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## NATURAL HISTORY AND BREEDING BEHAVIOR OF THE TINAMOU, *NOTHOPROCTA ORNATA*

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ON the high mountainous plain of southern Perú west of Lake Titicaca live three species of the little known family Tinamidae. The three species represent three different genera and grade in size from the small, quail-sized *Nothura darwini* found in the farm land and grassy hills about Lake Titicaca between 12,500 and 13,300 feet to the large, pheasant-sized *Tinamotis pentlandi* in the bleak country between 14,000 and 16,000 feet. *Nothoprocta ornata*, the third species in this area and the one to be discussed in the present report, is intermediate in size and generally occurs at intermediate elevations. In Perú we have encountered *Nothoprocta* between 13,000 and 14,300 feet. It often lives in the same grassy areas as *Nothura;* indeed, the two species may be flushed simultaneously from the same spot. This is not true of *Nothoprocta* and the larger tinamou, *Tinamotis*, for although at places they occur within a few hundred yards of each other, *Nothoprocta* is usually found in the bunch grass known locally as ichu (mostly *Stipa ichu*) or in a mixture of ichu and tola shrubs, whereas *Tinamotis* usually occurs in the range of a different bunch grass, *Festuca orthophylla*. The three species of tinamous are distinguished by the inhabitants, some of whom refer to *Nothura* as "codorniz" and to *Nothoprocta* as "perdiz." *Tinamotis* is always called "quivia," "quello," "keu," or some similar derivative of its distinctive call.

The hilly, almost treeless countryside in which *Nothoprocta* lives in southern Perú is used primarily for grazing sheep, alpacas, llamas, and cattle. The shepherds caring for these animals are the most important predators on *Nothoprocta*, for they hunt and eat both the eggs and the birds. Other common predators are the Andean fox (*Dusicyon culpaeus*), a large *Buteo*, and dogs belonging to the natives.

Our observations were made between December, 1951, and June, 1952, and in July, 1946. We dissected 40 specimens of *Nothoprocta ornata* and spent numerous hours searching for and watching live birds in their natural habitat. Many of our observations were made with binoculars at a distance of 100 to 300 feet from the windows of the converted bus in which we lived and travelled. For nest watching, stone blinds were erected about 200 feet from the nests. At other times we successfully watched *Nothoprocta* at distances of more than 200 yards without any attempts to conceal ourselves. This was possible because of the mountainous nature of the area.

We succeeded in marking only one individual, an incubating male that was squirted with dye as it sat on its nest. Another individual was recognizable by a distinctive feather pattern. We became sufficiently acquainted with the call notes of a third bird so that we believed we could identify it by its call alone.

For this report we have also drawn upon the field notes of Carl B. Koford between April, 1951, and June, 1952, and upon his notes on the twelve specimens of *Nothoprocta* dissected by him.

## GENERAL HABITS

*Nothoprocta ornata* is grouse-like in appearance with very little tail and with erectile feathers on the crown. When a bird of either sex is excited, the feathers may be drawn up into what appears to be a black crest. The crest is seen more frequently on the female. As in some other members of the Tinamidae, the females are slightly larger than the males. Among 10 adult, sexually active specimens of each sex taken between February and April, the females averaged 674 grams (range 593 to 761) and the males 569 grams (444 to 700). The bill also appears to be larger in the female: eight females had an average bill length of 28.2 mm. (26 to 30), while among seven males the bills averaged 25.0 mm. (23 to 27). Other than these size differences, which alone are not reliable field criteria, there is little sexual dimorphism in this species. Among 52 birds collected by shooting, the sex ratio was exactly 1:1.

In a number of cases an observed copulation plus a recognizable size difference in a pair of birds enabled us to keep straight the sex of individuals we were watching. The sex of the unmarked live birds referred to in this report was determined in this way.

*Nothoprocta* climbs onto boulders for sunning, preening, or calling, but it spends most of the time walking, feeding, or preening on the ground. As *Nothoprocta* feeds, the head is usually held down. Every few pecks, however, the bird raises its head, pauses, and looks about.

