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ASPECTS OF THE BIOLOGY OF THE HORNED SCREAMER IN SOUTHWESTERN COLOMBIA

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ABSTRACT.—An isolated population of the Horned Screamer (*Anhima cornuta*) in the Cauca Valley, Colombia, was studied intensively during 1983–1984. Variation of head plumage allowed me to identify individuals. This group of approximately 25 adults is the only breeding population of the species in southwestern Colombia. Home ranges were fairly large areas on the shoreline of the lagoon ($\bar{x}$ = 10.7 ha). Defense of home ranges involved both vocal displays and physical fights. Most activity occurred from 10:00 to 18:00. Long sessions of preening occurred during the early morning. Screamers fed on nine species of aquatic plants and were observed digging into mud. Besides preening and standing, seven comfort movements were identified: wing-shake, head-shake, tail-wag, wing-and-leg-stretch, two-wing stretch, one-wing stretch, and jaw-stretch. Of these movements, only the head-shake was performed as a part of the courtship behavior. Reproduction took place from late November to early May. Courtship involved social preening and an elaborate display performed by the male. Nests were floating platforms located within emergent vegetation. The average clutch size was 4.5 eggs, which were incubated by both sexes throughout the 47-day incubation period. *Received 17 June 1985, accepted 14 Oct. 1985.*

Information on the general behavior and ecology of the screamers (Anseriformes: Anhimidae) is meager. Recent literature on this group of waterfowl is based mainly on general field notes (Hudson 1920, Wetmore 1926, Weller 1967), and on observations in captivity (Stonor 1939, Lint 1956, Kupelberg 1959, Spence 1959, Bell et al. 1970). Only one paper is based on detailed field observations (Gill et al. 1974).

Two of the three species belonging to this family are distributed widely in Colombia. The Northern Screamer (*Chauna chavaria*) occurs in most of the Caribbean lowlands and the Horned Screamer (*Anhima cornuta*) occurs in the Amazonian region, the Eastern Llanos, and in two isolated populations in the Zulia and the upper Cauca valleys (Meyer de Schauensee 1949). No detailed field observations of these birds have been reported, except those by Gill et al. (1974). Other literature referring to screamers in Colombia includes only geographical notes, general observations, and descriptions of folklore (Olivares 1961, 1973; Rodriguez 1983).

During the last decade, personnel of the "Corporación Autónoma Regional del Cauca" (CVC), the government agency in charge of the management and conservation of wildlife in the Cauca Valley, have noted a decrease of the isolated population of the Horned Screamer in the region (O. Kaffury, pers. comm.). In order to evaluate the current status of this

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population and to initiate a long term study of the species in Colombia, I made field observations on the general behavior, feeding ecology, population structure, and reproduction of this species in the Cauca Valley in 1983–1984.

STUDY AREA AND METHODS

In the Cauca Valley, the Horned Screamer occurs in only two localities near Buga: the "Laguna del Choncial," a highly disturbed area where only four screamers have been observed during monthly visits in the last three years (O. Kaffury, pers. comm.), and the Natural Reserve "Laguna de Sonso" where the species has been reported breeding.

Most of my observations were made at the latter locality. The Laguna de Sonso is a large, approximately 594-ha marsh located near the eastern bank of the Cauca River (03°52'N, 76°21'W, 935 m above sea level) (Fig. 1).

Because of periodic flooding, the depth of the lagoon and its area fluctuate greatly. Most of the lagoon is covered with water hyacinth (*Eichornia crassipes*) and, to a lesser extent, water lettuce (*Pistia striatiotes*). The shoreline supports a wide belt of emergent vegetation with scattered trees and shrubs (mainly *Salix humboldtiana, Erythrina fusca, Laetia acuminata,* and *Fagara pterota*). The area is permanently protected from hunting and use of motor boats, but there is some fishing by local inhabitants, and the surrounding area is used intensively for grazing cattle and for cultivation.

The study included weekly observations from April 1983 through May 1984 (1–3 days per week; total observation time per week was 8–24 h). Most attention was given to activity patterns, but I also noted population size, home range size, and group composition. Birds were observed with 8 × 30 binoculars and a 60× spotting scope from a 6-m tower on the western border, and from portable blinds within the home ranges of the screamers. Observations were tape-recorded, and the time of each behavioral bout measured. Most of the behavioral patterns were also photographed using a camera with 400-mm telephoto lens and motordrive.

