

MISCELLANEOUS PUBLICATIONS
MUSEUM OF ZOOLOGY, UNIVERSITY OF MICHIGAN, NO. 102

**Great Blue Heron:
Behavior at the Nest**

BY
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AND
BETTY DARLING COTTRILLE

ANN ARBOR
MUSEUM OF ZOOLOGY, UNIVERSITY OF MICHIGAN
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GREAT BLUE HERON: BEHAVIOR AT THE NEST *

"IN THE reproductive cycle of the [European] heron [*Ardea cinerea*] the nest has a greater significance than in many other species. It is a near-permanent structure to which birds go each spring" (Lowe, 1954: 70). Yet the literature on the Great Blue Heron (*Ardea herodias*) contains little information on behavior at the nest, particularly during the period between spring arrival and egg-laying. The following observations were made in a southern Michigan colony of Great Blue Herons in 1954 (March 15 to July 25) and 1955 (March 14 to June 6).

The nests were in live and dead American elms (*Ulmus americana*) in a stand of these elms and black cherry (*Prunus serotina*), cottonwood (*Populus deltoides*), and red maple (*Acer rubrum*), which is about 300 yards south of Skiff Lake, Liberty Township, Jackson County (Sec. 25, T. 4 S, R. 1 W). We counted 114 nests in 1954, about 75 of which were occupied that year. Most of the nests were situated very high in the trees; the lowest nests were about 50 feet from the ground.

Since our purpose was to study the courtship of these herons in conditions as nearly normal as possible, we did not wish to create a disturbance by erecting a blind in the trees. We used instead a canvas ground-blind (a 5-foot cube) from which 14 occupied nests were easily observed with binoculars.

We were unable to determine exact dates of egg-laying and hatching because the height and precarious situation of the nests prohibited climbing, but we were able to make some observations on the care and feeding of the young.

Table I lists the visits made in 1954 and gives a skeleton outline of developments in the colony.

We are indebted to Dr. Josselyn Van Tyne for many helpful suggestions. We are also grateful to Richard P. Grossenheider for his fine pen-and-ink drawings.

By March 15, 1954, 3 herons had arrived in the heronry. On March 18 the flock had increased; we saw 15 herons in one tree, 2 of them on a nest. By the end of the month we could count over a hundred birds.

Most of the herons were in full breeding plumage: long black crest plumes, conspicuous lower neck and scapular plumes, rufous tibiae, and bright yellow bill. Immature birds were also present. We sometimes saw them standing near a nest as courtship progressed, but saw none in 1954 after April 11. Bent (1927: 108) reports that young Great Blue Herons are "ready to breed" after their second winter, though they do not attain fully adult plumage until the following postnuptial molt, and signs of immaturity "may not wholly disappear for another year or two." Lowe (1954: 82) states that a female European Heron (*A. cinerea*) may be reproductively mature in the first year, though a male apparently does not breed until the

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TABLE I
 OUTLINE OF DEVELOPMENTS IN COLONY OF GREAT BLUE HERONS IN 1954*