We have not seen them scratch. Frequently these birds stop behind grass clumps for extensive observation of some disturbance, their thin necks concealed by the dried stems. When *Nothoprocta* is using extreme caution in walking, the head and body are completely rigid, the neck erect, and the feet move so slowly that the motion is hardly seen. This behavior was observed in a male bird escorting his brood of chicks from the nest. At other times, when caution is less extreme but the bird is disturbed, agitation is expressed by a bobbing of the neck back and forth in an anteroposterior plane. This motion appears to be an exaggeration of the neck movements ordinarily accompanying walking and may indicate the bird's uncertainty as to whether to run away or stay. On the other hand, perhaps this motion serves the purpose of "rapid-peering" in increasing the stereoscopic vision of the bird so that it can better assess the disturbance. A bird may bob its neck 20 to 30 times without moving its feet.

*Nothoprocta* may fly when chased by another of the same species, when disturbed by man, livestock or other animals, to cross streams, to reach feeding grounds, or at times for no obvious reason. When flushed by a person, the bird explodes into the air with a loud and startling series of screeches. The wings are flapped in the first rise of the flight and they are then held in an arc as the bird glides around the hill and lands, out of sight if possible, from 50 to more than 200 yards away. When a bird is flushed by another bird or by a grazing animal, the flights are shorter and may or may not be accompanied by screeching. Almost all flights are downhill, but on one occasion a bird flew 40 yards uphill. Frequently the bird runs after it lands.

The distance at which a human may flush *Nothoprocta* varies from 1 to 20 feet. On two occasions we saw an Indian on horseback spot a bird squatting in the grass, ride up to it and circle it twirling his rawhide lariat. The Indian tried to hit the bird with his short lariat before it took off. A male that had been incubating for several days did not flush from the nest when an Indian girl walked within inches of him, when a dog passed by within a yard, when some of a herd of llamas jumped over the grass clump that shielded the nest, and on three occasions when squirted with dye from a distance of six feet.

Although not averse to flight, since they fly when unprovoked, the usual escape technique used by *Nothoprocta* is to dash away as much as 20 yards and squat underneath a clump of grass or tola. We have seen birds run in this manner from man, dogs, and from other birds of the same species. At times the dash is executed with the head held erect, neck stretched upward and rump correspondingly

depressed. If the bird is more closely pressed, the neck is stretched out in front and the head is on a level with the body as the bird streaks through the grass. In general the lowered head is the attitude of a pursued bird. If a bird is the aggressor in a chase with another bird, it may hold its head either up or on the horizontal.

*Nothoprocta* does most of its feeding on the moist green seeps that are scattered throughout its range. These feeding areas are usually low on the hillsides or along the valley floors, and some birds come at least 200 yards down the hills to feed on them, and then return up the hills. They feed on clover and other small leaves, buds, blossoms, fruits, berries, roots, pods, seeds, and sprouting seeds. Several species of beetles and caterpillars as well as grasshoppers and an ant have been found in the crop. Occasionally the birds move dried cow chips, apparently searching for insects.

In addition to the screeching noise given as it rises in flight, or in the course of ground chases between two birds, *Nothoprocta* makes a chirp like the first note of the alarm call of the American Robin. This seems to be at times a location call and at other times a territorial note. The monosyllabic call may be repeated at intervals of from 3 to 20 seconds for as long as three hours, and it can have different qualities depending on the intensity and harshness of the note. A series of calls that begins softly may become raucous and aggressive sounding. Occasionally two birds that are separated call to each other, but the calls are not in unison. The neck is flexed back and down at each note. Another call described as "eee-arr" is given occasionally, but its significance is not known. Two birds collected while calling in this manner were females with ripe ovarian follicles.

On one occasion the common, short call was used by an alarmed bird. In order to improve our visibility we had placed a 4 × 12 inch mirror eight feet from a nest several weeks along in incubation, while the male parent was off the nest. Although he could not see himself in it when he returned, he was concerned about the mirror and with much head-bobbing and calling he alternately approached the nest and retreated for almost two hours, whereupon the mirror was removed. This same bird called while sitting on the eggs.

Both males and females call, although when a male and female are together only the female has been observed to call. The birds call at any time of day, particularly in the early morning and late afternoon. A common call situation from our notes of February 26, 1952, is as follows: "a male appeared near the base of the hill and, while calling, made his way out into . . . [the feeding area]. Perhaps in response to his calls, a female appeared out on the flat and joined

him, whereupon the calling stopped." Follow-feeding (described below) ensued, and, finally, copulation.