Because of the unpredictability of the water level in the area and the difficulty of detecting some of the birds while they were active on the ground, timing of the observations was opportunistic, and an accurate description of seasonal variation of behavior is not possible. Activity was recorded, however, during almost every hour of the day, and some generalizations of the daily timing of each pattern are thus included. Population size was estimated using two different methods. First, because Horned Screamers are sedentary (Gill et al. 1974), the locations of birds inhabiting the western shore of the lagoon, where most of the observations were made, were mapped whenever they were observed. This was facilitated by recognition of distinctive patterns of head plumage of individuals (Fig. 2). This method also allowed me to determine the boundaries of the seven home ranges studied. Second, the screamers on the eastern border of the lagoon were counted repeatedly from the tower during early morning, when the birds were perched on the tops of shrubs and trees.

Voucher photographs of the study area and of Horned Screamer's home ranges, nests, eggs, and chicks, have been deposited in VIREO (Visual Resources for Ornithology, Academy of Natural Sciences of Philadelphia, 19th and The Parkway, Philadelphia, PA 19103) under catalog numbers N02-1-001 through N02-1-007.

ABUNDANCE AND POPULATION STRUCTURE

The combined survey methods yielded an approximate, but conservative, estimate of 25 adult birds (censuses averaged 24.6 ± 1.9 individuals [SD], N = 11).

