Behaviour patterns and their function in the Horned Screamer

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Introduction

A primitive reclusive bird, the Horned Screamer *Anhima cornuta* is the least known of the Anhimidae. The morphological characteristics of Screamers are closest to the Anatidae (Johnsgard 1965; Kear 1970). They inhabit wet savannas and swampy riverside forests particularly in the Amazon delta. This study attempts to classify several behavioural patterns and associated vocalisations by identifying the situations in which they occur. Additionally, an attempt was made to determine the significance of the Screamer's coverable patches of conspicuous colouration as well as the 2–5 cm long wing-spurs which may be exposed or covered during displays. The former are also found in several other bird species (Hanson & Rohwer 1986).

Study area and methods

Observations were made on Monkey Island which is situated in the Amazon River (10 km in width) near Leticia, Columbia. The island, the most central of the San Sophia Islands, is approximately 6.4 km by 1.6 km. The terrain consists of four main sand-bar ridges, covered with mature rain forest, between which are large grass-filled sloughways. The number of adult Screamers increased during the study period from 37 to 87 and up to 24 different territories were located. We concentrated on six Screamer pairs inhabiting two of the many long sloughway lakes. These lakes were visited in six years: 10–20 December 1974, 1976, 1977, 1979, 9–18 August 1977, and 14 January to 5 February 1980. One pair in particular was observed at close quarters on a territory near the resident game warden's house. In 1975, a female chick was taken from the nest and raised at the house. In the following two years this bird and her first wild mate established a territory there and remained tolerant of people (Pair 1).

Four consecutive all-day watches were made in 1976 from 0600–1800 hrs. Records of flights to trees and to feeding areas were made. In this and other years the majority of other observations were conducted opportunistically between 08.00–10.00 and 16.00–18.00 hrs. Records were kept of all display postures as well as postures before and after vocalisations. The distance and activity of the focal bird's mate were determined during each display and vocal sequence. Super-8 films and tape recordings were used to enable frame by frame analysis of postures and associated vocalisation. Tapes were played back to Pair 1 at close quarters and to wild pairs at greater distances to induce behavioural and vocal response.

Results

Diurnal activities and territorial declaration

Over 500 sightings (207 hours) of pairs indicated that they inhabited distinct territories on the lakes. The territories consisted of large floating mats of vegetation and the trees which bordered the lake. The birds consistently flew to one or two specific trees where they performed vocal declarations. Pairs used these areas for feeding and nesting. Boundaries were defended against intruders with vocal displays and overt aggression (see below). Territories ranged in size from 100 m^2 to 240 m^2. Calling was initiated by one pair which elicited vocal responses from pairs up to 1.5 km away (Gill *et al.* 1974). Pairs began calling soon after sunrise and vocalisations increased to a peak at 10.00–10.30 hrs when all six pairs were calling. Birds then began feeding on mats of floating vegetation. A second peak of vocalisations occurred around 17.00 hrs when the birds returned to their territories to roost. When tape recorded calls were played back near a pair's territory they immediately flew to the declaration trees and began calling.

Gill *et al.* (1974) described three different calls that were used during bouts of group calling. The Moo-co call had a second syllable distinctly lower than the first. Screamer pairs performed this call together in duetting sequences resulting in a trisyllabic sound. The male's call was louder

and deeper pitched than the female's. We recorded this call and the distinctive posture associated with it each time a Screamer became aware of an observer (n = 118) and when another pair of Screamers approached a boundary (n = 131). The more intense calls, Honking and Trumpeting, which were also bisyllabic, were performed when other birds landed within or near another's territory (n = 104). Each time these calls were made the head bobbed upward (Fig. 1a). From the films we noticed that during more intensive situations the wings were slightly elevated, exposing the buff coverts, and the tail was lowered and partially spread. As the intensity of calling increased the head and neck bobbing became more exaggerated. The intense calls were usually preceded and often followed by Moo-co calls.