A fourth kind of call was heard on one occasion when a male parent and his brood of more than four half-grown young (177 grams) were surprised along a road and separated. The note was a somewhat musical "chuck-chuck, chuck-chuck," and seemed to be a location call of the separated young. Since the adult was collected first, he was not heard to give this call.

## SOCIAL BEHAVIOR

We have encountered *Nothoprocta* singly, in pairs, and in coveys, but not in the trios that we found common among *Tinamotis*. The coveys seem to be family groups, with an adult still attending when the young are half grown. Coveys were seen in February, April, and May. Five pairs of *Nothoprocta* were collected, and each pair consisted of a male and a female. One pair was taken in August (perhaps juveniles), and the other four pairs were taken from December to February. Five additional specimens taken between February 3 and March 12 were known to be one of a pair at the time of collection.

The tinamou pairs that we have watched in February and March on feeding areas spent much of their time foraging aimlessly in a manner that we have termed follow-feeding. Usually the male precedes as he feeds and the female follows and feeds 3 to 10 feet behind. Both birds stop and preen for short periods. A pair can spend as much as two and one half hours feeding almost continuously in this desultory manner on a half acre of feeding area. Single birds feeding in a more business-like manner can finish in a half-hour.

We have observed many chases between two birds of this species, females chasing females, females chasing males, and males chasing birds of unknown sex. We have not seen a male chasing a known female. An example of a chase observed on March 10, 1952, is as follows: "Watched the pair . . . [that had copulated about 15 minutes earlier] feed for a while, then thought I saw the male display, and the female subsequently started chasing him. Heard a soft, long version of their flying screech as the male, head down, tore through the grass. The female chased him with her head held up. The male would make a short dash, duck under some grass and double back on his tracks, but the female always managed to find him again and continue the chase. The chase lasted about five minutes, when the male took off screeching and landed across the gully." Frequently the pursuing bird continues to run 15 to 20 yards in the same direction after the pursued bird has flown.

The female of *Nothoprocta* is conspicuously more aggressive than the male. When a pair is together only the female calls. Either bird may lead in follow-feeding, although the male is usually in front, but if an aggressive action is involved the female leads. For example, when a pair is approached by another pair of birds or by a single bird, the male remains passive while the female runs through the grass and bill-to-tail, drives off the intruders.

Courtship consists largely of follow-feeding activity. The male while feeding in front of the female may display with either his head or tail toward the female, raising the rump and spreading the short rump feathers. Twittering and squeaking sometimes accompanies this behavior. The raising of the rump exposes the rust colored feathers of the crissum and makes conspicuous a round dark patch on either side of the vent. The patches may result from the feathers parting in a way that reveals their dark basal portions. The common reaction of the female to a display is to dash three to ten feet away, usually running from her position behind the male to a position in front of him and a little to the side of the direction they had been travelling. If the female remains standing at the end of the dash, the follow-feeding continues and the male may display again. But if the female squats at the end of the dash, the male usually runs quickly to her and stands on top of her, facing in the same direction as the female. The primaries of the male are depressed and flicked while he stands on the female, but the wings are not flapped vigorously as in *Nothocercus* (Schäfer, 1954). The female stirs occasionally and the male makes treading motions, perhaps only to maintain his balance. His treading is not vigorous, as it is in chickens, and he does not grasp the female with his bill, but holds his head up. He stands upright, in contrast to the rooster, who squats on the female. The mounting of the tinamous sometimes lasts a full minute, during which there is no cloacal contact. At the end of this time there are some rapid movements during which the rump of the male is bent down over that of the female and during which there may be cloacal contact lasting about one second. He dismounts over the head of the female. So passive is the role of the male toward other tinamous and while standing on top of the female during copulation that in our early observations we believed the male to be the female. Not until we collected both members of a pair in this precopulatory position were we certain that the squatting bird was indeed the female and the bird standing on top the male. Frequently, preening follows copulation, after which the pair resumes feeding.