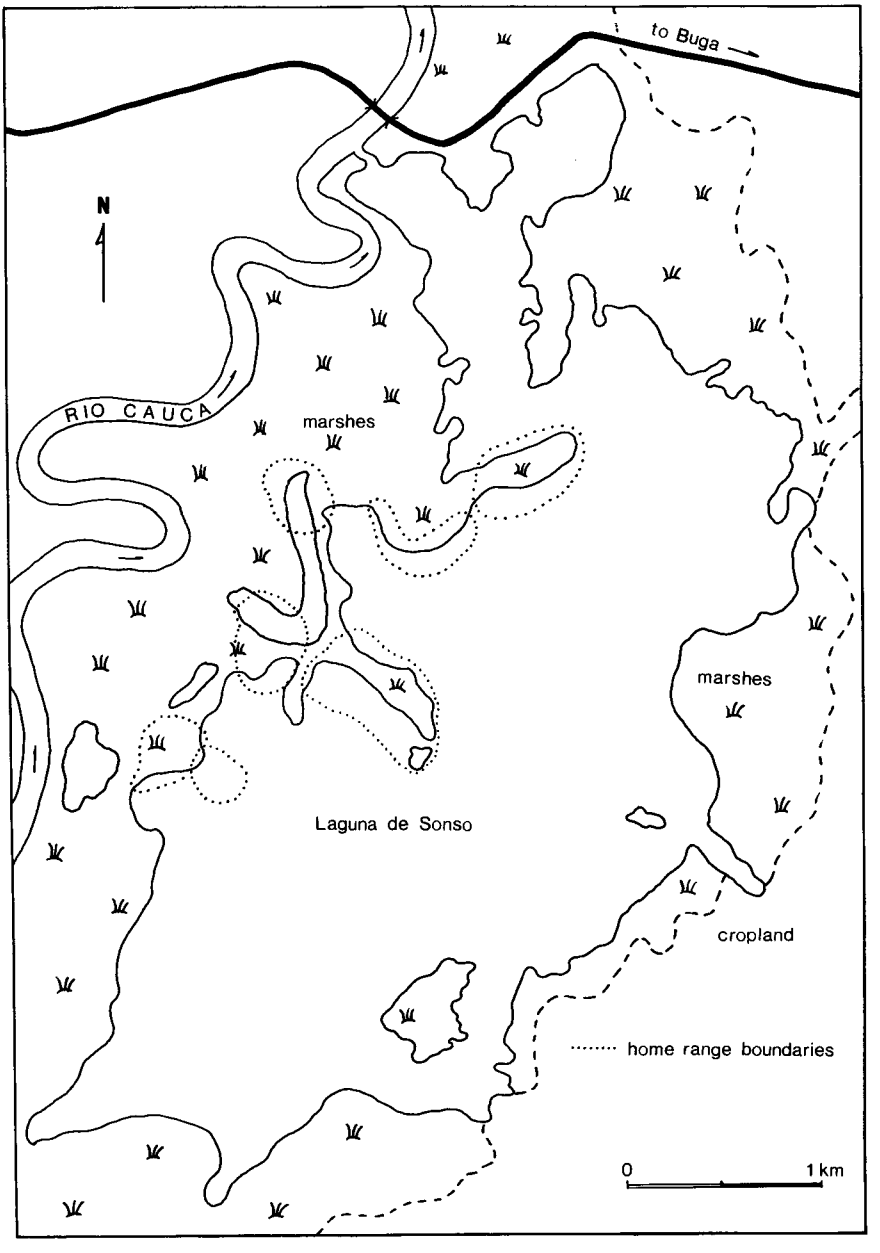

FIG. 1. Laguna de Sonso and adjacent marshes, showing the locations of the seven home ranges.

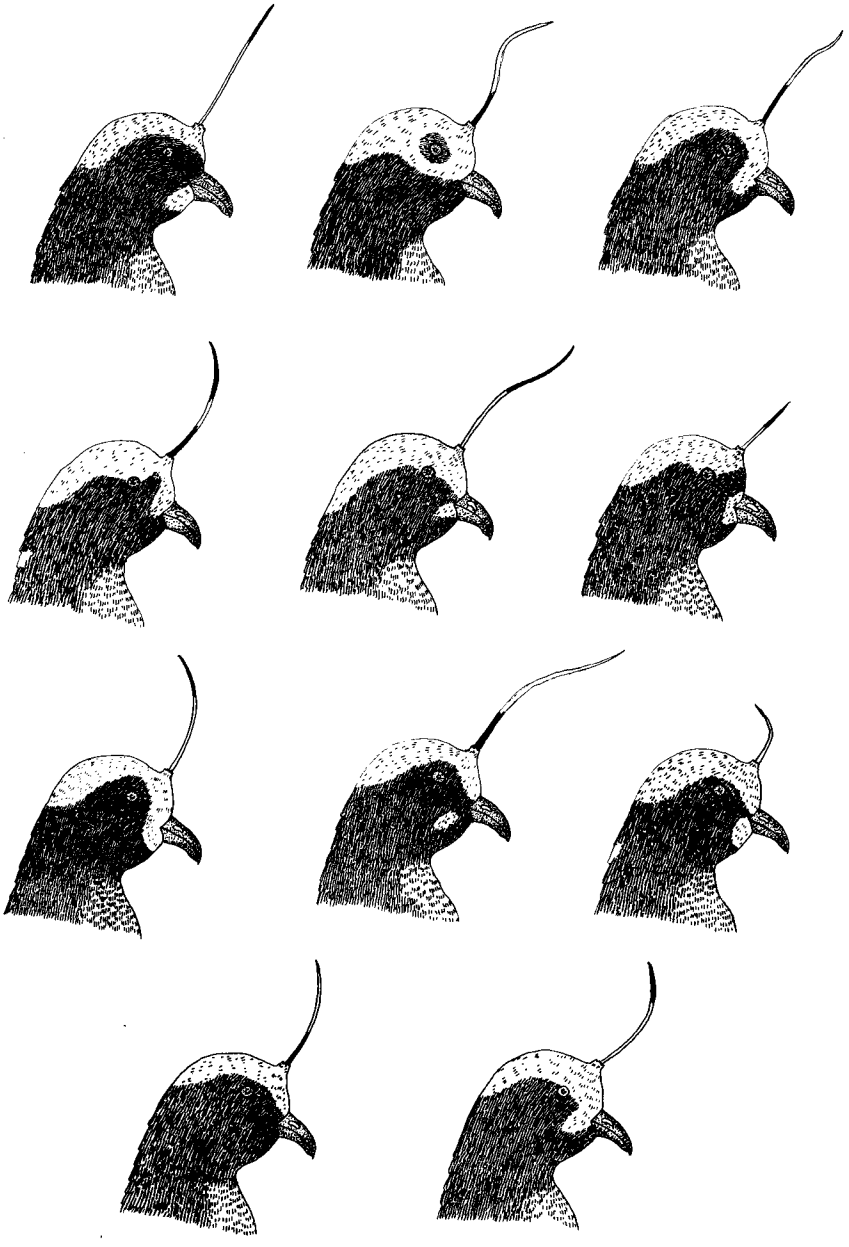

FIG. 2. Variation in the head plumage of the Horned Screamer in Sonso. Drawings were made on the site and are based on close range observations.