Agonistic and appeasement behaviour

A characteristic aggressive stance was observed when an observer was challenged by Pair 1 (n = 36) and during wild pair encounters (n = 41). The wings were held out from the body exposing the buff coverts and wing-spurs. As the Screamer walked indirectly towards the intruder the body was positioned parallel or diagonally to the opponent enlarging its appearance. The further wing was elevated above the body and the nearer one was lowered (Fig. 1b). As the bird increased its pace and turned to face the enemy both wings were slightly unfolded and raised. Physical attack consisted of jabbing thrusts with one wing at a time. When aerial pursuits were used by territory owners intruders were always displaced (n = 14).

On one occasion after the female of Pair 1 attacked the observer and was gently pushed back, her behaviour changed. She ruffled her feathers (Fig. 2a), preened and then the head was moved from side to side (usually toward the stimuli) as it was lifted to a vertical position while clicking her bill (Fig. 2b). Although bill movement was noticeable 15–20 m away, the clicking sound was so soft that it could only be heard 1–2 m from the bird. It consisted of two pairs of two clicks 0.103 sec apart with 0.125 sec between the pairs. Each episode consisted of 1–3 repetitions of the call. Bill-clicking was also recorded 80 times in four wild pairs, 76% being performed by just one partner. The behaviour appeared when the pair were performing territorial calls or when one partner alighted near the other. The call was also associated with feather replacement movements, preening and body shuffling (n = 60). These movements resulted in concealment of the spurs and in covering of the buff wing covert.

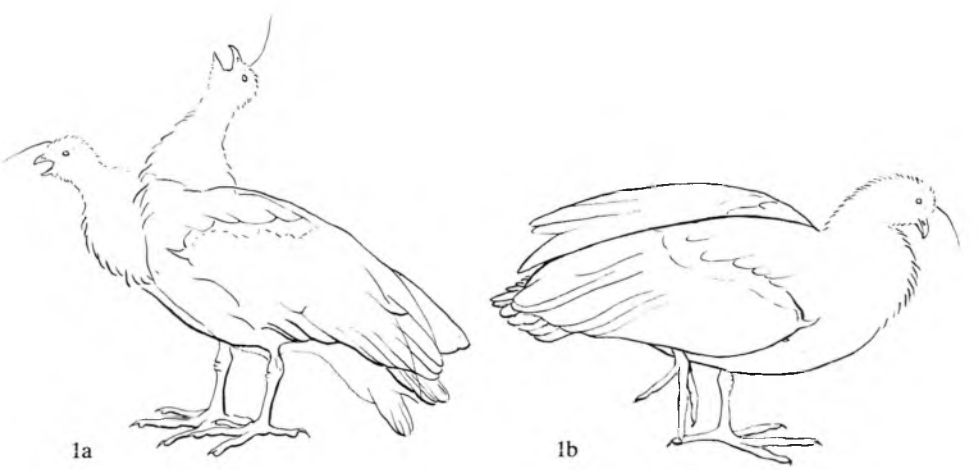

Figure 1. Postures held during territorial and agonistic situations.
(a) Territorial declaration call. (b) Aggressive walk.

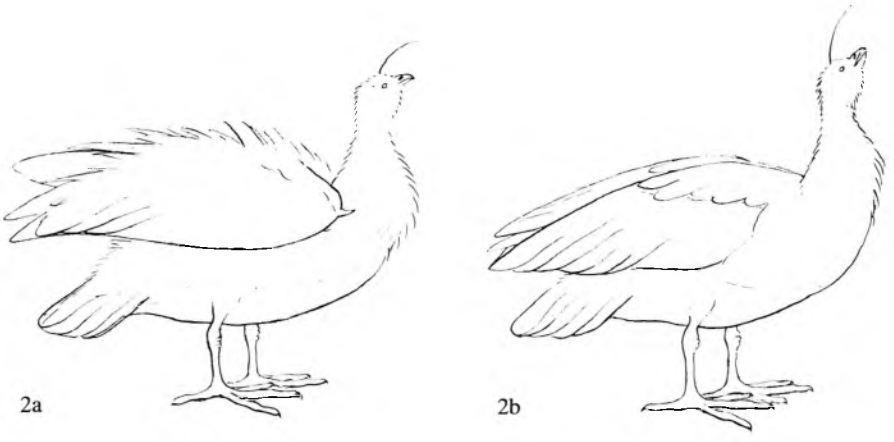

Figure 2. Postures held during appeasement situations.
(a) Feather-shuffling. (b) Appeasement bill-clicking posture.

