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“Snorkeling” by the Chicks of the Wattled Jacana

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ABSTRACT.—The chicks of the Wattled Jacana (*Jacana jacana*) exhibited an unusual predator escape behavior in the floodplains of Venezuela. When approached by a human, chicks dove and remained completely immobile while entirely submerged with just the beak protruding vertically above the water line. Since breathing should continue while hiding, we reasoned that it would be advantageous for the bird to have the nostrils placed in a forward position along the bill to facilitate breathing while submerged. To examine this expectation we compared the relative position of the nostrils of the Wattled Jacana with those of species belonging to phylogenetically related Scolopacidae. In accordance with expectations, Wattled Jacanas have nostrils that are placed significantly more forward along the bill than all species of Scolopacidae measured. Nostril placement in species belonging to other phylogenetically related families, Thinocoridae, Pedionomidae, and Rostratulidae is also basal as in Scolopacidae. Forward placement of nostrils seems to be a derived character in jacanas. The “snorkeling” behavior of Wattled Jacana chicks is a behaviorally elaborate predator escape mechanism, seemingly accompanied by anatomical adaptations. Received 16 June 1998, accepted 15 Dec. 1998.

Predation is often the major mortality factor of young birds and is therefore an important selective force shaping the behavior of young birds and their parents (Ricklefs 1969, Martin 1992). Capabilities of precocial chicks to escape predation or defend themselves from predators are limited. Their chances of predation are largely dependent on actions taken by their parents. When predators approach their chicks, adults frequently perform “distraction displays” that often divert the attention of the predator away from their offspring (Skutch 1976). Safety of precocial chicks also depends upon their small size, concealing coloration and immobility (Skutch 1976). In this note we describe an unusual predator escape

behavior exhibited by Wattled Jacana (*Jacana jacana*) chicks and extend information on the hiding behavior of jacana chicks.

The Wattled Jacana inhabits freshwater wetlands with floating and emergent vegetation throughout its range from northern South America and Panama to central Argentina (del Hoyo et al. 1996). Like several other jacanas, Wattled Jacanas show sex-role reversal and a polyandrous mating system (Osborne 1982). Although few details have been reported on Wattled Jacanas (see Osborne and Bourne 1977, Osborne 1982), it is generally assumed to have similar behavioral traits to the Northern Jacana (*J. spinosa*; del Hoyo et al. 1996). Chicks are highly precocious, leaving the nest soon after hatching, but are tended by the male parent. Parental care includes brooding, attending and defending, but not feeding the chicks (Jenni and Collier 1972, Stephens 1984a, Betts and Jenni 1991). Females aid males in defending offspring from potential predators or conspecifics (Jenni and Collier 1972, Stephens 1984a). Heavy predation pressure on eggs and chicks appears to be important in both Wattled and Northern jacanas (Jenni 1974; Osborne and Bourne 1977; Stephens 1984a, b).

Our observations were made on a savanna flooded approximately 40 cm deep, covered with floating and emergent vegetation (*Eichornia* sp., *Hymenachne amplexicaulis*) at Hato El Frio, a cattle ranch and biological reserve in the southern Llanos (floodplains) of Venezuela (7° 46' N, 68° 57' W). As E.H. approached a pair of jacana adults with three chicks, one of the adults, presumably the male, performed a typical “broken wing” display, jumping and apparently attempting unsuccessfully to fly. As the observer continued to approach, the parents flew away. When we looked among the vegetation for the chicks they were nowhere to be seen. While searching, we found that what seemed to be an odd looking slender yellowish flower was in fact

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the bill of one of the young jacanas. The chick remained completely immobile while entirely submerged with just the beak protruding vertically above the water. By bringing a hand from below we were able to pick up the bird, which made no attempt to escape nor showed any defense behavior. The chick was in the downy stage.

This hiding behavior should reduce the chances of detection by predators or aggressive conspecifics. For it to be effective, the chick should remain motionless underwater for an unpredictable length of time. In order to continue breathing while submerged it would be advantageous to have the nostrils placed toward the tip of the bill.

