against Dillon's theory that the pecten was used to straighten bristles and expressed amusement (1831:275-6) at the simplicity of J. Rennie in supposing the comb useful in removing insect parasites. Swainson (1836, 1:360; 2:151) said members of the Caprimulgidae "seize their food by the foot." Hayward (1830:449) stated that the so-called Fern Owl (*Caprimulgus europaeus*) uses its "singular claw" for the purpose of detaching the sharp-hooked claws of beetles which are occasionally affixed to the sides of the mouth. Hayward claimed to

have seen this process take place while the bird was in flight. Wilson (Brewer, 1839:380) felt that the pectinated claw was used as a comb to remove vermin from the plumage of the head because small particles of down were frequently found adhering to the teeth.

The captive Poor-will scratched itself with the long middle toe. Examination of the pecten, which until the third week is only a lateral ridge on the inner side of the claw, revealed caught fragments of down and feathers. High-speed flash photographs were taken of the scratching. They reveal that the foot is turned outward so that the comb on the long middle claw engages the feathers (fig. 2).

As the bird's claws grew, the claw of the longest toe curved laterally outward. This curving placed the pecten in the most advantageous position for contact with the feathers. This observation confirms that of Dillon (1830:30-33). Until it was 71 days old,



Fig. 2. High speed photograph of a Poor-will scratching, showing use of inner surface of middle toe which bears pecten. Note the foot is brought over the wing which is dropped to ground for support.

the bird balanced on one leg while it brought the other forward to the scratching position. From this time on, the wing on the scratching side was dropped so that the leading edge of the primaries rested on the ground for support, then the leg was brought around and over the wing to the scratching position. The scratching was limited to the throat, bill, rictal area, crown and sides of head, and nape of neck. At times, the scratching of the head was augmented by a rubbing of the head region and rictal area with the bend of the wing. I think that the scratching also straightens the rictal bristles, but this has not yet been proved photographically. Many times, the bird scratched in the area of the rictal bristles immediately after preening. Preening usually deranged the bristles.

A mallophagan parasite, *Ethiopterum macrocephalum* (Kellogg), was found to be numerous only in the crown and nape region. This parasite is also found in the night-hawks (*Chordeiles*). The only evidence that the pecten is used to rid the bird of these lice is that on one occasion a louse was found approximately 3 feet from the bird immediately after it had been scratching.

*Swaying*.—The Poor-will initiated all actions by a side-to-side rocking motion which at times was extremely vigorous. This motion was carried out in place, much like a soldier's marking time, and lasted 3 to 15 seconds. The rocking proved to be a convenient clue for indicating that some action such as scratching or preening was about to take

place. I have seen this mannerism many times in the field. Orr (1948) describes it as a "rhythmic swaying." Although this movement is the Poor-will's most characteristic mannerism, its significance is not immediately apparent. It may be a balancing maneuver or it may be a preparatory flexing of the muscles. It is used whether the bird is perching on a stand or crouched on the ground. It may be a generalized "intention movement" of the sort discussed by Tinbergen (1951:141).

*Stretching.*—In the field, I have repeatedly seen Poor-wills fly to their nest sites, land with wings held fully extended vertically for 5 to 10 seconds, then suddenly fold them with such rapidity that it was necessary to refocus the eyes before the bird could again be seen. The captive bird, when disturbed, demonstrated this same type of action by flying a short distance to a new site, landing, immediately turning to face the disturber, holding its wings vertically over the back for a few seconds and then suddenly snapping them into place. The stretching of the Poor-will is unusual in that the action is extremely prolonged and always terminated by a rapid return to the normal resting position. When stretching only one wing, the bird extends the wing laterally flat upon the ground, then follows this by spreading half the tail of the same side and extending the leg of the same side out and to the rear. It holds this position for from 5 to 20 seconds and after first drawing the leg back into position, it suddenly snaps the wing and tail into position. Then the bird remains motionless. Another form of this prolonged stretching involves both wings. The bird raises the half-folded wings over its back and stretches them while extending the head and neck forward and downward. This action is climaxed by a sudden snapping of wings into place followed by a period of immobility. These extremely rapid movements followed by a complete lack of movement should be of considerable survival value. The coloration of the Poor-will blends into the patterns of its environment. The lighter buff patches of the extended wings convey an impression to the observer which is not evident in the resting bird an instant later when it has folded its wings. The eyes of the observer continue to search for the original impression. The first impression upon rediscovery of the bird is that it appears darker and duller than was anticipated.