Pair bond behaviour

Mock-preening, allopreening and head-arching

Mock-preening was usually performed by one of the partners (Fig. 3a). The bill was either closed (n = 21) or if open was not coursing the feathers (n = 7). During allopreening sessions partners usually concentrated on the short black neck feathers just below their mate's head. Partners were also seen rubbing their necks together at this region. After a ritualized mock or allopreening session the bird's head lifted in a smooth arch toward its back (Fig. 3b). The head sometimes rested on the back for an instant before returning to an upright position. As the head reached the upright position, it was turned from side to side, though predominantly in the direction of the mate. Head-arching immediately followed an allopreening bout in 50% of observations and preceded allopreening in 33% (n = 125). Head-arching was also recorded during a nest-building session (n =

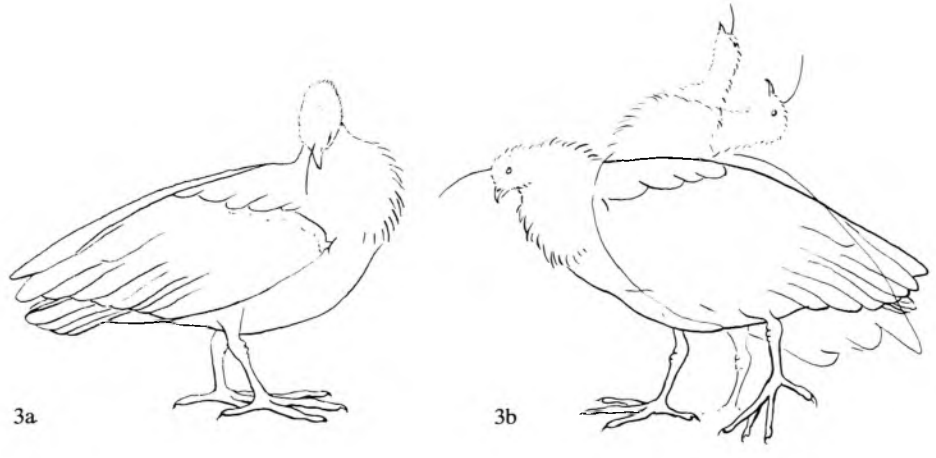

Figure 3. Postures held during pair bond situations.
(a) Mock-preening. (b) Head-arching.

10). A characteristic vocalisation, the "Ugh" call, was given before, during and after bouts of mock-preening, allopreening and head-tossing.

The Ugh call was a low intensity sound given in repetitive sequences, occasionally leading to a double or trisyllabic sound as the intensity and frequency increased. The intervals between notes averaged 0.306 sec and the mean duration of 20 individual notes was 0.070 sec. The body was held in a horizontal position, tail dropped slightly, while feathers in the middle neck region repeatedly became erect and relaxed as the syllables sounded (n = 6 pairs, 261 calls). From this observation we assumed that the call was produced as air was forced through the subcutaneous air sacs in this region (De May 1940). As the call was given the humeral contour feathers covered the buff-coloured upper wing coverts in 80% of 193 observations. This buff patch was partially covered in the other cases and was never completely exposed as in agonistic postures. When the call was given by pair members within two metres of each other they oriented themselves in the same (61%) or opposite (39%, n = 101) direction. The call was always directed in the mate's direction when they were separated by more than 2 and up to 20 metres (100%, n = 74). This call was recorded 26 times when juvenile birds were attended by their parents (Jan.–Feb. 1980), 14 times when parents and young were reunited and on 8 occasions when family members were standing in a declaration tree.

Copulatory behaviour

Copulatory behaviour was observed in Pair 1 on two mornings in December 1976. After a period during which Ugh calls were given by both birds, they engaged in an allopreening session, followed by nest-building movements. Both birds walked around a clear area of the mat, pulled up plant material and tossed it over their backs. Then the female gave a single Ugh call with her head raised and flew to the nest site. The male followed her, and for several seconds they walked side by side with heads held at approximately 45° (Fig. 4a). The female began to crouch while walking with her head parallel to the ground. The male moved from her side and placed his foot on her back (Fig. 4b). The female then crouched lower, forming a large platform with uplifted wings. The male mounted and just prior to copulation nibbled the female's neck and shuffled his tail (Fig. 4c). After copulation, the male stepped off to the side. There was no post-copulatory display. Ugh calls were given during and after the sequence.

