THE MAINTENANCE BEHAVIOR OF THE BLACK-CROWNED NIGHT HERON

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THIS paper is concerned with a three month study of the maintenance behavior of the Black-crowned Night Heron (*Nycticorax nycticorax*) and includes a description and interpretation of the activities observed. Maintenance behavior, as used in this paper includes movements concerned with locomotion, preening, scratching, care of feet, shaking, stretching, defecation, bill-wiping, sleeping, throat pulsation, yawning, resting, and feeding.

The Black-crowned Night Heron is well suited to this type of study due to its colonial nesting habit. The work by Meyerriecks (1960) reinforced our interest in herons and this paper follows the style established in his monograph, so that these data may be utilized more easily. Specific comparisons of night heron with Green Heron behaviors are made whenever the differences or similarities are striking enough to merit them.

Some work has been done on the food preference of the night heron (see Palmer, 1962 and Teal, 1965), but little on the feeding behavior of immature herons. A detailed description of the behavior leading to the food transfer, as well as the food transfer itself, has not been available.

Field observations were made in Fox's Marsh on North Bass Island, Ottawa County, Ohio, in western Lake Erie during the summer of 1963. Further observations were planned but the colony failed to breed in the marsh the following year. The marsh, about 1500 feet by 500 feet, is located at the south-west corner of the island. In the past it has been connected with the lake, but due to low water and wave action, it is now separated by a gravel bar. In the spring the marsh contains, at the deepest point, three feet of water, but becomes almost dry by August. The primary vegetation includes buttonbush (*Cephalanthus occidentalis*), which supported the night heron nests, water persicaria (*Polygonum lapathifolium*), and cattail (*Typha latifolia*).

The night herons were observed and photographed from an elevated blind located in the center of the marsh, by use of a 15× telescope adapted to a single lens reflex camera. Drawings were made from the photographs. Total observation time in the marsh was 114 hours.

Data for this paper were collected while the senior author was a research assistant at Franz Theodore Stone Laboratory of The Ohio State University, Put-in-Bay, Ohio.

LOCOMOTION

Walking.—Most walking observed occurred on the buttonbush in the nesting area. Some walking is involved when the birds feed in shallow water. The movements are slow and deliberate. The head and neck are lowered and slightly retracted to a crouch position and the foot is raised and placed firmly ahead. After a grasp is achieved the other foot is advanced. We have seldom seen a night heron run. These descriptions are similar to those of the Green Heron (*Butorides virescens*) given by Meyerriecks (1960).

Flight.—The flight of the night heron differs from that of the larger herons in that the crow-sized night heron appears to have a labored flight in contrast to that of the graceful Great Blue Heron (*Ardea herodias*). Some gliding was observed during sustained flights and during flights against moderate winds. On sustained flights the heron has the neck retracted with legs parallel and extended to the rear. Only the toes extend beyond the rectrices. The *quack* call is commonly given while the heron is on the wing, especially at night and in response to a disturbance in the colony.

Some attempts have been made to record wing-flap rates and speed. Blake (1948) gives a wing-flap rate of 2.6 per second. We counted wingbeats during ten one-minute periods and determined an average of 2.8 wingbeats per second for herons leaving the breeding area. In Palmer (1962) the flight speed is given as 18–21 miles per hour. In this study the flight speed of the night heron was measured by motorboat and found to be approximately 20 miles per hour.

Green Herons differ from the night heron in that the night herons seldom glide during a sustained flight, although some gliding has been observed just before landing. The Green Heron is similar to the night heron in that both have a wing-flap rate of 2.8 per second and a speed of around 25 miles per hour (Meyerriecks, 1960).

Takeoff.—Intention movements (see Heinroth, 1911, and Daanje, 1950) indicate that takeoff is imminent. The night herons' most obvious intention movement is head rotation. Just prior to takeoff the night heron looks around. Defecation was found to be an indicator of imminent takeoff. If a preening bout or period of resting is followed by defecation, there is a good chance flight will follow.

From a study of a series of still photographs the takeoff procedure appears to occur in the following manner. The night heron sleeks the feathers and lowers the body rearward in much the manner for defecation. This shifts the body weight and centers it over the legs, giving the bird initial thrust. The head and neck are retracted, the tail spread slightly, and the wings extended upwards as the night heron thrusts itself forward with its legs. The head and neck are extended for the first downstroke, but retracted for

FIG. 1. Preening breast or abdominal feathers.

FIG. 2. Side preening.

the following upstroke. At about thirty feet elevation the feet are brought together and extended rearward as the wing beat rate decreases to the sustained flight rate.

