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The voice and first nesting records of the Zigzag Heron in Ecuador.—Recent sightings of the little-known Zigzag Heron (*Zebriulus undulatus*) have come primarily from Peru, as reported by Mathews and Brooke (*Wilson Bull.*, 100:147–148, 1988) and by Davis et al. (*Condor*, 82:460–461, 1980). Neither Hilty and Brown (*A Guide to the Birds of Colombia*, Princeton Univ. Press, 1986, p. 68) nor Hancock and Kushlan (*The Herons Handbook*, Harper and Row, New York, 1984, pp. 230–232) mention any recorded nests of this species. Here we report on five nests that we found at La Selva Lodge (00°24'S, 76°39'W), approximately 100 km by river down the Napo River (Río Napo) from the town of Coca, Napo Province, Ecuador, elevation 280 m.

La Selva Lodge is located in an area of undisturbed lowland rainforest on the north bank of the Napo River. There are two oxbow lakes with substantial lakeside vegetation separated by 1 km of rarely flooded upper *varzea*. One of the lakes, Garzacocha, is dominated by overhanging trees and drains into *Heliconia*-dominated *varzea*. The other lake, Mandicocha, is dominated by *manglar* trees (*Coussapoa trinervia*, Moraceae) and is connected to the Napo by two flowing streams, one at each end. Sightings of Zigzag Herons in this area have become quite frequent in recent years, with both adults and immatures found calling at dawn and dusk. These individuals prefer the edges of oxbow lakes thick with low fringing vegetation, especially fallen trees at the water's edge, and that are surrounded by undisturbed forest.

Paul Greenfield (pers. comm.) recorded the first call of the Zigzag Heron; it resembles the "oooop" call of the Fulvous-bellied Antpitta (*Hylopezus fulviventris*) when given in a series. This call can also be described as a hollow hooting, sometimes given alone, and sometimes given in a series of 7 or 8 calls at a rate of one/sec. A second call is a nasal, higher-pitched "ahnnn" that is delivered singly. A third call combines vocal characteristics of the first two calls and is given in a series. Only adult herons have been observed giving the hooting call, and juveniles most frequently have been observed giving the "ahnnn" call but respond aggressively to both calls. Adults and juveniles appear to be equally responsive to playback calls from a tape recorder. On one occasion, a juvenile plumaged individual was seen giving the hooting call, but the possibility still exists that the different calls are related to maturity. Both adults and juveniles deliver their calls with the bill tipped slightly upward and the mandibles slightly apart; the throat can be seen moving as the sound is produced.

Nest records from two years of observation at this locality (see Table 1) suggest that the Zigzag Heron breeds from April through July and that the herons may nest more than one time in one season. The Zigzag Heron appears to lay only one egg, as often reported for the Rufescent Tiger-Heron (*Tigrisoma lineatum*) (Hancock and Kushlan 1984). The Zigzag Heron egg was pure white, rather than the bluish-white, often blotched eggs of the Rufescent Tiger-Heron reported by Hancock and Kushlan (1984). Downy young appear completely yellowish-cream or white and gradually mature into the rufous immature plumage, with the darker feathers of the head, wings, and back emerging last. The bill and legs of the juvenile

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COLOR PLATE

The Zigzag Heron (*Zebriulus undulatus*). This painting by Tracy Pedersen was the George Miksch Sutton Award winner at the Centennial Meeting of The Wilson Ornithological Society in 1988 at Rosemont College, Rosemont, Pennsylvania. This color plate has been made possible by an endowment established by George Miksch Sutton.



TABLE 1
COMPARISON OF ZIGZAG HERON NESTS

Nest	Height above water (m)	Distance from bank (m)	Active dates	Edge-barrier present	Young observed	Egg observed
1	1.5	2.0	30 April–17 May 1989	Yes	Yes	Yes
2	2.0	N/A	29 June–5 July 1989	Yes	Yes	No
3	3.0	2.0	20 May–27 May 1990	Yes	Yes	No
4	1.0	3.0	9 June–12 June 1990	No	No	No
5	1.5	N/A	July 1990	Yes	Yes	No

Zigzag Heron are yellowish-green, whereas the adult has a blackish bill and grayish horn legs. The adults were not seen near the nest as the young grew, and it is assumed that this was due to increased time expenditures on hunting.