By contrast to the elaborate and lengthy ceremonies of *Nothocercus*

(Schäfer, 1954) and *Crypturellus* (Beebe, 1925), the precopulatory behavior of *Nothoprocta* is extremely simple. The display by the male and the squatting of the female are merely brief interjections in the follow-feeding pattern. A pair of *Nothoprocta* copulated at different and unspecialized places in their territory, and copulation was not repeated in a short time as it is in *Nothocercus* (Schäfer, *op. cit.*). The aggressive precopulatory role played by the male of *Nothocercus* is also in striking contrast to that of *Nothoprocta.*

Several of the ten copulations that we watched took place with no concomitant display by the male. In these copulations the female initiated the mounting merely by squatting, or by squatting after a short dash. On three occasions a startled male displayed when he was uninterested in copulation. This was observed in a nesting male late in incubation. When he left the nest in the morning he flew to his usual feeding grounds. As he landed a bird ran to him from a few yards away. The male immediately postured. When the aggressor bird was momentarily distracted by a third bird, the male raced away. The aggressor tried to follow him, calling, and once got close enough to make him run again, but the aggressor never caught up with him. Another time when an incubating male met the female who guarded his nesting territory, he fluffed and postured, and the female, as in the usual courtship procedure, darted away about five yards. Instead of giving the expected further display or mounting, however, the male started running from the female, initiating a weaving chase 40 to 50 yards downhill and finally eluding her. On a third occasion display probably occurred as a displacement activity. A male displayed to an attacking bird, turned and chased it 15 to 20 yards, and then both stopped to feed about ten yards apart.

The female is aggressive in courtship as well as in other social behavior. An incubating male left his nest in the afternoon, walked about 50 yards, and stopped to preen, calling occasionally. A female joined him. He continued to preen and paid little attention to her as she busied herself around him, usually a few feet away. Several times she squatted for five to ten seconds within a few feet of him, usually facing him. The squatting sometimes climaxed a run of several feet. Except for one display he ignored her. After two to five minutes of this fawning by the female, he started feeding up the ridge. She followed closely, squatting frequently. After a few minutes a tinamou approached them from uphill. The female soon spotted it and gave chase. The uphill bird finally flew, whereupon the female returned to the nest male. The male almost immediately

postured, first head towards her, then tail; she squatted, and he mounted. On several other occasions as well, copulation occurred after the female had chased another bird.

Defense occurs both on the feeding area and in the neighborhood of the nest and is the responsibility of the female. An area may be used for feeding and courting by at least two pairs, but not simultaneously. The female does much calling on the feeding ground, will drive off other birds who are there when she approaches the feeding area, and may come down to the feeding area from uphill to drive away birds. When a stuffed female dummy was placed on the feeding area, however, two different birds known to be females scarcely reacted to it, indicating that the stimulus for the female's aggressiveness may be the behavior rather than the appearance of another bird. Two birds of unknown sex came within two feet of the dummy but after scrutinizing it, ignored it.

Under some circumstances a female tolerates a bird other than the male she is with on the feeding area, and it seems likely that such single birds are males. On one occasion the female of a follow-feeding pair drove one bird off the feeding area but a short time later ignored another bird feeding within 10 yards of her and her male.

The male may call on the feeding ground, but his calling stops when he is joined by a female.

The nest where most of our observations were made (nest 1) was under a clump of grass (*Festuca dolicophylla*) in a small gully about 250 yards above the valley floor. A female made herself conspicuous in the area around the nest, although she never approached the nest closer than 20 yards. This female was seen to copulate with the incubating male six and four days before the eggs hatched. She spent a great deal of time calling and preening on a small ridge about 25 yards from the nest and from this same vantage point in the course of two hours on one afternoon made four sorties against at least two birds calling from areas farther from the nest. Much of her territorial behavior was directed against a bird that passed through her nesting territory on the way to and from feeding. Neither the defending female nor the incubating male reacted to male or female dummies placed within 20 feet of the nest.

The area commonly used by the nesting pair mentioned above was about 100 by 300 yards (6 acres); part of it was clearly defended nesting territory and part less carefully defended feeding area. In favorable habitat nearby at the same season, we estimate that six pairs occupied about 41 acres (7 acres per pair). They will tolerate nests at least as close as 300 yards, for we found two nests separated by this distance that were being laid in at the same time.