Date and Time	Temp. in F.	Sky	Wind	Observations
March 15, 1954				3 herons in heronry.
March 18 (10:00-11:10 a.m.)	28°	cloudy	W, 10 mph	15 herons in one tree; 2 birds on one nest.
March 21 (2:00-3:00 p.m.)	26°	cloudy	W, 10 mph	20 birds flushed.
March 25 (10:00 a.m.-12:00 m.)	42°	cloudy	W, 40 mph gusts to 60	50 herons.
March 27 (6:15-7:15 p.m.)	68°	cloudy	NE, 15 mph	75 herons in 5 trees; increased attachment to nest noted. A few nests contained pairs.
March 28 (4:30-6:30 p.m.)	48°	fair	W, 20 mph	Over 100 herons counted. Territorial disputes and courtship recorded. Copulation observed.
March 29 (6:00-6:30 a.m.)	16°	overcast	3 mph	Herons inactive on snow-covered nests.
April 1 (2:50-5:30 p.m.)	50°	clearing	NW, 10 mph	Courtship behavior resumed.
April 4 (12:30-2:30 p.m.)	36°	fair	E, 12 mph	Little activity.
April 8 (8:45-11:30 a.m.)	40°	cloudy	SE, 12 mph	Nest construction. Copulation observed.
April 11 (3:15-5:30 p.m.)	42°	cloudy	W, 7 mph	Incubating birds on 15 nests. Nest repair and building throughout heronry.
April 14	50°	fair	W, 10 mph	
April 22 (7:30-11:00 a.m.)	58°	overcast	SE, 15 mph	Incubating birds on at least 50 nests. Some evidence of hatching.
April 25 (2:00-4:00 p.m.)	60°	fair	S, 3 mph	
April 29 (10:00-10:30 a.m.)	50°	cloudy	E, 15 mph	
May 6 (9:00 a.m.-12:00 m.)	52°	cloudy	SE, 7 mph	
May 16 (9:00 a.m.-12:00 m.)	58°	fair	W, 5 mph	Clacking of young birds heard.
May 20 (9:00-11:00 a.m.)	56°	cloudy	W, 20 mph	Young herons visible above rim of nest.
May 26 (8:10-11:00 p.m.)	54°	night	NW, 15 mph	
May 27 (2:00-4:00 p.m.)				Remains of several herons under trees in 2 locations: owl nest and feeding perch.
May 30 (2:00-4:00 p.m.)	56°	fair	E, 6 mph	
June 3 (4:00-5:00 p.m.)	84°	slight rain	W, 20 mph	Dead birds, 3 to 4 weeks old, found on the ground after 40- to 60-mph wind the previous night.
June 6 (9:00-10:00 a.m.)	86°	clear	none	Young exercising their wings.
July 4 (10:00-11:00 a.m.)	80°	fair	SE, 10 mph	Some young have left nest. Others almost full grown.
July 11 (10:00-11:00 a.m.)	78°	fair	E, 4 mph	
July 18 (2:00-3:00 p.m.)	68°	fair	NE, 15 mph	Young actively hopping about the nests.
July 25 (2:30-3:00 p.m.)	74°	fair	S, 5 mph	3 immature and 2 adult herons in heronry.

*During 1955, nine visits to the heronry were made between March 14 and May 26.

"summer of its second calendar year or even . . . the spring of the third calendar year (Holstein)."

Courtship did not begin immediately upon the return of the herons in spring: instead, the time was spent preening or just standing about in the trees. The herons were on the alert, however; the entire colony would take wing at the slightest disturbance and might not return for an hour or two. They came back singly, alighted cautiously, and resumed the vigil if there was no further disturbance. By March 27, the herons had taken up their territories and were standing on the nests (apparently a sign that courtship was about to begin). Not all the birds flushed on our arrival that day; those that did returned more quickly than before. One bird returned in less than half an hour, settled in a nest, and began to repair it. When the rest of the flock returned, activities other than the usual preening were observed. A few pairs had already established themselves in nests, it appeared, and in one or two nests a single bird was displaying and occasionally howling. There was some posturing, bill-jabbing, and bill-snapping.

On March 28, many nests contained pairs. Some herons were still standing by quietly, but most of them were actively engaged in courtship. Sometimes a bird crouching in a nest would extend its neck over the edge and snap its bill loudly. Two birds on a nest would jab at each other with their bills, then grasp each other's mandibles and "seesaw" back and forth. They would snap their bills audibly as they extended their necks over the edge of the nest. Often they would cross their necks below the nest before making the snap. In some nests a pair of herons would stroke each other's head, neck, and back with their bills, or one would grab a stick from the nest and shake it. Often a pair of herons would suddenly stop their courtship activities and take flight, one in the lead. They usually flew to the north in the direction of the lake and disappeared from sight. They soon returned and resumed the activities described above. We first observed copulation on this day.