With one exception, pairs of adults observed were stable throughout the year. The exceptional case was a pair observed sporadically from September to November 1983; by March 1984 the female of this pair was replaced by another bird that had been seen alone earlier in a neighboring area. Of the seven home ranges studied, two were occupied by family groups, composed of three and four individuals, respectively. I observed the group of four individuals carefully during 10 months, beginning in March 1983. Two of the birds lacked the characteristic horn-like feather on the forehead, and were probably yearlings; they habitually followed the other two individuals closely. In November 1983, one of the apparently young birds, at that time exhibiting a short horn, started to court the adult female. This bird was repelled repeatedly by the adult male. One month later, when the adults were observed performing courtship and copulation behavior, the two young individuals had disappeared from the area.

The other group was composed of three individuals in adult plumage; changes of the structure of this group were not detected. These observations seem to be in accordance with the strong pair bonds suggested by Todd (1979) for screamers, and the low gregariousness reported for the species by Gill et al. (1974).

HOME RANGE

Each of the seven studied ranges included a large area on the shoreline ($\bar{x} = 10.7 \pm 8$ ha) (Fig. 1); aquatic boundaries varied according to the amount of floating vegetation moved around by the wind.

Most of the area occupied by the screamers was flooded permanently, and birds waded within the emergent vegetation or walked on the floating masses of water hyacinth while feeding; but I never observed birds swimming. Birds used emergent ground only when it was covered with aquatic food plants. Six of seven home ranges included at least one tree (*Salix humboldtiana, Erythrina fusca, Laetia acuminata*) or some shrubs (mainly *Fagara pterota*) that were used as perches. In the only area that lacked a perch, the two birds using it started to perch on a blind within their boundaries, immediately after its construction.

Although direct evidence of territoriality is scarce, some data suggest that the home ranges of the screamers might actually be defended territories. Each day screamers performed one or more choruses of loud calls. Most of the vocalizations were produced while the birds were perched; birds were more silent when searching for food on the ground. The screams initiated by one adult or a group of birds often resulted in vocalizations by neighbors (such a response was detected in 76% of the choruses observed by Gill et al. 1974 and in 100% of those in the present study).

I saw birds defend territories twice in the Laguna de Sonso. On 14 October 1983, a group of four individuals was searching for food at 09:44 when a bird flew above them and landed nearby. The four birds took off immediately, landed within 2 m of the bird, and pursued it for 19 sec. The group kept their necks inflated and partially retracted, the bills close to the neck feathers, the dorsal plumage erected, and their shoulders pointing forward with the spurs conspicuously exhibited while they rapidly flapped their wings. The intruder flew out of the area, and the four birds then performed a vocal chorus, shaking their heads and necks, for 58 sec.

On 30 December 1983, a pair of screamers not previously seen in the area arrived within the border of the home range of the same family group cited above, and perched on a tree for about 4 h. At 10:11 the pair flew toward the middle of the home range and landed about 30 m from the resident female, which immediately flew to a point less than 5 m from the intruders, inflated her crop, erected her dorsal plumage while pointing her spurs forward, and initiated a series of loud vocalizations that were answered by one of the intruders (the other flew out of the home range after the female approached). The vocalization period lasted 4 min, during which time the foreign bird called seven times ($\bar{x} = 7.7$ sec), and its opponent called three times ($\bar{x} = 6.6$ sec). The intruder then left the area, followed by the resident female 2 sec later. Upon reaching the border of the home range, the female landed and remained in an alarm posture for 7 min, before returning to the center of the home range.

The fact that only two territorial displays were observed may be a reflection of the reduced size of the population in the area. Weller (1967) and Todd (1979) noted that screamers become involved not only in aggressive displays, but also in actual fights; and both authors mentioned broken spurs found in the breasts of some of their birds.