Landing.—The night heron approaches the landing site in either a straight or circular glide path. At about 200 feet from the landing site the glide begins with feet dropped and head fully retracted; the heron then extends its neck and starts flapping the wings approximately 30 feet from the perch. Crest erection was not noted during the approach. The wing flapping frequency increases until the bird is over the perch. The perch is grasped by the feet and the wings continue to beat until equilibrium is established. The head and neck are retracted to the perched position and the wings folded. Meyerriecks (1960) noted that on the landing approach of the Green Heron, when the neck and head are extended, almost invariably the crest is erected.

BODY MAINTENANCE

Preening.—Preening is a common activity of the night herons and occupied approximately 20 per cent of the 7.7 hours devoted to observing preening frequency. Even while caged the night herons were observed keeping their feathers continually tidy (Heinroth, 1929). Table 1 gives the frequency and percentage of time devoted to preening the major body areas. The entire body surface except the head and upper neck can be reached by the bill. Preening methods used by the herons were the same for all individuals, but there appeared to be no uniformity in the preening pattern. The eyes are alternately opened and closed during a preening bout.

The breast and abdominal feathers are reached by lowering the neck to an angle of 90 degrees from the perched position until the top of the head is nearly parallel to

TABLE 1

FREQUENCY AND PERCENTAGE OF TIME DEVOTED TO PREENING IN EACH MAJOR BODY AREA DURING 7.7 HOURS OF OBSERVATION. FIVE BLACK-CROWNED NIGHT HERONS WERE OBSERVED.

Region	Total preening time (minutes)	Percentage of total preening time
Breast	24	26
Underwing and sides	21	23
Neck	18	19
Upperwing	9	10
Primaries	9	10
Back	6	6
Head	3	3
Tail	3	3

the ground (Fig. 1). The heron gently nibbles the feathers with the bill and smooths them with a stroke sweeping from base to tip. Some small feathers come out during the preening bout but no actual pulling of feathers was observed. A bluish color on the bill was noted after preening and was assumed to be from powder-down. There was no return to the powder-down tract when preening other areas, so that any dressing of plumage as suggested by Hindwood (1933) was confined to the breast and abdominal areas.

Side and under wing preening usually occur together. During side preening the position of the head is similar to the above description (Fig. 2). The night herons nibble deeply to the skin but little feather stroking occurs. The under wing is exposed by a slight wing drop accompanied by bending the neck to the side of the exposed wing. The tip of the bill points downward while preening (Fig. 3). The under primary and secondary coverts are passed through the bill in one smooth movement. Most under wing preening is concerned with maintenance of feather integrity. Little feather nibbling was observed.

The feathers of the neck are nibbled and stroked with apparent effort. While the neck remains in the perched position, a sharp bending occurs at the anterior end of the cervical vertebrae. The bill is parallel to the neck while nibbling and in the initial phase of feather stroking. The bill moves from base to tip of the feather in an arc to a vertical position (Fig. 4). The night heron can reach most of the neck feathers except some dorsal areas.

Upper wing and primary preening is accomplished by bending the carpals and lowering the wing. The upper primary and secondary coverts are erected and the primaries fanned slightly. The coverts are nibbled and stroked first. Usually the night heron does not preen all primaries at one session, and on occasion only one primary may be preened during a preening sequence. The primary feather is either nibbled along its entire length or, more commonly, run through the bill in one smooth stroke.

Nibbling of the back and tail feathers is followed by stroking these feathers through the tip of the bill (Fig. 5). The head is turned to one side and the top of the head is turned down at an angle of 45° from the horizontal. This position forces the occipital plumes to an erect position at the base of the skull.

The head feathers are smoothed by placing the head under the wing. The wing

FIG. 3. Preening under wing.

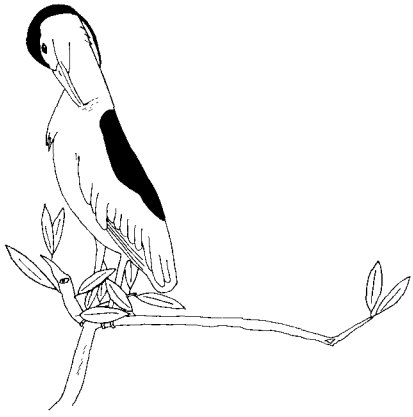

FIG. 4. Neck preening.

is slightly lifted from the body and the neck bent posteriorly until the head is enclosed by the leading edge of the wing. The inverted head is thrust downward by the wing until it is halfway down the back. The head is then vigorously twisted between the body and wing. This sequence is completed in less than a minute.