*Nothoprocta ornata*, Department of Puno, Peru. (*Upper*) Habitat near Vilque, 13,300 feet. Beneath and between the bunch grasses are many small herbaceous plants on which the tinamous feed. (*Lower*) Nest of this species near Tincopalca, 14,000 ft. A six-inch ruler is included.

## REPRODUCTION AND NESTING

Eight active nests were found near Vilque and Tincopalca in the Department of Puno. All were well concealed either under a clump of grass or under a tola bush (plate 10). The nests are substantial structures of circularly wrapped grass and rest on a foundation built up of dry earth or a mixture of earth and mossy turf. Even when laying has not been completed, the eggs are usually covered with feathers while unattended. In general, nests that are well along in incubation have more feathers about them than do the earlier nests, which shows that the male, which does the incubating, supplies many of the feathers. An incubation patch develops in the male but not in the female. Unfortunately, we were unable to discover which sex builds the nest.

The eggs of *Nothoprocta* are a violet-chocolate color with the glossy appearance characteristic of eggs of the Tinamidae. The shell membrane is considerably tougher than in a chicken's egg. Average dimensions of six eggs, with extremes in parentheses, were: width, 36 mm. (35 to 39); length, 53 (51 to 56); and weight, 39 grams (35 to 44). Completed clutches consisted of 4, 6, 6, 9, 9, and 9 eggs. Two other nests in which incubation had not begun had four and eight eggs, respectively. The number of ruptured follicles in the ovaries of four females about to lay the last of a clutch were 4, 6, 8, and 9. These counts agree well with counts of eggs in nests and show that a single female is able to contribute all the eggs incubated by the male in a nest. Natives in the area stated that the females lay every other day. However, from the weights of the graded series of ruptured follicles in ovaries of laying females, and assuming that the rate of resorption of ruptured follicles is similar in *Nothoprocta* and Ring-necked Pheasants (Meyer *et al.*, 1947), we judge that eggs are frequently produced on consecutive days. One female appears to have laid three eggs, skipped two or three days, then laid daily for six days. Evidence that laying can be irregular was presented by a nest that on March 16 and 18 had seven eggs but that had an additional egg added to it by March 21. The natives also say that incubation lasts 24 days. The eggs in nest 1 hatched 22 days after our observations began, but we do not know when incubation had started.

Figure 1 summarizes our observations on the season of reproduction. Although nesting activity probably centers around March, this tendency is exaggerated in figure 1 because most of our collecting was at this season. Collection of two juveniles (210 and 230 grams) on February 10 proves that some nesting occurred much earlier in the

season. Testes of 13 breeding birds shot in February and March varied from 17 to 22 mm. in length.

In support of Goodall *et al.*, 1951, and of observations on caged *Nothoprocta* (Seth-Smith, 1930), we have found only the male incubating. Three birds collected on nests, one in the morning, one at dusk, and one at midnight, were males; it was always the male who sat on the eggs at nest 1, and the female never came close to them.

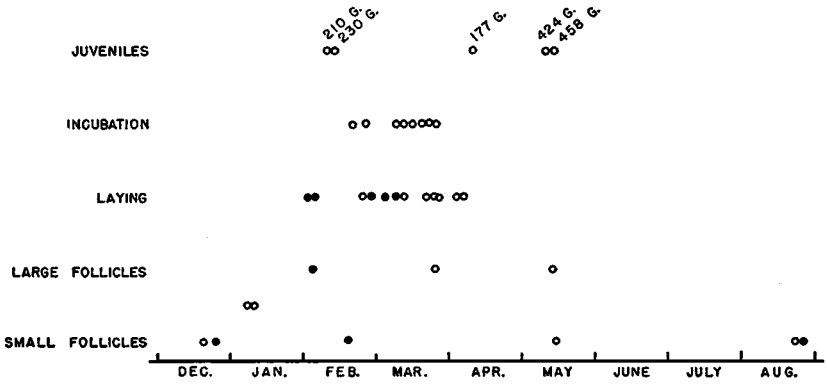


FIGURE 1. Reproductive stages of *Nothoprocta*. The points for incubation are placed at the estimated beginning of incubation for each nest. Solid circles indicate that the specimen was one of a pair at the time of collection.