When we visited the heronry on the morning of March 29, after an 8-inch snowfall during the night, we found the herons standing motionless on their snow-covered nests. By April 1 the snow had melted, the temperature was 50° F., and the herons had resumed courtship activities. They flushed on our arrival but returned more quickly than before. The first bird returned to a nest 15 minutes after we were settled in the observation blind. It then flew to an adjacent nest, threw some sticks out of it, and returned to the first nest. In a few minutes about 40 herons returned, making gurgling noises as they came.

The colony was still comparatively quiet on April 4, though a Great Horned Owl (*Bubo virginianus*) flew through, chased by noisy crows. We later discovered that an owl of this species was using an abandoned heron nest some 30 feet from the nearest occupied heron nest.

By the second week of April the herons were engaged in almost every phase of courtship activity, and in incubation, nest construction, and nest repair. On April 11, birds were incubating on at least 15 nests. Richard P. Grossenheider and William L. Brudon spent most of the afternoon of April 14 sketching and photographing the postures and activities of the birds.

On April 22 (38 days after we first began to observe the colony), there were several broken egg shells under the nesting trees, apparently the result of hatching.

By May 16 (about 9 weeks after arrival of the first birds), the heronry was fairly quiet, except for the gurgled greeting of a bird coming in for nest relief. The bird in the nest would rise as it heard the greeting, step to the rim of the nest, and fly off as its mate landed. The newly arrived bird usually settled slowly on the eggs and remained motionless for some time before shifting its position or moving the eggs. We first heard the clacking notes of the young herons on this day, and in a few nests we noted a difference in the way an incoming heron reacted. It would alight on the edge and look down into the nest for several minutes before carefully settling down. There was also a difference in behavior on the nest. Incubating birds remained very still, but brooding birds were more active — they shifted position, preened, and snapped their bills.

Sometimes while a bird was brooding, its mate would bring in small twigs and the brooding bird would work them into the nest. On one occasion (April 8), we observed a heron bring a fish to its incubating mate, which swallowed it whole. Ryves (1948: 196) also reports observing one such feeding visit in the European Heron. Lowe (1954: 81) calls this incident "an aberration" and adds that an explanation of its significance "would involve an examination of the evolution of bill-sparring, which may be symbolic of a former habit of feeding."

On the evening of May 26 we went to the blind just before dusk (sunset was at 8:04 p.m.) and stayed as long as the herons were active. Most of the nests in use contained two birds, one squatted on the nest (brooding), the other perched on the rim of the nest or on a nearby branch. We could hear the staccato-like clacking of the young herons. From time to time we heard the whoosh-whoosh of wings and detected a heron coming back to the nest, gurgling a greeting as it approached. Occasionally the clacking of the young would increase in tempo and volume. By 9:30 the heronry had begun to quiet down, and by 10:15 all was quiet except for an occasional bill-snap or cluck of an adult bird, or the wing-flapping of an incoming bird. It was very dark, and we were able to follow events only by ear. At 10:30 we were startled by agonized throaty alarm notes coming from one of the trees behind the blind, accompanied by wing-flapping and loud bill-snapping. We thought it must be the forcible eviction of a heron which had landed in the wrong nest, though we also sensed terror in the commotion. After a few minutes all was quiet again. We remained in the blind until 11:00 and then in almost total darkness groped our way undetected to the car.

The following day we found the fresh remains of two adult herons under the tree used by the Great Horned Owl's newly fledged young. This, like previously reported evidence of predation of the Great Horned Owl on the heron, is only circumstantial. A number of observers have found Great Horned Owls nesting in heronries and have reported that the herons seem to accept their presence. Miller (1944: 20), for example, recorded 20 instances in the Philadelphia area. He says: "On the many occasions I have scared up Horned Owls in heronries, their flight over incubating or brooding birds

never alarmed the herons. Once I discovered evidence of a Great Blue deliberately building in the same tree where an owl was rearing 2 young."

On May 30, some of the young herons that could be seen from the ground preened, jabbed with their bills, and grasped each other's mandibles. Their clacking was heard constantly.

On June 3, after a severe windstorm, we found 10 dead birds on the ground; we judged them to be between 3 and 4 weeks old. All nests appeared to be intact and activity in the heronry was normal.