Discussion

The Moo-co call and the more intensive calls which are performed each morning appear to establish and maintain boundaries between pairs. When birds entered the territory of another the calls were made more conspicuous by exaggerated postures. The wings were held out and the buff wing patch was exposed. When calling the head was thrown upward in a conspicuous manner. The function of this movement, therefore, appears to be a threatening one when intruders are present which is similar in function to head and neck movements in geese (Raveling 1970; Black & Barrow 1985). When attacking an intruder the bird increased its apparent size by holding the wings slightly above the back and turning sideways. While the bird walked in front of its opponent the buff-coloured patches and spurs were displayed. The jabbing movement of the wings was different from the swinging motion characteristic of swans and geese.

Screamers are both monogamous and highly aposematic in appearance. It therefore seems adaptive to possess a system of appeasement to allow contact between mates. Appeasement behaviours appear to be bill-clicking, feather shuffling and preening. The non-aggressive bill-clicking posture allowed close contact between mates. It probably arose from conflicting tendencies to attack and escape, homologous to the upright posture held by geese during conflict situations (Raveling 1970). The latter actions are important in covering the buff wing coverts in non-agonistic situations with the long contour feathers (De May 1940). Hansen & Rohwer (1986) showed that the brightly coloured epilets on Red-winged Blackbirds *Agelaius phoenicus* function in thwarting conspecific intrusions as well as signalling submissiveness when the patches are covered. Our observations on the contextual use of the coverable buff-coloured patches suggest that their function