We watched nest 1 for most of five days and for periods as long as five hours on fourteen other days. The incubation schedule of the male during most of incubation entailed three periods off the nest each day (fig. 2). The shortest time that the male spent off the nest was 40 minutes, the longest, 105, and the average for 16 periods was 77 minutes. The shortest daytime period on the nest was 1½ hours, and the longest period (observed at nest 5 late in incubation) was 7 hours. The morning absence from the nest tended to be longer than the noon and afternoon absences. Perhaps this is correlated with the fact that the mornings are usually sunny and warm and the unattended eggs less likely to chill than in the afternoons during the southern hemisphere summer when cold winds, rain, hail, and snow are frequent. Night temperatures are near or below freezing.

When the male leaves the nest he arranges the loose feathers on top of the eggs, but other parental nesting habits do not seem to have been modified in a way that prevents chilling of the eggs. In spite of the climate, he is off the nest three times as long each day as *Nothocercus*, a tropical relative (Schäfer, 1954). Temperature conditions during the late afternoon feeding of the male on nest 1, who was incubating a clutch that hatched 10 days later, were as follows: 4:00

P.M.—Male left nest. Weather had just become cloudy and windy. Temperature in grass clump similar to that occupied by nest was 12° C. 5:00 P.M.—Air temperature 8°; temperature in grass clump above eggs, 8°; inside of an egg in the nest, 22½°. All eggs covered with feathers except one partly exposed in the center of the nest. 5:35 P.M.—Male returned. Air temperature 6°. On some days the

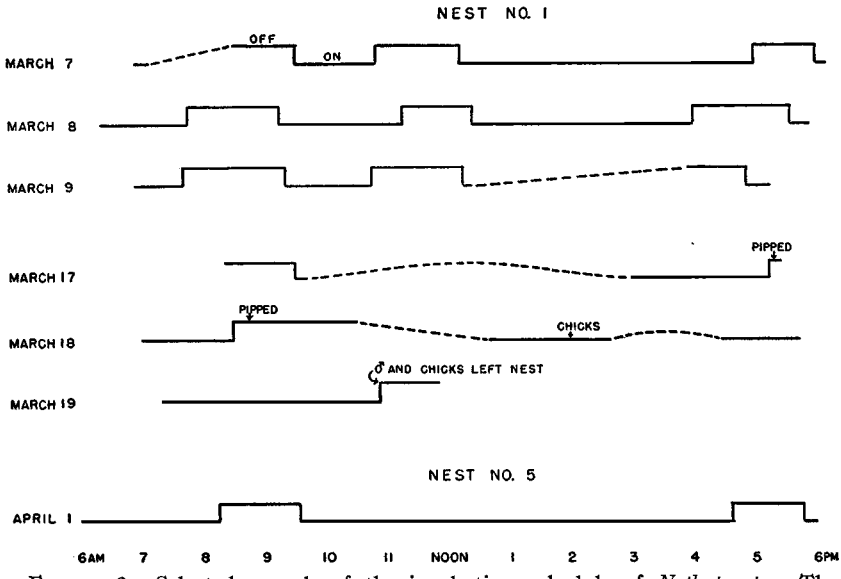


FIGURE 2. Selected records of the incubation schedule of *Nothoprocta*. The bottom diagram is for nest 5, an estimated three days before hatching. Dotted lines cover periods during which we were not watching the nest.

male did not return until after 6 P.M. when the air temperature was even lower.

Another male was shot on a nest at midnight when the air temperature was −2°; cloacal temperature was 39½°. The temperature inside two of the eggs was 35½° and 36°. Three eggs were left in this nest, covered with feathers. Despite the below-freezing night temperature, at noon the next day their temperature was 27° and the embryos (12 to 15 grams) were moving and had beating hearts. Eggs from a different nest were taken to camp overnight and at 6 A.M. had a temperature of 3½°. When the eggs were warmed to 28° and opened, the embryos (5 to 7 grams) moved voluntarily and showed strong heart beats. It appears then that embryos of *Nothoprocta* are resistant to chilling.