By June 6, the foliage in the heronry had become so dense that we were able to remove the blind and observe the birds from under the trees without disturbing them. On this day we saw the young in the nests exercising their wings.

Four weeks later we visited the heronry to find the young herons about ready to leave the nest. We could see that many had already gone. As we walked around under the nests to get a better look at the birds and to inspect the ground, we were surprised by a shower of whole and partially digested fish, regurgitated by the young. This behavior of young herons is apparently a fear reaction (see, for example, Bent, 1927: 107, and Knight, 1946: 85). It was used systematically by Kirkpatrick (1940: 595-96) to secure samples of the food of the young for study.

The few young birds left in the heronry on July 18 were actively exercising their wings as they hopped from nest to nest. They were fed very infrequently.

By July 25 the heronry was almost empty. Only five herons remained — two adults and three immatures.

Although our data on behavior of the Great Blue Heron at the nest are quantitatively not at all comparable to those reported for the European Heron by Lowe (1954: 68-100) and Witherby *et al.* (1939: 127-29), the similarity is striking and supplements other evidence (see, for example, Parkes, 1955) that these two herons are very closely related.

COURTSHIP

Of the European Heron, Lowe wrote (1954: 75): "When a male heron comes into breeding condition he takes possession of a nest or a site where one will later be built. From this vantage point he renders himself conspicuous as a potential mate by a display involving voice and gesture." The description is admirably applicable to the Great Blue Heron. (We were unable to mark our herons, but sexes were identifiable during copulation, and the behavior of recognizable individuals could thus be associated with one sex or the other.)

Once a heron claims it, the nest becomes a target for a certain amount of attack by other herons in the vicinity. Any move toward a nest is warded off by the occupant with a startling threat display: plumes erected, neck thrust over edge of nest, bill jabbed at intruder — emphasized by a loud clap of the mandibles and/or a vocal "bark." Early in the season this reaction seems to be directed toward intruding birds of both sexes. "In species where the sexes look alike the male's first reaction to an approaching

female is often the same as his attitude to an intruding male — Verwey suggests that a show of animosity at the outset is the normal result of the heron's being a solitary bird during the greater part of the year: he may not have as yet adjusted himself to the idea of companionship and the urge to have a mate is in conflict with the urge to protect his territory" (Lowe, 1954: 76).

When a mate has been accepted by the occupant of a nest, the pair begin to perform a variety of "courtship rituals":

- Erecting plumes and crest
- Shaking head from side to side
- Walking around each other in the nest
- Clapping mandibles together (loud hollow sound)
- Grasping each other's mandibles and seesawing back and forth
- Howling
- Shaking stick in nest
- Preening (individual and mutual)
- One bird stroking the other with bill on throat, nape, and back

In the event that either bird has not developed sufficiently to respond to the stimulus of such courtship ceremonies, one or both birds may fly from the nest, returning later to work on nest construction, to stand on the nest and preen, or to continue courtship behavior.