To examine this prediction, we compared the relative position of the nostrils of the Wattled Jacana with those of phylogenetically related species. Of the four other families in the same parvorder (Sibley and Monroe 1990) only Scolopacidae occur in Venezuela and specimens were available in bird collections. We selected at random 6 of the 12 genera of Scolopacidae that occur in the country (Meyer de Schauensee and Phelps 1978) and one species from each of these, except for speciose genus *Calidris* from which we chose two species. In 10 individuals of each species we measured the length of the exposed culmen (EC) and the distance between the posterior margin of the right nostril and the tip of the bill (NT). Specimens, selected at random, were measured at the Phelps Ornithological Museum in Caracas with calipers to 0.1 mm. For jacanas we measured separately adults, juveniles, and the one downy chick in the collection. The exposed culmen was measured from the base of the frontal shield where it rises more abruptly. From those measurements we calculated an index (I) to describe the relative position of the nostrils along the bill:

$$I = (EC - NT)/EC$$

The value of this index should be zero in those species in which the nostrils are placed at the base of the bill and closer to one the nearer the nostrils are to the bill tip. Statistical analyses were done with SYSTAT 7.0 for Windows (Wilkinson 1997).

Mean relative position of the nostrils differed between species (Fig. 1; Single Factor ANOVA on the arcsine-transformed data: P

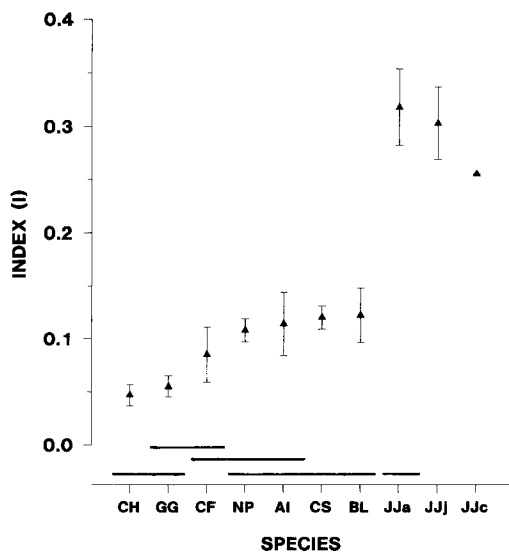


FIG. 1. A comparison of the relative position of the nostrils along the bill between *Jacana jacana* and several species of Scolopacidae. Mean Index values (\pm SD), see text for definition of the Index. Species are: CH = *Calidris himantopus*, GG = *Gallinago gallinago*, CF = *Calidris fuscicollis*, NP = *Numenius phaeopus*, AI = *Arenaria interpres*, CS = *Catoptrophorus semipalmatus*, BL = *Bartramia longicauda*, JJa = *Jacana jacana* (adults), JJj = *J. jacana* (juveniles), Jc = *J. jacana* chick. $n = 10$ in all cases, except for the single *J. jacana* chick. Horizontal lines above species labels indicate similarity between the index mean of those species (from Tukey HSD test). *Jacana jacana* juveniles and the chick were not included in the test.

< 0.001 , $F = 143.632$, $df = 7$); the single jacana chick and juveniles were not included in this comparison. A Tukey HSD *a posteriori* test revealed a number of significant differences between species ($P < 0.05$; Fig. 1). Wattled Jacana nostrils are placed significantly more forward along the bill than all species of Scolopacidae measured (Fig. 1). Nostrils were also placed forward on juveniles and one newly hatched downy chick.

Nostril placement in species belonging to families phylogenetically related to the Jacanidae, but not available to us, can be seen in photographs in del Hoyo and coworkers (1996). Both species of Rostratulidae (belonging in the same superfamily with Jacanidae) have nostrils placed basally (del Hoyo et al. 1996:293–299). In the Plains-wanderer (*Pedionomus torquatus*, Pedionomidae), the posterior end of its longish narina is clearly set

back (del Hoyo et al. 1996:535–536). The corneaceous flaps covering the nostrils of the Thinocopridae (*Thinocorus* spp., *Attagis gayi*) appear to be placed at the base of the bill also (del Hoyo et al. 1996:539–543).

It appears that basal placement of the nostrils is ancestral in the group and that forward displacement in jacanas is a derived character. We cannot assert that breathing while submerged was an important selective force in the forward displacement of jacana nostrils, but their current position should facilitate it.