Green Herons as observed by Meyerriecks (1960) conduct preening for the most part in the same manner as above except for the occasional pulling out of some of the breast feathers and the frequent final act of rubbing the bill over the oil gland.

Care of the feet.—Little attention is given to the feet and legs by the night heron. Only one instance of foot pecking was noted. The aquatic habits of the night heron may so clean the legs and feet that they require little maintenance.

Scratching.—Black-crowned Night Herons scratch the head and neck areas directly (Simmons, 1957) ("Vorherum" of Heinroth, 1930), not by drooping the wing but by bringing the leg straight up and concomitantly lowering the head. The indirect method (Simmons, 1957) ("Hintenherum" of Heinroth, 1930) of head-scratching common to passerines was not observed. The pectinated claw on the middle toe is the part of the foot which makes contact. Each head scratch was accompanied by a slight occipital plume erection (Fig. 6). Scratching did not seem to be associated with a preening bout. It did occur while the bird preened, but more often was an isolated action. The scratching process is similar to the behavior of the Green Heron as described by Meyerriecks (1960), except that he states that scratching of the head occurs at least once during a preening bout and could occur at any time in a bout.

Shaking.—Shaking was observed at the end of a preening bout, or as an isolated activity. The night heron leans forward slightly, erects most of the

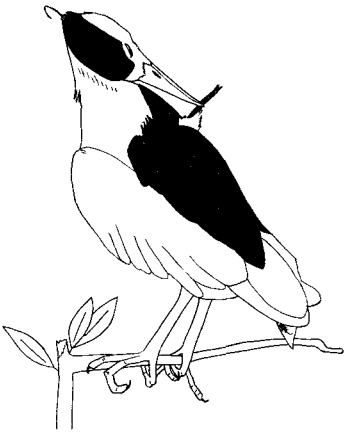

FIG. 5. Preening back feathers.

FIG. 6. Scratching.

contour feathers and shakes vigorously while rapidly moving the wings in and out (Fig. 7). The length of a shaking session is from 5 to 10 seconds. Shaking apparently places the feathers in order.

Stretching.—Stretching usually occurs during the preening bout, but was also observed as an isolated incident. We did not notice a tendency for the heron to stretch one wing more often than the other or to stretch, for example, the right wing before the left. The heron shifts his weight to the right (or left) leg and places the head and neck in the perched position. The left leg is lifted until the tibiotarsus is parallel to the abdominal wall and the tarsometatarsus hangs vertically. Extension of the left wing down and out is followed by an outward extension of the left leg. The same but opposite procedure is followed for the right wing stretch.

Defecation.—Defecation may occur either in flight or while perched. Defecation sometimes occurs just a few seconds after take-off, but more commonly the heron will defecate while perched immediately prior to takeoff. In contrast Meyerriecks (1960) states that the Green Heron seldom defecates upon takeoff unless frightened. The defecation position is assumed by rearward dropping of body. The head, neck, and wings remain in the perching position, while the tarsometatarsus moves from an almost vertical to a nearly horizontal position. The young nestlings void into the nest, but about the time of fledging they elevate the rump and defecate over the edge. No attempt by the adult at nest sanitation was noted.

Bill-wiping.—Bill-wiping is an uncommon activity. It usually occurs after a preening bout or after food transfer to young herons. The head is lowered, so that the bill comes in contact with the branch on which the bird

FIG. 7. Shaking.

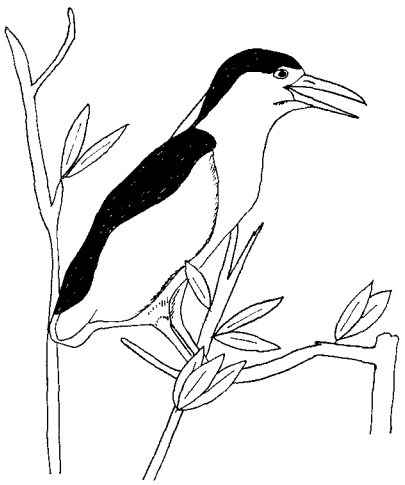

FIG. 8. Posture during throat pulsation bout.

is perched. A repeated stropping action of the bill against the branch is accomplished with swift strokes. This was the only method of feather removal observed following a preening bout.

Throat pulsation.—Special attention was given to the rapid in and out motion of the gular region which we termed "throat pulsation." It is performed while the heron is in the perched position with the bill opened slightly (Fig. 8). A tendency was noted for the throat to pulsate more often during higher temperatures and in direct sunlight. A study was made of three separate throat pulsation bouts, one lasting 49 minutes and the other two 55 minutes each. The heron would stop and start the throat movements for varying periods of time during a bout. Each period of throat movements was termed a "pulsation session." During the three bouts, there were 42 pulsation sessions. The average length of a single pulsation session was 7 minutes, and the minimum length was 0.25 minutes. These pulsations probably act as a body heat regulatory device.