FEEDING BEHAVIOR AND DIET

With only a few exceptions, screamers fed from mid-morning (10:00) until late afternoon (18:00). Birds alternated the search for food with periods of standing, preening, and walking or flying. Two components of feeding behavior were observed.

The most frequent feeding behavior (97.2% of the total feeding time) was grazing. As previous workers (Weller 1967, Todd 1979) reported, the screamers are mainly if not completely herbivorous. In Sonso, the Horned Screamers fed on at least nine different plants, which they took while walking or wading slowly across their home range. Screamers grazed by pecking at leaves, vines, stems, and flowers with lateral movements of

the head, and swallowed the food items immediately, except when the food was longer than their bills, as in the case of water hyacinth inflorescences (Fig. 3A–C). Plants included in screamer diets and the proportion of occurrence of each (percentage of the observed grazing time) were as follows: *Hydrangea,* 56.4%; *Eichornia crassipes,* 14.9%; *Polygonum hispidum,* 5.6%; *Paspalum dilatatum,* 5.1%; *Artemisia absinthium,* 3.1%; *Aeschynomene ciliata,* 1.4%; *Pistia striatiotes,* 1%, *Cardiospermum carendum,* 0.4%; and unidentified plants, 12.1%.

The second most common feeding behavior (2.6% of the total feeding time) was digging. Although I am not certain that the screamers actually took food while digging, they were observed making swallowing motions after each digging bout. Birds waded slowly in shallow free water, and moved their bills into the mud with rapid backward strokes of the head. The behavior resembles the digging behavior of the Magpie Goose (*Anseranas semipalmata*) (Davies 1963), although I do not know if the screamers "filtered" while they dug. Olson and Feduccia (1980) reported the presence of vestigial lamellae both in the upper and lower mandibles of the Horned Screamer, which suggests the possibility of occasional filtering.

I observed screamers drinking briefly on two occasions. Perhaps the succulence of the plants used by these birds as food accounts for the infrequent occurrence of this behavior. A bird drank while wading in shallow water; it dipped its bill into the water and lifted its head, swallowing the drink immediately.

COMFORT BEHAVIOR

The behavioral patterns here described are based upon 73 detailed observations of nearly 15 min each of 14 different adults. The general behavior of the screamers was classified into five categories, comprising movements with variable frequency and proportion of occurrence. The names given to each of these movements follow McKinney's nomenclature (1965), with the exception of standing and sleeping, which were not described by him. Although the total number of samples was low and the proportion of samples per hour varied, some generalizations can be made by grouping the observations into 4-h periods to show the general activity sequence during the day (Table 1). Because of their high percentage of occurrence in the activity of the screamers, both standing and preening are included in the table as separate entries. The behavioral categories and their component movements are described as follows:

Standing.—Screamers alternate every activity with periods of standing. Although only a slight variation in the proportion of the time spent stand-