As hatching approached, the incubation schedule of the male attending nest 1 changed. On March 15, two days before pipping,

he first left the nest almost two hours later in the morning than was usual, and it is probable that, like the male at nest 5 (fig. 2) about three days before hatching, he took only two recesses on that and subsequent days. On March 15 his behavior while off the nest altered also. On March 14, as on previous days, the male had met and copulated with the calling female who frequented the nesting area. On March 15, however, the male avoided the female, and in one feeding

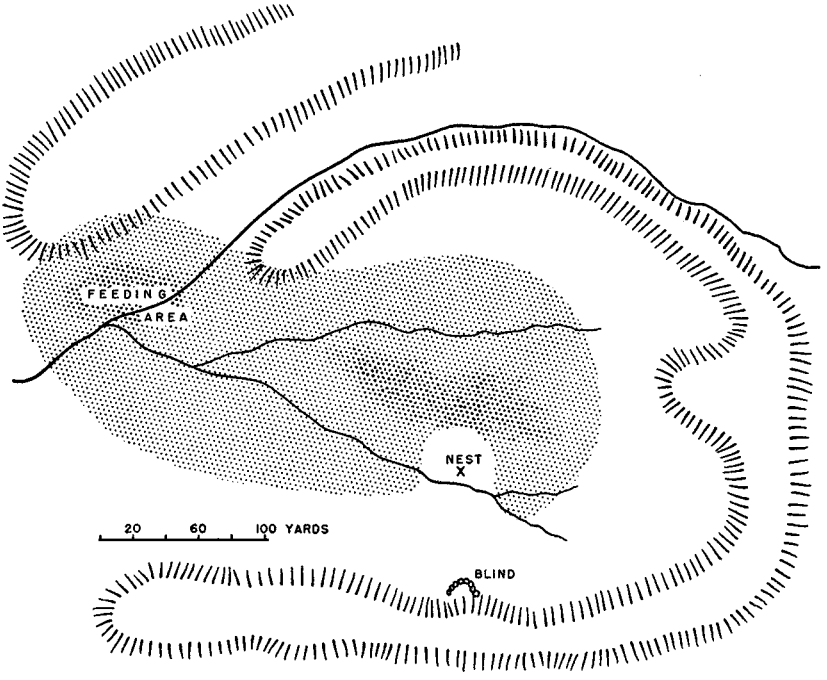


FIGURE 3. Diagram of the area around nest 1, showing the extent of the territory occupied and defended by the female. The degree of stippling is in proportion to the amount of time the female spent in different parts of her territory. The incubating male stayed within the female's territory.

period was twice seen to run and escape from her attentions. Perhaps it was the change in behavior of the male that prompted a change in the behavior of the female that ordinarily guarded the nest area, for during the last few days of incubation she was not seen in her usual places.

When the male leaves the nest he covers the eggs, then walks 20 to 50 yards away before he stops to feed or preen. The male from nest 1 fed mainly at the base of a hill about 230 yards from the nest and blind. Figure 3 is a diagram of the nest area and shows the extent

of the observed movements of the nest male and female. When the male returns to the nest, he moves aside the feathers before settling on the eggs.

The nesting male sometimes called during the periods off the nest and, as mentioned before, may briefly answer calling while sitting on the nest. The female's calling bears some relation to the incubation schedule. Frequently she began calling near the time when the male left the nest, and her calling stopped when the male joined her. While with the male, she may resume calling, using the same short chirp, if she needs to defend her territory. Many times the female begins calling again after the male returns to the nest.

During the time that we watched *Nothoprocta* we saw no evidence of either polygyny or polyandry. No male was known to have copulated with more than one female; the female who guarded nest 1 territory never, to our knowledge, copulated with males other than the nest male. The fact that copulations between the incubating male from nest 1 and the female who guarded his nesting area were observed only four and six days before the eggs hatched suggests that the female was laying, or about to lay, a second clutch. Further evidence of renesting comes from another nest where the male was incubating nine eggs that were about a week from hatching. Sixty yards from this nest, well within the expected territory of a nesting pair, a female was shot with the last of a clutch of nine eggs still in her oviduct. The puzzle is, of course, if the female lays a second clutch while the male incubates and broods the first, how does she find and induce a second male, probably not the father of her second brood, to incubate the second clutch?