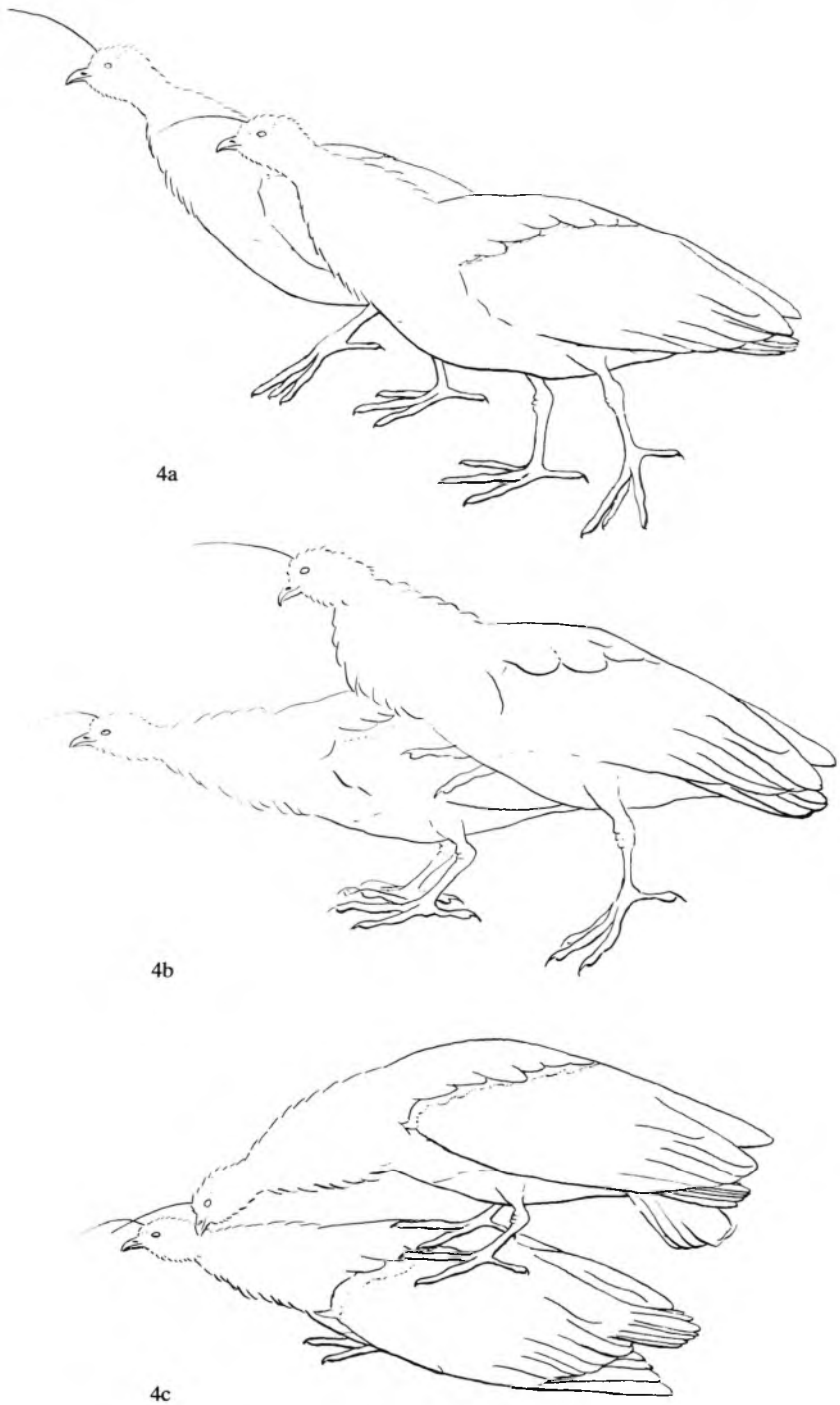

Figure 4. Postures held during the copulatory sequence.
(a) Pre-copulatory walk. (b) Male mounting from the side.
(c) Neck-nibbling and treading.

in Screamers may be similar to that in Red-winged Blackbirds.

Mock-preening and allopreening appears in several species of waterfowl (Johnsgard 1965), and is thought to strengthen the bond between partners. Head-arching, which is directed at the mate, is closely associated with allopreening. This movement is probably homologous to the head and neck movements performed by geese and swans during a Triumph Ceremony. The function may also be similar: to provide cues for choosing mates and to maintain pair bonds (Black & Owen 1986). We suggest that the modified feather forming the "horn", which is apparent when the head is arched back, may be a characteristic that displays the quality of the mate or potential mate. The size of the horn has been linked with age (Spence 1959). The Ugh call was performed during bouts of allopreening, head-arching, and copulation. If partner were separated the call was directed in the direction of the mate. It was also given in the presence of young birds. The call probably functions as a pair and family contact call which ensures pair and family proximity as well as maintaining bonds.

The copulatory sequence of the Horned Screamer is similar in several respects to that of the Magpie Goose *Anseranas semipalmata* (Johnsgard 1965). Both sequences take place on or near the nest site and there is no elaborate pre-copulatory display. The male Horned Screamer, however, unlike the male Magpie Goose, grasps or at least nibbles the female's nape during copulation as do other male waterfowl. No post-copulatory display followed mating, which again contrasts with mating behaviour in the Magpie Goose. However, the lack of a post-copulatory display could indicate that the matings were unsuccessful. The female, two years of age, may have been sexually immature.

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Summary

After sunrise Horned Screamer *Anhima cornuta* pairs give territorial declaration calls in response to the calls of neighbouring pairs. The buff-colour wing patches, normally hidden by the long contour feathers, were exposed and the head was thrown upward in a bobbing motion. These calls and displays were performed at greater intensity when a conspecific approached or entered the territory. Body postures were made conspicuous during aggressive attacks; the body was turned parallel to the opponent, buff-coloured patches on the wings and shoulders were exposed, and wings were held to the side of the body displaying the wing-spurs. Several appeasement behaviours have developed. A non-aggressive stance, head pointed upward, was held while bill-clicking. Wing-shuffling and preening behaviours covered the buff wing patches and hid the wing-spurs. Our findings support the hypothesis that coverable coloured patches have evolved as signals of threat if exposed and submissiveness if covered. Pair bond behaviours were closely associated with the "ugh" call emitted from subcutaneous air sacs on the neck. The behaviours included mock-preening, allopreening and head-arching directed toward the mate. The copulatory sequence entailed precopulatory calling, nest building movements, a short flight to the nest site, a side by side walk, and a crouch. While the male stood on the female's back he nibbled her neck, trod and shuffled his tail. We observed no post-copulatory display.

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