*Vision.*—The location of the eyes and the lack of lateral projection of the frontal bone allows the Poor-will to see objects overhead. Moths flying around the room aroused the captive Poor-will almost to a frenzy of excitement. In one instance, a moth flew up behind the bird at a distance of approximately 2 inches and flew toward the head over the back. It was not until the moth came directly over the bird's head that the bird apparently became aware of its presence. The bird did not respond until the insect came into its visual field. Many similar observations seem to demonstrate that the bird finds its food primarily by vision.

*Preening.*—Another action in which the Poor-will indulged in the daytime was occasional preening. This was done while the bird was resting on the ground or perching at right angles to the end of a box or on a small branch. Usually one or both wings were dropped so that the leading edge could be used for support. All parts of the body were preened. The region around the uropygial gland received much attention.

*Features of the mouth.*—Photographs show that the mouth is wide open while the Poor-will is catching food. This action could not be seen with the eye due to the speed with which the mouth was opened and closed. The bird yawned or opened its mouth frequently while stretching (fig. 3). Although the action was swift, it was relatively slower than in catching food.

It was possible to obtain a series of pictures revealing the mouth's interior in its natural status. Muscles located in the pharyngeal region when constricted separate the mouth from the esophagus. When these muscles relax there results an enormous gape

revealing the extensive circulatory network of the throat. The internal nares in the palatal region are clearly visible. Contrary to Orr's statement (1948:49), the Poor-will's tongue is tiny and lanceolate. The glottis is directly posterior to the tongue in the center of the laryngeal prominence. There are inward pointing barbs on the posterior and lateral surface of the prominence.

There is a bending point midway on the lower mandible which enables the bird to gain a broader gape. Due to the presence of this "hinge" in the mandible, it may be possible that the Poor-will can call without appearing to open its mouth. Many times the Poor-will uttered single notes with a ventriloquistic quality. I had heard this note repeatedly for two months and felt in an uncertain way that it came from outside the

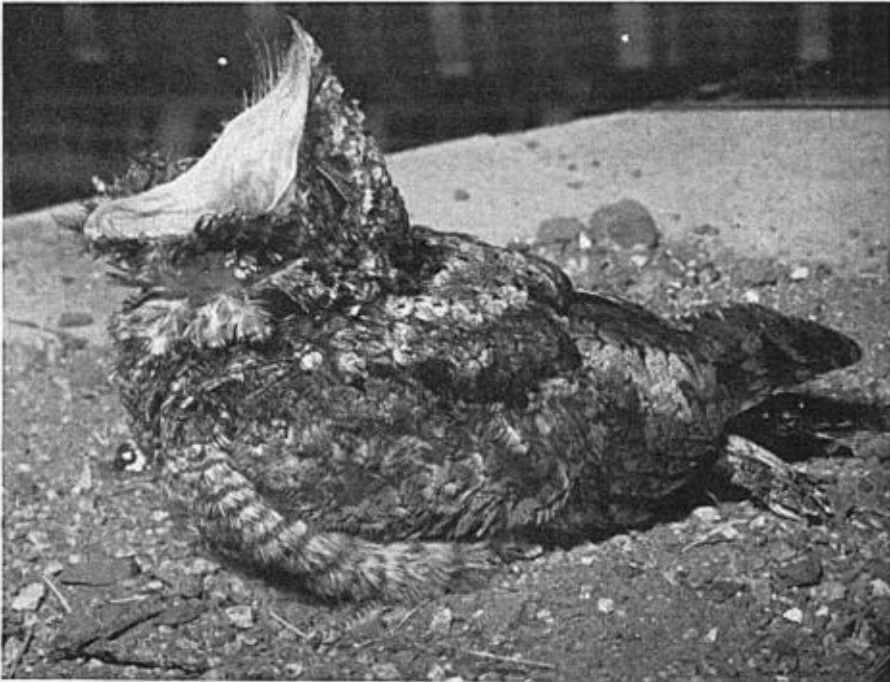


Fig. 3. High speed flash photograph of a Poor-will yawning.

house. It was not until I heard the note while looking directly at the bird that I became aware that the bird was calling in the same manner as a person talking out of the side of the mouth. While making observations at a nest site I had noted and taken pictures in color of the young picking food out of the sides of the parent's mouth while the adult's bill was closed.