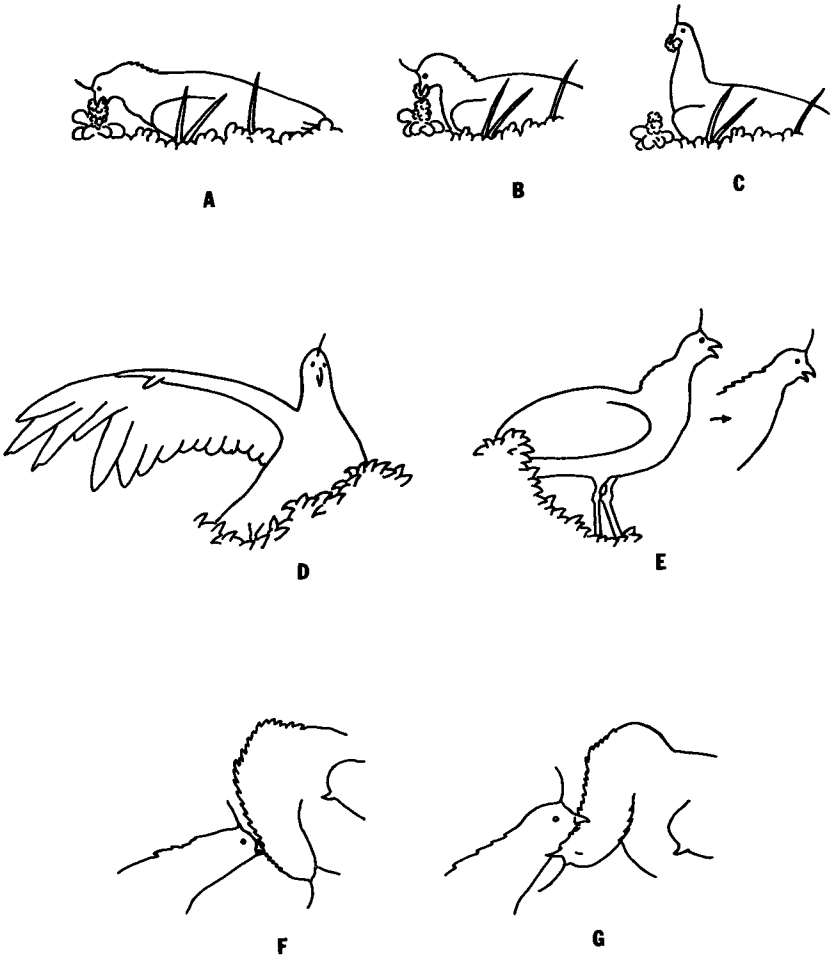

FIG. 3. Behavioral movements of the Horned Screamer: (A–C) Grazing, (D) One-wing stretch, (E) Calling, (F–G) Social-preening. All drawings were made from 35 mm photographs of individuals in the field.

ing was observed, standing occupied a higher proportion of the time as the day progressed (Table 1). Screamers stood with their necks partially retracted, wings folded, and, for brief periods, one foot raised.

Preening.—Most preening occurred during the early morning while the screamers were perched on trees and shrubs; time spent preening decreased progressively through the rest of the day (Table 1). Preening included almost every part of the body, with most time spent on breasts,

TABLE 1

MEAN DURATION ± SD PER SEQUENCE AND PERCENTAGE OF TOTAL TIME SPENT IN DIFFERENT BEHAVIORAL PATTERNS

Behavior	Morning[a]			Midday			Evening		
	N[b]	$\bar{x}$[c] ± SD	%	N	$\bar{x}$ ± SD	%	N	$\bar{x}$ ± SD	%
Preening	150	13.0 ± 5.6	27.9	288	6.7 ± 3.2	10.9	148	7.0 ± 2.8	5.9
Comfort	14	5.7 ± 1.8	1.2	44	4.0 ± 1.2	0.6	18	3.5 ± 0.4	0.2
Locomotion	3	6.7 ± 0.0	0.2	36	12.9 ± 5.8	2.4	24	17.0 ± 4.4	2.0
Feeding	24	36.9 ± 40.2	9.0	247	15.0 ± 9.9	17.0	266	11.4 ± 4.0	20.4
Calling	7	2.9 ± 0.5	0.2	22	7.6 ± 2.4	0.6	7	5.4 ± 0.0	0.2
Social[d]	14	12.5 ± 5.0	1.8	13	11.2 ± 12.4	0.5	12	5.4 ± 3.2	0.2
Agonistic	1	21.0 ± 0.0	0.2	3	6.0 ± 0.7	0.1	0		0.0
Sleeping	0		0.0	4	91.3 ± 4.7	1.0	0		0.0
Standing	195	34.2 ± 40.1	59.5	599	56.7 ± 70.5	66.9	477	56.5 ± 53.7	71.1

[a] Morning = 06:30–10:30 (total time of observation 8911 sec), Midday = 10:30–14:30 (29,701 sec), Evening = 14:30–18:30 (22,548 sec).
[b] N = number of sequences observed.
[c] $\bar{x}$ and SD in seconds.
[d] Social = Social-preening and Head-bobbing.

wings, and sides. Only a small proportion of preening involved scratching the head. Birds grasped feathers with their bills while preening, and preening perches were easily recognized by the numerous feathers, including remiges, on the ground (screamers undergo a graduated wing molt [Haffer 1968, Todd 1979]).

The following three shaking movements were associated mainly with preening and standing.