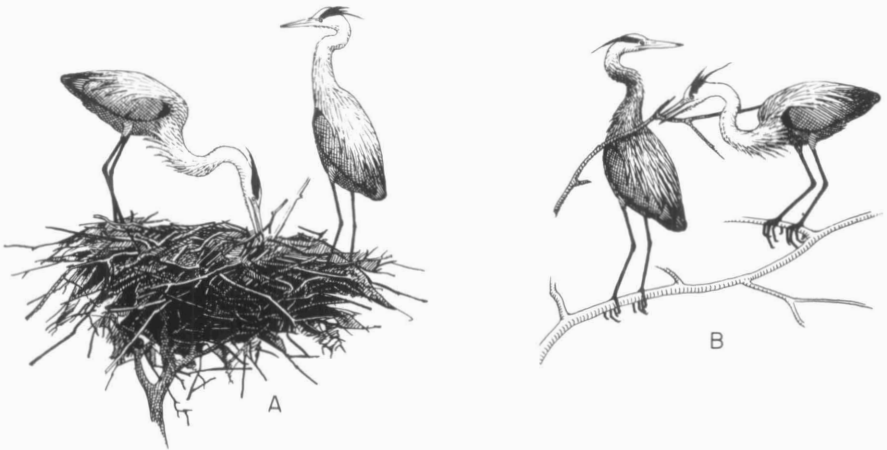


Fig. 1. (A) Working into nest stick brought by mate. On occasion both birds were seen working a stick into the nest. (B) What appeared to be starting of nest with "big" stick (about 3/4 in. at butt). Twice attempted to balance stick on back of bird. Following this, first one bird and then both tried to anchor stick on branches for a period of about 15 minutes. Each time stick started to fall a bird would catch it, until it finally fell to the ground. No other nest-building effort by this pair was observed during our stay in the blind.

NEST BUILDING

The nest may be a flimsy platform erected during the current year or a massive structure which has been repaired and added to for a number of nesting seasons.

We saw a heron place the first stick in a crotch of a tree on April 22, 1954. When we returned three days later, the nest seemed to be complete and a heron was sitting on it. Only a few sticks were added to this nest during the following weeks. On the other hand, one pair spent more than two weeks repairing a nest before we noticed incubation taking place.

Additions to the nests are made throughout the incubation period and until the young are quite large.

Apparently the herons will use any available stick or twig for building. In the colony we studied, sticks were obtained from the ground near the nests, from other nests (occupied or not), and by breaking twigs from both live and dead trees. We saw one bird try to work into its nest a leafy twig that was still attached to a nearby tree.

On April 22, 1954, as we approached the field adjacent to the woods, we observed a steady stream of herons flying from the heronry to a small marshy area nearby and returning with reeds and marsh grass in their bills. They were using the material to line their nests, some of which must have contained small young. We watched these round trips for over an hour, but the herons paid little or no attention to us.

Sticks are usually brought to the nest by the male, while the female remains in the nest and arranges them. In the early stage of work on the nest, each stick is presented in a ceremonious manner. As the male flies to the nest with a stick in his bill, he is greeted by the female, who makes a deep bow and emits a long howl. At the end of the howl she takes the stick in her bill and begins to work it into the structure while the male stands on the rim of the nest. The male may preen for some time, or he may fly away



Fig. 2. (A) Bird in nest howling (sounded like the howl of a dog) upon arrival of mate at nest. (B) Greeting ceremony; bird landed near end of branch and walked up to nest.

for another stick. Sometimes this sequence is disrupted when a stick is dropped or when a squabble is provoked by an intruder trying to steal a stick from the nest.

The nests are constructed so carefully that they can withstand such rigors as the 60-mph windstorm on March 3, 1954, the 8-inch snowfall during the night of March 28, 1954, and the 40- to 60-mph wind on June 2, 1954, which dislodged 10 young from the nests.

On April 11 we were amused to see a bird lose its balance and fall from a nest into which it was trying very hard to work a stick. This bird fell through the branches to within 8 or 10 feet of the ground before it recovered; then it flew out of the heronry, circled, and returned to the nest at treetop level.