The five nests were all shallow, round platforms averaging 17×22 cm. They were similar to nests of the larger Rufescent Tiger-Heron nests discovered in the same area, but they were usually ringed by a thorny edge-barrier while the Tiger-Heron nests were not. The edge-barriers were made from various thorny plants, primarily *Uncaria tomentosa* (Rubiaceae), known locally as uña de gato, and *Bactris* palms. The nests were found on the edge of water, either an oxbow lake or a permanent stream. Nests were placed an average of 1.5 m above the water, although up to 3 m above the water when the level was low. When built on a stream edge, nests averaged 2 m from the bank. The one egg discovered was elongated and white.

The first of the five nests was discovered 30 April 1989 and was observed until 17 May 1989. The nest was located approximately 400 m eastward down a small stream, approximately 8 m wide, connecting the eastern edge of the oxbow lake Mandicocha to the Napo River, roughly 1.5 km to the south. The area is often flooded, although the mud banks keep the stream course well defined. The level of the stream fluctuates with the level of the Napo River and is thus dependent on the rainfall in the mountains to the west. The nest was placed midway up a coco palm (*Bactris* sp.) within a patch of extremely thorny chontilla (*Bactris* sp.) fronds. The *Bactris* fronds were woven into the edge of the nest. The nest was within 100 m of a Rufescent Tiger-Heron nest that was located approximately 4 m above the water and centered over the stream.

One adult Zigzag Heron was always present on the nest. The adult's plumage and posture appeared as described in Hilty and Brown (1986), with the adult maintaining the bittern-posture with its head held upright while on the nest.

The nest was viewed from below by canoe, yet the adult nevertheless maintained a vertical posture. The adult always faced towards the viewer and used cautious body movements rather than head movements to maintain eye contact, although occasional slight head rotation was noted. The continuous nervous tail-flicking of foraging birds noted by Mathews and Brooke (1988) was not seen, although occasional slow tail-flicks of this type were noted at the rate of one per 10-min period.

On 7 May 1989, one egg, 4 cm in length, appeared on the nest. The adult and egg were present together until 17 May 1989, when both disappeared. Presumably, the egg loss was due to predation following which the adult abandoned the nest.

A second nest containing one downy young was found 29 June 1989. The nest was

approximately 1 km from the first nest on the incoming, rather than the outgoing, stream connecting the western edge of Mandicocha to the Napo River. Given the distance between the two nests and the relatively high numbers of Zigzag Herons observed in the area, it is unlikely that the second nest was a second nesting attempt by the first pair. The area is a wooded swamp and the nest was located in a manglar tree surrounded by water. This nest resembled the other nests with thorny sticks woven into the outside edge; in this case the thorns were of *Uncaria tomentosa*, portions of fronds of *Bactris* palms, and other thorny plants and vines. This nest was within 30 m of a Hoatzin (*Opisthocomus hoatzin*) nest which was similarly placed over the water.

The young Zigzag Heron was seen on or near the nest until 5 July 1989. This bird differed considerably from the adult and immature plumage descriptions of Hilty and Brown (1986) and was presumably in juvenile plumage. It was approximately 20 cm tall and uniformly yellowish-cream with grayish wings and no trace of rufous. The head had traces of white down and no hint of the blackish adult crest. When viewed from close range, the young heron appeared agitated: it silently moved its head from side to side and hopped from the nest to its supporting branches and back again to the nest, but it never strayed farther than 20–30 cm from the nest.

A third nest (WFVZ #161934) found 20 May 1990 was on the eastern edge of Mandicocha in the same area as the first nest. This nest was again a small platform with *Uncaria tomentosa* woven into the nest as an edge-barrier. This nest was in a small, sparsely branched tree. The nest was collected on 16 August 1990.

When the third nest was discovered, it contained one downy young, with the adult heron perched on a branch approximately 1 m from the nest. The young heron had whitish downy feathers on the head and neck, with the body and wings covered with very lightly colored, rusty feathers. The flight feathers were undeveloped. During this visit, the adult maintained an erect bittern-posture while facing the observer and did not make any discernable movements.