In the afternoon of March 17, 22 days after our observations on nest 1 had started, the parent was very restless on the nest for three-quarters of an hour before he left, and he left later than usual for his evening feeding. The five eggs, covered over with feathers, were arranged in a saucer shape, with one egg on top of the others. The egg on top had a hole about 3 mm. in diameter in it, and the shell membrane had also been punctured. Pipping was just starting on the upper surface of the two other eggs that were seen clearly. When the parent left the nest again the next morning the eggs were in the same positions, with one egg on top. The other four eggs had pip marks, but no holes. Apparently there had been no progress in hatching overnight, for the hole in the top egg was still 3 mm. in diameter. Two hours later the male parent was still off the nest, and as we approached we could hear peeping. The top egg, whose opening was now 5 mm. in diameter, had slid over and was no longer on top. The other four eggs were still just pip marked.

The incubating male was increasingly restless as the day passed. He did much poking under and about him with his bill, and preened about the neck and breast. In the early afternoon a large piece of shell popped out on one side of him, and he, in several thrusts, forced it back under himself again. At 2 P.M. the first chick, already dry, popped up in front of the male but was immediately forced under the parent again. At 5:15 P.M., when the sun set on the nest, the male had not left for his evening feeding. There was some calling fairly close to the nest, and the bird stood up, poked into the nest with his bill, and sat down again. We left our blind at 5:45, the male apparently settled for the night. To our knowledge he left the nest only once on this hatching day, in the morning.

On the following day the male was again restless. Several times he stood up and looked underneath himself but did not leave for a feeding. Finally, at 10:20 A.M. a chick climbed out on the edge of the nest and tumbled off onto the ground. The others followed, and all five were out by 10:30. The young were steady on their feet. As soon as they were off the nest they started pecking at the ground and exploring within a distance of two feet. At 10:50, twenty minutes after the last chick had left the nest, the parent stood up and started moving almost imperceptibly down the gully. He was extremely cautious, watching carefully about and paying no apparent attention to the chicks. Occasionally he pecked at the ground and once he fluffed out his feathers and defecated within a yard of the nest. When about 1½ yards from the nest he circled back to the nest. Three of the chicks gathered at his feet, and he turned and set off down the gully again. The last two chicks straggled well over two yards behind the rest. There was little organization, for the chicks sometimes preceded him a little or wandered about to the sides. No sounds could be heard at the blind 65 yards away. By 11:40 the procession had gone a distance of only 9 feet from the nest. Observations were interrupted until 3 P.M., when a careful search failed to reveal either the brood, the male, or the territorial female. They did not return to the nest, and during the next three days we could not locate them in the area. The abandoned nest was surrounded by a ring of about 12 large droppings. The egg shells were broken into pieces and lay mixed with feathers in the bottom of the nest.

In addition to seeing the above male escort his brood from the nest, we were able to collect an adult attending a brood of at least four young. This bird also was a male. In our two encounters with discrete coveys of half-grown young, we saw only one adult attending each, so it seems likely that the female does not assist the brooding male.

SUMMARY

*Nothoprocta ornata* lives between 13,000 and 14,300 feet in the grass-covered hills of southern Perú. Both sexes screech when taking flight, and a single sharp chirp is used as a location call and as a territorial call.

During the breeding season the females are aggressive in their social and sexual behavior and defend the nesting and feeding areas. A pair was observed to have a territory of about 6 acres, which included both nest and feeding ground. Only the male sat on the eggs, and the female never came within 20 yards of the nest during the incubation period.

During courtship the members of a pair feed together, the male usually preceding. In display he raises the rump and displays the bright crissum. The female responds with a short dash to a position in front of the male and squats. Mounting may follow.

Clutch size in six completed nests varied from four to nine eggs, with an average of seven. Laying females were found from February through April, although the breeding season is probably longer than this.

An incubating male customarily took three recesses a day from the nest. *Nothoprocta* embryos are resistant to chilling. The precocial young hatched on the twenty second day of our observation of a nest and left the nest permanently about 20 hours later with the brooding male. We have no evidence that the female takes any part in rearing the chicks.

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