Wing-shake.—The bird slightly raised one wing, then the other, and then folded them, usually after preening the sides or the wing coverts ($\bar{x}$ = 3.6 ± 0.7 sec [SD], N = 5).

Head-shake.—After preening or feeding bouts, the birds sometimes shook the head from side to side for 3.9 ± 1.01 sec (N = 7). A secondary situation in which this movement occurred (Head-flick) will be discussed under courtship behavior.

Tail-wag.—The bird depressed its tail and moved it rapidly from side to side 1–4 times while standing. Two bouts of 3.5 sec each were observed.

The following three stretching movements were only observed after long sessions of preening and standing:

Jaw-stretch.—The bird stretched its neck and widely opened its beak, which was pointed upward ($\bar{x}$ = 2.8 ± 0.2 sec, N = 11).

Wing-and-leg stretch.—The bird fully stretched one wing laterally, or both the wing and leg of the same side directed backward ($\bar{x}$ = 6.5 ± 3 sec, N = 7). The one-wing-stretch movement (Fig. 3D) is not mentioned for the Anatidae by McKinney (1965).

Both-wings stretch.—The bird slowly flapped the partially or fully extended wings, with the neck fully erected or inclined forward ($\bar{x}$ = 5.25 ± 0.7 sec, N = 10).

Sleeping.—I observed screamers sleeping four times. All of the observations were in the middle of the day, when the birds were on their feeding grounds. The birds rested with their eyes closed and their bills on their retracted necks or buried within their back feathers.

LOCOMOTION

The proportion of daily activity dedicated exclusively to locomotion was very small; most movements were from one foraging site to another. More time was spent moving in midday than during early morning or late afternoon (Table 1). The average duration of flying bouts was 5 ± 0 sec (N = 8), and that of walking and wading was 22.2 ± 20.0 sec (N = 23). Screamers flapped their wings a few times and then soared until landing. Hudson (1920) observed frequent soaring by the Southern Screamer (*C. torquata*), but in Sonso the screamers were not observed soaring.

VOCALIZATIONS AND SOCIAL BEHAVIOR

Gill et al. (1974) described in detail the vocalizations of this species. At Sonso, I noticed no daily variation in the proportion of time spent calling, but the average duration of the calling bouts (Table 2) appeared to be longer during the midday. While calling, the screamers stretched their fully inflated necks, and shook their heads (Fig. 3E).

Head-bobbing.—When one screamer approached its partner on the ground or landed on a perch beside it, both birds shook their heads upwards 1–3 times while keeping their necks stretched ($\bar{x} = 2.35 \pm 2.2$ sec, N = 14).

Social-preening.—Often when the two members of a pair were standing together, they preened the feathers of each other's heads and necks ($\bar{x} = 21.1 \pm 30.4$ sec, N = 7) (Fig. 3F–G). Stonor (1939) mentioned this display as the main courtship behavior; in the present study the birds performed it throughout the year.

AGONISTIC BEHAVIOR

Agonistic behavior was observed only when the screamers were attacked by flying Southern Lapwings (*Vanellus chilensis*). When a flying lapwing approached a standing screamer, the latter stretched its neck in the alarm posture and then bowed, keeping the neck pointing forward. After the attack, the screamer called loudly (1–4 times, $\bar{x} = 9.8 \pm 7.5$ sec, N = 4).

REPRODUCTION

Courtship behavior.—Stonor (1939) noted that apart from allopreening displays, the Southern Screamer does not exhibit any definite courtship behavior. Horned Screamers, however, in addition to the frequent mutual preening observed throughout the study, sometimes performed a display immediately before copulation. In this display, which I saw on four occasions, the male walked around the standing female with his bill pointing downward against his inflated crop, his neck retracted, his dorsal feathers partially erected, and his wings partially opened with the carpal joint pointing downward. After circling, the male bowed 1–3 times in front of the female ($\bar{x} = 84.5 \pm 92.3$ sec, N = 4). In one case preceding this display, the male shook his head in a circular motion during 3 sec, flew in a wide circle for 30 sec, returned to his departure site in front of the female, and then began to court her. The circular motion of the head by the male corresponds to the Head-flick described by McKinney (1965), and found as a precopulatory movement within the Anatidae only in the Red-crested Pochard (*Netta rufina*).