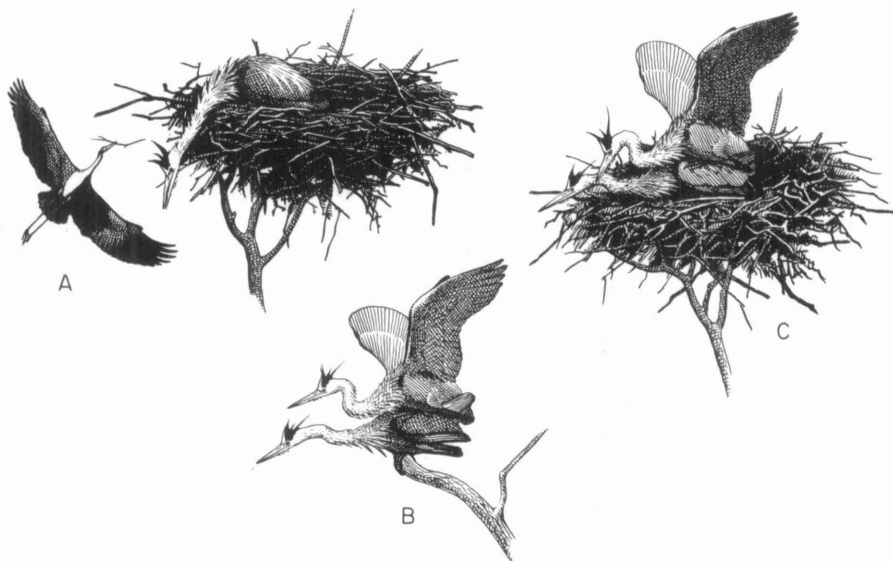


Fig. 3. (A) Bird in nest drooping head and neck over side and shaking bill slowly from side to side; mate coming in with stick and circling nest to arrive against a wind blowing about ten miles an hour. (B) and (C) Copulation on branch and in nest.

COPULATION

Copulation (first observed on March 28) nearly always took place in the nest, but sometimes occurred on an adjacent limb. Usually it was preceded by one or more of the rituals of courtship. A typical sequence follows:

Bird in nest (later identified by its copulation posture as a male) greets its approaching mate with posturing and howl. Both birds clap mandibles loudly, then walk around each other in the nest. The male strokes the female on head, neck, and back with his bill. Female crouches. Male steps on her back, grasps her neck feathers with his bill, and copulates, balancing



Fig. 4. (A) Postcopulation shaking and preening. (B) A male bird arriving at a second nest immediately after copulation with female in nest on right.

with his wings. The female elevates her wings slightly, which helps to support him. Average duration of copulation was 12 to 15 seconds.

Occasionally a male will fly directly to the nest and copulate with little or no preliminary ceremony. On April 1, a female on a nest was joined by a male who had walked down a limb into the nest. Both birds walked around the nest and extended their necks vertically, emitting long howls. The female then crouched and copulation took place. Nest building often stimulates a pair to copulate without any of the usual precopulatory ceremonies.

After copulation, the birds may shake themselves vigorously or may crouch in the nest, extending their necks down over the edge (sometimes

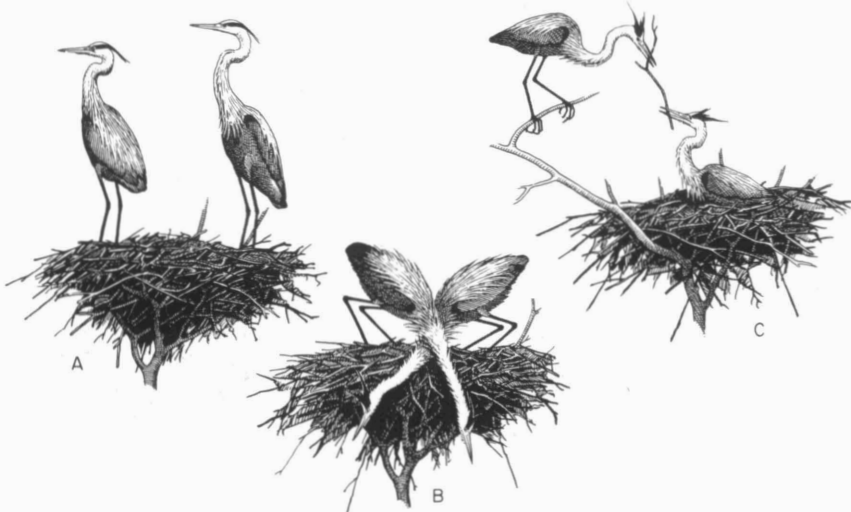


Fig. 5. (A) Postcopulation quiescence. (B) Neck-crossing ceremony; repeated a few seconds after the birds had righted themselves. (C) Stick transfer.

crossing them) and snapping their bills. Sometimes the male flies away while the female remains to rearrange sticks in the nest.

One pair in a nest went through all the precopulatory activities for an hour. The female crouched four times, but the male did not respond. Finally the male flew from the nest; he returned in 15 minutes and was greeted by the usual howl and posturing. He stepped onto the nest and began to preen, taking no notice of the female.