On 24 May 1990, only the young heron was present on the nest. The down feathers remained only on the head, and darker rufous was visible on the face and back. The bill and legs were yellowish-green, and the iris was bright yellow.

This juvenile was last seen at the nest 27 May 1990, approximately 1 m from the nest on supporting branches. No down remained on it, and the plumage closely resembled the immature plumage pictured in Hancock and Kushlan (1984) and described in Hilty and Brown (1986), but without the rufous chestnut breast.

The fourth nest was found on 9 June 1990, again on the eastern extension of Mandicocha, approximately 100 m eastward down the stream from the lake. It is possible, given the proximity of the third and fourth nests, that these were by the same nesting pair. The nest was in a low overhanging bush.

When the nest was discovered, it was occupied by one adult heron. No egg or young was ever seen on this nest. On 12 June 1990, the nest was washed away by an exceptionally high flood several meters higher than any reported in the two years that the stream has been informally monitored.

The fifth nest was found in early July in a small tree (*Inga* sp., Mimosaceae) on the edge of an inlet to the *varzea* waterway system of Garzacochoa, on the southeastern edge of the lake. Garzacochoa is not connected to the Napo River by streams as is Mandicocha, but rather is connected by frequently inundated *varzea* for the 0.5 km to the river. Garzacochoa is completely surrounded by primary forest except for a small clearing around the lodge compound. The edge of the lake on the eastern side is dominated by *Heliconia* sp. with sparsely distributed *Coussapoa trinervia* and other small trees. The nest tree was roughly 1 m from the open water of the lake. Little information was gathered on this nest, although

the adult heron was frequently seen on the nest, and later a juvenile was sighted near the nest.

Although sightings are most frequent on the edges of the oxbow lakes, several individuals have been seen in a single day in the 1 km of rarely flooded upper *varzea* forest separating the two lakes (Paul Coopmans, pers. comm.). We suggest that the Zigzag Heron may prove to be more numerous than previously thought in areas that provide the proper requirements. Among these requirements may be a closely related series of oxbow lakes with substantial lakeside vegetation and undisturbed forest. The frequency of sightings in such habitat at La Selva Lodge suggests that the paucity of past sightings may be a result of the secretive habits, previously unknown voice, and the specific habitat requirements of the Zigzag Heron, rather than uniformly low population numbers throughout its range. Given the knowledge of these specific habitat requirements and its voice, Zigzag Herons may be found to range widely but thinly throughout Amazonia and the Guianas.

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Enhanced fledging success by colonially nesting Ospreys in Nova Scotia coastal habitat.—Historically, Ospreys (*Pandion haliaetus*) often nested in colonies along the Atlantic coast of North America. One colony on Gardiner's Island, New York, contained as many as 300 pairs in the early 1900s (Puleston 1977). Recently, more colonial nesting has been reported (e.g., Spitzer and Poole 1980, Hagan and Walters 1990). In Nova Scotia, colonies have been reported by Prévost et al. (1978) and by Greene (1987); the former was part of the population examined in the present study.

An Osprey colony could function as a center where flock mates are obtained for the purpose of social foraging (Flemming 1988, Hagan and Walters 1990). Flemming (1988) found that social foraging reduced the time required to locate prey. This suggests that colonial Ospreys might provide more food to their young, thereby enhancing the adult's reproductive success. The objective of this study was to determine if colonial Ospreys fledged more young than those nesting solitarily and, furthermore, to test whether this was related to colonial nesting alone rather than to nesting habitats or types of nest sites.

Study area and methods.—We studied Ospreys in northeastern Nova Scotia primarily within the Pomquet, Antigonish, and Pictou Harbour watersheds. Each of these watersheds flows into one of several shallow estuaries that border the coastline of the Northumberland Strait. The highlands are covered with deciduous and mixed forests, while valley slopes and poorly drained areas are dominated by coniferous forest. Harvesting of coniferous stands is extensive. Several powerline corridors bisect the study area. Pairs were considered to be nesting along the coast if their nest sites were within 6 km of an estuary, where most coastal foraging by Ospreys occurs (Jamieson et al. 1982). The next closest Ospreys were a distant