Yawning.—Yawning occurred irregularly while the herons rested. The night heron remains in the perched position; the bill is opened wide and the eyes are open and bulging slightly. It did not appear to be associated with sleeping and no external factors were observed influencing the yawn.

Resting.—The night heron remains in the perched position for extended periods of time without movement except for some head turning. A major portion of the daylight hours is devoted to this behavior which appears to be resting.

FIG. 9. Pre-feeding behavior of Black-crowned Night Heron.

Sleeping.—Black-crowned Night Herons sleep during some of the daylight hours if there is no disturbance in the heronry. They sleep perched either on top of the buttonbushes, or low in the bushes out of sight. The sleeping heron retracts the neck, drops the wings slightly and stops all throat movement. The eyelids are completely closed, although they may be opened slightly at intervals and then reclosed. After the young have fledged, the adults spend most of the daylight hours sleeping or resting at a roost apart from the breeding heronry.

No sunning posture was observed in this colony, but the sleeping position was usually assumed in direct sunlight. Visiting Great Blue Herons (*Ardea herodias*) did assume the wing spread sunning posture described by Meyerriecks (1960).

FEEDING BEHAVIOR

Feeding of the young.—Observations were made of young night herons approximately two weeks old and older. Feeding methods used by younger Black-crowned Night Herons are summarized by Palmer (1962). The feeding ritual we observed is quite complex and involves active participation of

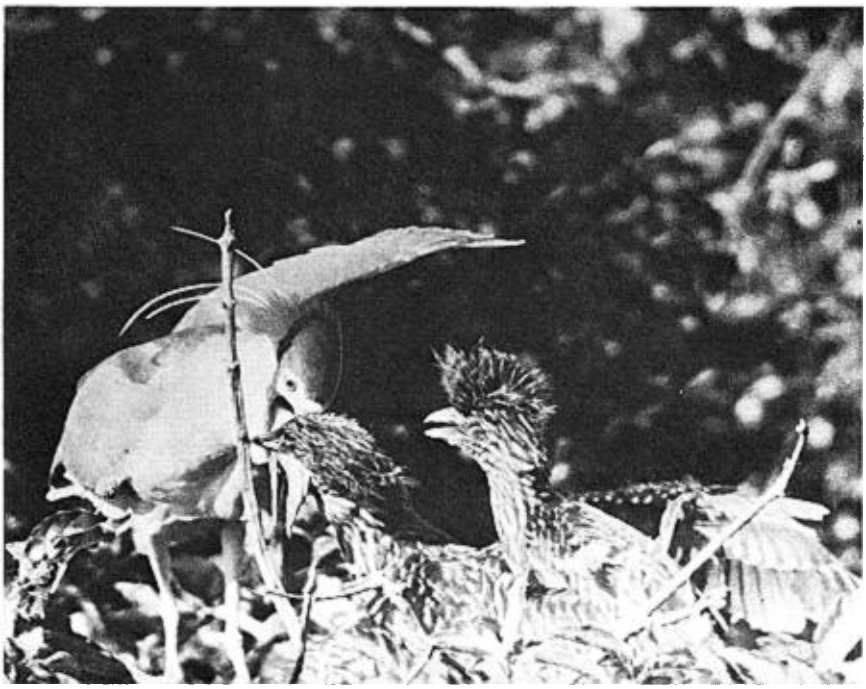

FIG. 10. Food transfer from adult to immature heron.

both parent and young. The feeding bout varies in duration and sequence of events. Regurgitation was evident in all feeding bouts, although some were more labored than others. Usually only one food transfer occurred during a feeding bout; however, as many as three transfers have been observed. The earliest attempt of the young to grasp the parent's bill was noted by Noble et al. (1938) at about two weeks of age. Bill grasping is an important phase of the food transfer process. The most aggressive young herons will grasp the bill first, pushing the younger nest-mates away. Evidence of the behavior is reflected in the billing that occurs among the young herons throughout pre-flight life. Noble et al. (1938) described the billing as an outgrowth of the feeding responses. If dominance is achieved by the nestlings' aggressive feeding responses, and its maintenance is achieved by billing, then Noble is probably correct. As the birds get older and venture from the nest one of the young herons will assume the highest perch. Billing still occurs, but height assumes a more important role as the birds near flight age.