*Dusting.*—An interesting action in the Poor-will is its method of dust-bathing. Following the usual introductory swaying, the bird lowers the leading edges of both wings to the ground and scratches the ground diligently with its feet. The wings support the bird, but the exact position and motion of the feet is hidden by the contour feathers. The scratching motion is so vigorous that dust rises into the air. When this performance was first seen, it appeared that the bird was merely throwing dirt against the inner part of the wings, but further observations revealed that this action was primarily to loosen the soil. After scratching in this manner several times, the bird would back up a few

inches, lower the head and shake it in the loosened dirt with great vigor. After a few shakes, the bird would be heavily covered with dirt. An energetic shaking of the entire body would ruffle the feathers and remove most of the dirt. These observations may explain, in part, the bare appearance of the nesting and roosting areas which are cleared of leaves, twigs, and pebbles. It is possible that the Poor-will cleans the nest area and also digs the depression for its eggs with its legs and feet, which, although short, are by no means feeble.

*Eyeshine.*—Most descriptions of eyeshine in Poor-wills refer to it as red or ruby colored. In the several hundred instances in which I have observed this eyeshine, both alone and in company with experienced field ornithologists, I have found that it almost invariably ranges from white to amber colored, and my companions have agreed. Informal tests both in the field and on the captive Poor-will indicate that the precise color of the eyeshine varies with light intensity, the direction that the bird is looking, and the position of the light relative to the eyes of the observer. The whitish eyeshine is apparent when one looks directly down the beam of light into the eyes of the bird. If the light is held at waist-level, or if the bird is not looking directly at the observer, the eyeshine may be pinkish to ruby.

*Calling.*—The young Poor-wills have a "mewing" call suggestive of a kitten's faint cry. The captive bird began to develop a *kwut* note when approximately 25 days old. This note and the full song are the ones typically heard in the field. When approximately 65 days old, the bird uttered its first full song. Subsequently, it sang at irregular intervals. Seldom did it utter more than five complete songs at any one time. The song was the one characteristically heard in the field. It has been generally assumed that only male Poor-wills sing. When the captive bird sang, I felt quite positive that it was a male. However, dissection after its death showed that it was a female. This is clear-cut evidence that the female can sing. To forestall any question as to whether the male sings, it is well to point out that I have collected singing males.

Other types of calls noted are:

1. A ventriloquistic single note: *foi*, accomplished with apparently closed mandibles and no movement.
2. A low, quiet *kwa-kwa-kwa-kwa-chukka-ka-duka-ka dukka*, repeated very rapidly with throat vibrating.
3. A raspy hunger call: *sqaw-sqaw*, etc.
4. An excited call after flight: *chukka doo—cha-cha-cha*. This is repeated rapidly.
5. Two single-note calls of excitement when dusting: *chuck* and a whistled *tyu*.

#### SUMMARY

Over a ten-month period, observations were made on a captive Poor-will (*Phalaenoptilus nuttallii*) which was hand-fed from the age of 15 days. Its activities were recorded by high-speed photography. Poor-wills can be raised successfully on mealworms, lettuce, chopped meat and cod-liver oil. The pectinated claw is used for scratching feathers of the head region and probably for straightening rectal bristles. It may also help to rid the bird of lice. Prior to undertaking any activity, the Poor-will performs a characteristic side-to-side swaying motion. After alighting, the Poor-will elevates both wings in a prolonged stretch, which is terminated with a single, abrupt snap which returns them to their resting position. The probable survival value of this maneuver is discussed. The Poor-will finds its prey by vision. The legs of Poor-wills are short but they serve as effective diggers. Poor-wills have an enormous gape which can be further increased by bending outward the lower mandibles. The color of the eyeshine is white to amber when one looks directly down a beam of light into a Poor-will's eyes. Factors modifying color of eyeshine are discussed. Both male and female may sing the same song.

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