Aggression.—As mentioned before, pairs were stable throughout the

year, and apparently juveniles remained with their parents during their first year of life. In one case, a juvenile courted an adult female repeatedly, and was chased with increasing frequency by the adult male. Most chases were simple running pursuits in which the adult male inflated his crop and directed his spurs forward. In one case, the two birds grasped each other's necks with their bills, and shook their wings rapidly with their spurs directed toward each other. The fight lasted 40 sec, after which the adult male abandoned the site, and both the female and the juvenile vocalized in duet eight times during 12 sec.

Copulation.—I saw two copulations, both by the same pair (6 November 1983 at 07:10, 2 December 1983 at 11:49 during a feeding session). Without any preliminary display, the male mounted the female for 10 sec, while grasping her horizontally extended neck with his bill, and flapped both wings slowly during copulation.

Nests and eggs.—Because of the dense vegetation in the nesting areas and floods at the beginning of the nesting period, only two nests were detected. On 28 January 1984, one nest was discovered when it was carried out of the lagoon in a floating mass of vegetation. The nest was partially destroyed, and I collected the eggs and attempted (unsuccessfully) to hatch them in an incubator. The second nest was found on 1 April 1984. It was situated in a small pond adjacent to the lagoon, encircled by tall grasses, rushes, and bushes. The structure was a platform floating over 116 cm of water, formed of water hyacinth plants covered with dry *Paspalum dilatatum.* It was 65 cm in diameter, 12 cm above the water level, with a shallow depression in the middle that contained the eggs.

The eggs were oval, with the ground color varying from almost pure white to buffish, mottled with cinnamon brown. Eggs measured 84.6 × 61.02 ± 3.2 × 1.9 mm, and weighed 149.9 ± 11.02 g (N = 9).

Incubation.—Incubation by both sexes was reported by Stonor (1939) for the Southern Screamer, and by Lint (1956) for a pair of captive Horned Screamers. Because the nest was not directly detectable from the observation site in Sonso, shifts in incubation were inferred from the observed arrival and departure of birds at the nest site. I distinguished the sexes by individual differences in the head plumage of copulating birds. The female remained at the nest during most of the daylight hours and was replaced by the male for short periods. The male was at the nest for most of the night. Diurnal sessions averaged 65.6 ± 61.2 min (N = 7) for the male, and 194.2 ± 106.5 min (N = 6) for the female. Nocturnal sessions averaged 830 ± 83.1 min (N = 3) for the male and 934 min (N = 1) for the female.

When the nest was discovered (1 April 1984), it contained three eggs.

When I checked the nest seven days later, it contained an additional egg. As Stonor (1939) noted that the Southern Screamer does not begin to incubate until the clutch is complete, the incubation period for this nest was between 40 and 47 days; this agrees with the 44-day artificial incubation period reported for a captive Horned Screamer clutch by Lint (1956).

EVOLUTIONARY RELATIONSHIPS

Researchers disagree on whether the resemblances of behavioral patterns of the Magpie Goose and the Anhimidae are due to a close phylogenetic relationship or to convergence (Johnsgard 1961, Davies and Frith 1964); recent information from biochemical and anatomic studies (Brush 1976, Olson and Feduccia 1980) support the former interpretation. Digging as a component of the feeding behavior of the Horned Screamer, and social preening observed both in this study and for the Southern Screamer (Stonor 1939) support this proposed relationship. Other behavioral patterns described in the present paper do not provide conclusive evidence to favor either hypothesis. Further study aimed at identifying secondary displays derived from the comfort movements would help clarify this problem.

CONSERVATION

The results of the censuses of the present study showed that the population size of the species in the region is extremely small (25 adult birds). There is no evidence of decrease for the last five years, taking into account estimations made by personnel of the CVC. At both of the localities where the species is found west of the Eastern Andes, habitat appropriate for screamers is shrinking because of sedimentation and plant succession, accelerated by drainage of marshes and cultivation on the surrounding areas. I believe that unless some programs of habitat preservation are initiated, sufficient suitable habitat for the species will decline, and extirpation of this isolated population is likely during the next few years.

ACKNOWLEDGMENTS

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