The details of the food transfer were recorded in a series of still photographs. Both sexes were observed feeding the young. Sex determination was based upon the number of occipital plumes, one or two plumes probably

indicating a female, three or four plumes a male (Noble et al., 1938). The length of the feeding bout seemed to be determined by the time required for regurgitation. As the adult enters the nest area, the immature herons move in an awkward fashion toward him. The adult makes a forward thrust ("repelling reaction" of Lorenz, 1938) toward the immature heron in an apparent effort to keep the young heron from grasping his bill (Fig. 9). The forward thrust or "repelling reaction" observed is a swift stab with opened beak and does not appear to be a part of the appeasing ceremony described by Lorenz (1938). During these violent engagements either the immature heron is knocked off his perch or the adult flies to an adjacent branch. If the adult has not completed regurgitation, he resists bill contact until ready to feed the immature heron. The pre-transfer behavior usually lasts for five to ten minutes.

Herrick (1935) noted that herons transfer regurgitated food by a "crossing or juxtaposition of bills, rather than by insertion of the parent's bill in a young one's mouth or contrariwise." This is the method we observed for the actual transfer of the fish. When the adult is ready to transfer the fish, it advances toward the immature heron and permits the bill to be grabbed. A young heron encloses the adult's bill at about a 65° angle with the adult's upper bill to the rear of the immature heron's mouth. The young heron always grasps the adult's bill from the top or slightly to the side. Once bill contact is made the immature heron vigorously shakes the adult's head and both birds flap their wings, presumably to maintain balance during the transfer. The head, neck, and back feathers are erect with the occipital plumes separated and extended. The adult regurgitates the fish forward in the mouth until the young heron can grasp it (Fig. 10). A withdrawal of the two bills follows with the young heron pulling the fish from the adult's mouth. Both adult and immature herons will wipe their bills with their tongues after transfer. Although the unfed young will advance toward the adult until they receive food or the adult flies, all aggressive action between the adult and fed immature heron ceases until the fish has been swallowed.

For twelve hours during a four day period we observed feeding rates at six nests. All hours between 0700 and 1830 were included in the observations at least once. During the twelve hours there was an average of four feedings per nest. These feeding data are meant to be only an indication of diurnal activity.

SUMMARY

A field study of Black-crowned Night Heron maintenance behavior was conducted on the Bass Islands of Lake Erie, Ohio, in the summer of 1963. Descriptions of the behavior patterns associated with locomotion and body maintenance are given.

The breast receives the most preening and the head the least. There is no set preening

sequence, and the preening methods used showed little individual variation. Scratching was observed to be by the direct method and was for the most part an isolated action. Stretching and shaking are employed at infrequent intervals and shaking is used to place the feathers in order.

Sleeping and resting were carried out during the daylight hours. Sunning, which is common to other herons, was not observed, but the herons did sleep in the direct sunlight. Throat pulsation, a rapid in and out motion of the gular region, was also noted during periods of higher temperatures.

Bill-wiping and care of the feet are an uncommon activity of the night heron. Defecation may occur either in flight or while perched but occurs more commonly just before flight.

When feeding, the immature heron's bill grabs the adult's bill at approximately a 65° angle and the food is transferred as the immature heron's bill withdraws from the adult's. There was no evidence of the adult placing its bill into the immature heron's mouth.

ACKNOWLEDGMENTS

This study was made possible by a National Science Foundation Summer Fellowship for Graduate Teaching Assistants, awarded to the senior author. Research supplies and travel funds were furnished by the Franz Theodore Stone Laboratory of The Ohio State University. The Meirs Wine Cellars of Silverton, Ohio, granted us permission to use their land for a research area. We wish to thank the many who helped with construction of the blind and Mildred Miskimen and Maurice G. Brooks for critically reading the manuscript. A special thanks to Bruce M. Stapleton for his help with the preparation of the manuscript.

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NEW LIFE MEMBER

A recent addition to the roster of Life Members of The Wilson Ornithological Society is Mrs. Kathleen Green Herbert of Middletown, Delaware. A graduate of Mt. Holyoke College and the University of Michigan and a former student at St. Hilda's College, Oxford. Mrs. Herbert is also a Life Member of both the AOU and the Cooper Society as well as a member of British Trust for Ornithology and several other conservation organizations. Her principal ornithological interests have been devoted to the study of the Peregrine Falcon and she has published several papers on this subject including an important paper on the Peregrine in the New York City region written jointly with her late husband, Richard A. Herbert. At present she teaches ornithology in the University of Delaware extension division, and continues her field work and activities in various conservation organizations.