On April 8, in a nest directly in front of the blind, a bird (A) was apparently incubating. Suddenly a heron (B) approached the nest, squawking as it came, and attempted to copulate with A, who remained crouched in the nest. Another heron (C) flew in, dislodging B; before copulation could occur, still another heron (D) rushed in and dislodged C. While this onslaught was going on, A spread her wings over the nest, then stood up and D flew away without coition taking place. After the attack, A shook out her feathers, rearranged some sticks in the nest, and settled down again. This commotion disturbed the other birds, and for some time the heronry was very noisy. Jourdain and Tucker (in Witherby *et al.*, 1939: 128) report that attempts at rape of a breeding female European Heron by both paired and unpaired males "are apt to occur." Goodwin (1955: 100) discusses similar sexual attacks among Rooks (*Corvus frugilegus*) in England.

YOUNG

When feeding newly hatched young, the adult would stand on the rim of the nest, motionless except for retching movements of the neck and throat; then the adult carefully placed the regurgitated food in the open bill of the young bird — taking as long as five minutes in some cases. According to Lowe (1954: 87), the young of the European Heron are fed in this fashion for 10 days. After feeding, the adult heron seemed to arrange the young in the nest; then it settled down to brood them.

At a later stage of their growth, the young would jab at the parent's bill (an action which probably stimulates it to give up the food) as the parent stood at the edge of the nest going through the retching movements. Then, as soon as the food was in the throat and bill of the parent, the young heron

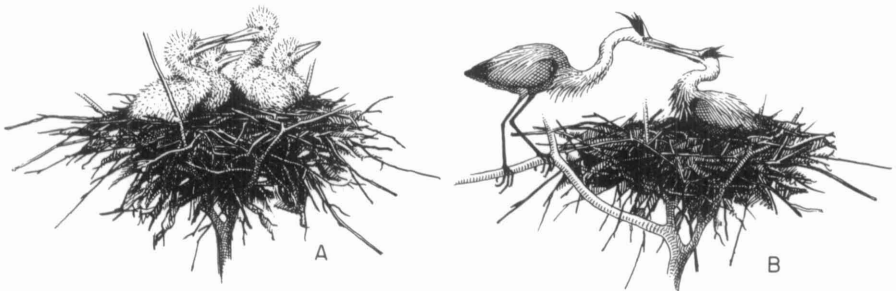


Fig. 6. (A) Young billing; appears to be a food-coaxing act. Action as in adults. (B) Adults billing; heads move forward and back several times with bill tips locked.

thrust its bill into that of the adult. Sometimes the adult opened its bill wide enough for the young to reach into its throat. There appeared to be enough food for all the young in a nest at each feeding. At this later stage, the adult did not brood the young after feeding them, but flew from the nest or stepped out on a limb to rest or preen. As the young grew larger, the parents often dropped food into the nest for them instead of feeding from the bill.

Between feedings the young preened themselves and each other and jabbed one another with their bills. Occasionally they grasped each other's mandibles and seesawed back and forth in a manner similar to that of the adults in courtship. Meanwhile a constant clacking went on, increasing in volume and tempo when an adult approached the nest. These clacking notes seem to be like those of the European Heron, "which might be written as *yek-yek-yek-yek-yek*, are entirely vocal and produced with the mandibles parted, yet of such a quality as to suggest bill-clapping" (Lowe, 1954: 86).

VOICE

The calls of the European Heron have been described very fully by Tucker (in Witherby *et al.*, 1939: 127); we found those of the Great Blue Heron very similar:

Ordinary note: A loud harsh *frarnk*.

Pairing call: A loud broad *arwo*.

Howl: As the bird stretches skyward, it emits a low *o-o-o-o*; at the height of the stretch the sound becomes higher and louder — *h-o-o-o-o-o*; it draws out and descends in pitch as the bird sinks to a squatting position in the nest, and dies away as the bird returns to a standing position with its bill still pointing upward (Fig. 7). This eerie howl of the heron is perhaps its nearest counterpart to the territory-advertisement and mating songs characteristic of many birds.