Young of jacanas are known to avoid predators or aggressive conspecifics by taking to water and snorkeling behavior is shared with other species. The chicks of the Northern Jacana, which is considered to form a superspecies with the Wattled Jacana (del Hoyo et al. 1996), have been reported to swim (Gilliard 1967), to hide in the water (Stephens 1984a), and to submerge with only their bills and the tops of their heads showing above the surface (Miller 1931). The hiding behavior of young Pheasant-tailed Jacanas (*Hydrophasianus chirurgus*) from India and Asia seems similar; chicks “may freeze while hiding under a leaf or even while completely submerged except for the bill” (Johnsgard 1981:40). The chicks, and sometimes even the adults, of the Lesser Jacana (*Microparra capensis*) of Africa are also known to submerge with only their bills out of the water (Maclean 1972). Since snorkeling seems to be accompanied by anatomical adaptations, it is likely that those species have forward displaced nostrils also. In fact, this seems to be the case in the Northern (del Hoyo et al. 1996:277) and Pheasant-tailed Jacana (drawing in del Hoyo et al. 1996:288). For the Lesser Jacana it is difficult to judge from available pictures. Other species of jacana for which we do not have information on snorkeling behavior also have nostrils placed in forward position along the bill, most notably the African Jacana (*Actophilornis africanus*; del Hoyo et al. 1996:281). A broader survey would be necessary to establish if snorkeling and forward placement of the nostrils is shared by all species of the family.

In similar aquatic habitats in the central Llanos of Venezuela, the young of at least three other species swim or dive, although adults do not: the altricial nestlings of Hoatzins (*Opisthocomus hoazin*; Strahl 1987) and

Greater Anis (*Crotophaga major*; Lau et al., in press) jump from their nest and swim or dive in the water below; the precocial chicks of Purple Gallinules (*Porphyriola martinica*) dive when threatened (Zaida Tárano, pers. comm.). Interestingly, the latter and congeneric *P. flavirostris* have nostrils displaced forward along the bill (pers. obs.).

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Rapid Long-distance Colonization of Lake Gatun, Panama, by Snail Kites

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ABSTRACT.—The distribution of the Snail Kite (*Rostrhamus sociabilis*) is closely tied to that of apple snails (*Pomacea* spp.), its nearly exclusive food. Before the early 1990s, the species occurred in Panama primarily as a vagrant. Apple snails were introduced to Lake Gatun in central Panama in the late 1980s, and by 1994 Snail Kites had colonized the lake from population sources at least 350 km away and initiated breeding. Since 1994 the population has increased rapidly and the species can now be found throughout the lake. Received 7 Oct. 1998, accepted 6 Jan. 1999.

The Snail Kite (*Rostrhamus sociabilis*) is a highly specialized raptor that ranges from southern Florida and Mexico, through Central America, to Bolivia, northern Argentina and Uruguay (Beissinger 1988). Its distribution is closely tied to that of apple snails (*Pomacea* spp.), which form its diet almost exclusively (Beissinger 1988). The kite uses its exceptionally thin upper mandible to extract snails from their shells (Snyder and Snyder 1969). Other species of snails, turtles, crabs and other items are taken on occasion (Beissinger 1990a, Snyder and Kale 1983, Sykes and Kale 1974). The species is nomadic, moving in response to changes in the availability of its favored prey because of fluctuating water levels (Sykes 1979, 1983; Beissinger and Takekawa 1983, Takekawa and Beissinger 1989).

Snail Kites are rare in southern Central

America, and there have been only seven previous reports from Panama (Ridgely and Gwynne 1989). The sole Panama specimen, an immature female, was collected near the Colombian border at Permé, near Puerto Obaldía, San Blas Province, in 1929 (Wetmore 1965). There were four reports of single birds, all either females or immatures, at marshes near Panama City, in 1971, 1973, 1977, and 1979. There were two reports from Chiriquí province in western Panama; an adult male and a female or immature near Gualaca in 1965, and several pairs and a nest in a marsh near Remedios in 1973, the latter being the only previous report of breeding activity in Panama (Ridgely and Gwynne 1989). The closest significant populations of Snail Kites to Panama are in western Colombia, on the west side of the Gulf of Urabá (Hilty and Brown 1986), about 350 km from the Panama Canal area, and the Tempisque Basin in northern Costa Rica (Stiles and Skutch 1989), approximately 650 km away.

STUDY AREA

Lake Gatun (420 km²) is an artificial lake created by the damming of the Chagres River to form the central part of the Panama Canal in 1914. The lake level is controlled by the Panama Canal Commission, and may vary several meters between wet and dry seasons as water is released when ships pass through the locks. The Canal area experiences a strong four-month long dry season from mid-December to mid-April.

The introduced aquatic plant *Hydrilla verticillata* is a major problem in the lake. It apparently first became established in the late 1920s or early 1930s, and had

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