Greeting call (both sexes): *Arre-arre-ar-ar-ar-ar* sounded as mate returns to nest. This call is accompanied by plumage display — the long head-plumes and some of the plumes on lower neck and scapulars are raised. It is heard all through the breeding season and "persists as an alighting call after young have flown" (Tucker in Witherby *et al.*, 1939: 127).

Pursuit call: *Scha-a-h* used when one bird is chasing another from the nest territory. This call is made by both pursued and pursuer.

Anxiety call: A soft murmuring *go-go-go* uttered nasally, the neck outstretched and bill closed. This is "apparently specially associated with disturbing objects *below* the bird (*viz.* man under nest); not confined to breeding season" (Tucker in Witherby *et al.*, 1939: 127).

Threatening call (used by both sexes): A heron in attendance at a nest, seeing an intruder approach, will extend the neck with plumes erect, thrust at the intruder with the open bill, and utter a loud *gooo*.

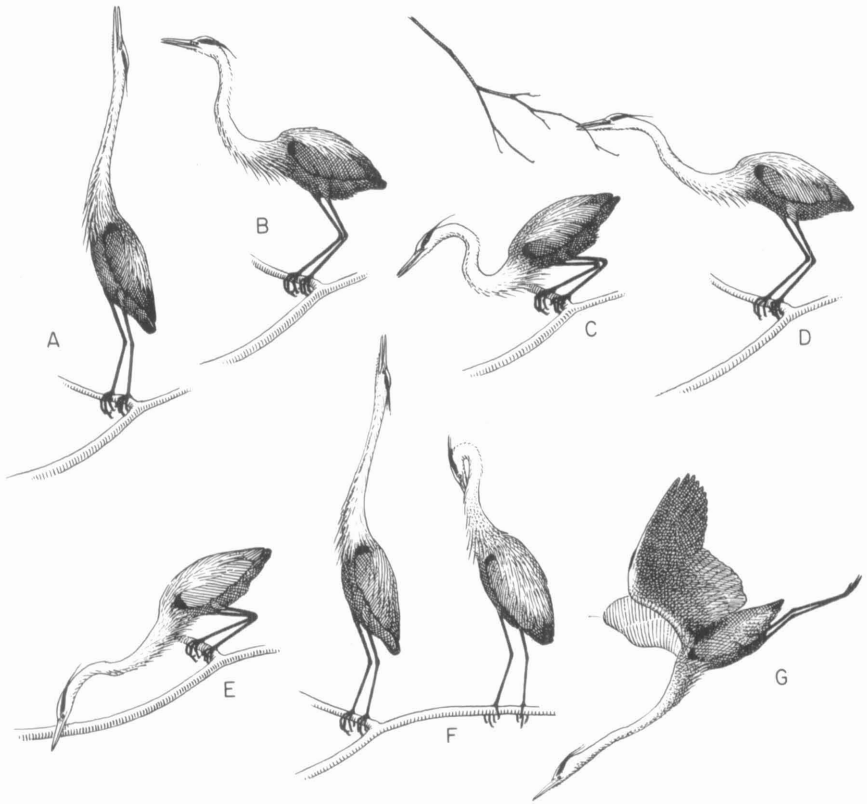


Fig. 7. Howling on branch. Start of howl is on a fairly high note with bird in erect position (A) and slides down in pitch as the bird's head and body descend (B and C). Howl ends in third position (C), and at the very end of the call its pitch slides quickly upward. Between howls the bird may reach out and tug a twig (D).

On one occasion the heron was seen doing a "bill-sharpening" act (E) after howling. It was then joined by another bird, which stood by preening while the first bird continued the howling performance (F). Apparently these birds were not yet paired, for after they flew off together the first bird returned alone and continued the howling performance. Finally it flew off alone (G).

The cry of pain or terror which we heard during the night of May 26, 1954, is not described by either Tucker or Verwey (1929). It seems beyond us also, but we are certain that it will be easily recognized when heard.

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