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NOTES ON NESTING RAPTORS IN THE LLANOS OF VENEZUELA

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ABSTRACT.—Observations on 13 species of hawks and owls in savanna-forest habitat of Venezuela suggest that at least some species breed principally in either the dry season or the wet season but usually not both. Nesting sites varied from stick nests in palms and trees to tree cavities; most species laid one to two eggs per clutch. Young White-tailed Hawks and Great Black Hawks appear to receive prolonged post-fledging care.

The biology of neotropical raptors is little known. Even basic data on abundance, clutch size, nesting success, and time of breeding—whether wet or dry season—remain unknown for entire regions. A continuing loss of habitat and heavy usage of pesticides in the tropics also lend importance to the acquisition of any breeding information on raptors. Here, I present notes on the nesting biology of 13 species representing 11 genera in Venezuela; information was gathered from 39 nests.

METHODS

I made observations on raptors from 14 February to 15 October 1978, 25 April to 3 October 1979, and 26 April to 5 May 1980 at a cattle ranch, "Fundo Pequario Masaguaral," 45 km south of Calabozo in Guarico State, Venezuela. I traveled by motorcycle, horseback and on foot. Nest contents were determined by climbing trees or using a mirror attached to a pole.

My study area was characterized by palm savannas, and patchily distributed forest which included some gallery forest along the Guarico River. The region of my study—the llanos—is classified as dry tropical forest by the Holdridge system (Ewel and Madriz 1968). It is typified by one dry season (generally December through April) and one wet season (May through November). In February, the palm savannas are dry and dusty while in August they may have up to a meter or more of standing water.

SPECIES ACCOUNTS

Rostrhamus hamatus. Slender-billed Kite. Two nests (both wet season) were found in trees of a gallery forest near the Guarico River. I climbed to the first nest on 14 September 1978. It was lined with leaves and contained a newly hatched chick and one egg. The chick had pale grey down. To my knowledge, the eggs of this kite have not previously been described. The egg was brownish cinnamon in color with dark splotches. The second nest was found 28 August 1979 when an adult flew off of it; the contents were unknown. A second screaming adult promptly joined the first. Both nests were placed near the end of primarily horizontal branches. The only previously described nest of the Slender-billed Kite, to my knowledge was found 20 m high in a tree by Haverschmidt (1959) on 20 July (wet season) in Surinam. Thomas (1979) found two or three breeding pairs in Venezuela in the wet season. Apparently this kite feeds entirely on *Pomacea* snails (Haverschmidt 1959, Voous 1969).

Rostrhamus sociabilis. Snail Kite. Four nests (all wet season) were found on 19 September 1978 in flooded savanna and were only a few meters from one another in palms (*Copernicia tectorum*). Colonial nesting is common in this species (Sykes 1979). One nest contained two young (less than a week old), one had two eggs, and two contained three eggs each. Two other completed nests were nearby but empty. The six nests averaged 5.4 m in height (range 4.3–6.7 m). At least 10 adults were present. These nests were again checked 26 September and although the nest contents were the same, noticeably fewer adults were present. On 27 October all the nests were empty; the reason for their failure was not known (Betsy Thomas, pers. comm.). In 1979, these nest sites were unoccupied. Haverschmidt (1968) reported four to five nests with eggs in the wet season in Surinam. I observed 28 prey captures by Snail Kites in 1979; 19 (68%) were crabs (*Dilocarcinus dentatus*) and 9 (32%) snails (presumably *Pomacea* sp.). This is in contrast to a previously reported diet of principally snails (Haverschmidt 1962, Snyder and Snyder 1969, Sykes 1974).

Geranospiza caerulescens. Crane Hawk. Seven nests were found in trees (all wet season). Four contained eggs (all two-egg clutches; on 23 July, and 5, 12, 16 August) and three had chicks (one with one chick about 2–3 days old on 16 August, another with one chick 4–7 days old on 28 September, and the last with two chicks 1–1.5 weeks old on 9 August [Fig. 1]). One nest tree used in 1978 was used again in 1979, although the nest was built on a different branch. On 23 February, an adult engaged in an undulating flight near two soaring individuals possibly as a breeding or territorial display. Renessen (in Haverschmidt 1968) found six nests with eggs in Surinam, probably laid as follows: one near beginning of wet season; another in middle of wet season; and four others in the dry season. He determined clutch size for three nests; two had two eggs and the other one egg.

I saw an adult carrying a rodent and another catch a small iguana (*Iguana iguana*). A different adult was observed hanging underneath palm fronds by one foot and slashing unsuccessfully at a bird nest with its other foot. Jehl (1968) reported similar behavior by an adult foraging in a tree. This agile behavior is a result of a double-jointed leg (Burton 1978). Sutton (1954) documented a diet of snakes and lizards for this species in Mexico; stomach contents of four Crane Hawks in Surinam included a bat, two spiders and three insects (Voous 1969). I found three pairs in an area (about 7 km^2) of mixed palm savanna and forest.

Accipiter bicolor. Bicolored Hawk. One nest (beginning of wet season) was found with two eggs (9 May); the resulting young successfully fledged. The nest was placed 11.7 m high in a tree (*Albizia* sp.) and when discovered on 2 April, was approximately half com-

FIGURE 1. Crane Hawk chicks about three to four weeks old. Nest construction is similar to that of the North American Cooper's Hawk (*Accipiter cooperii*) except that no lining is added to the nest. Note the long tarsometatarsus, tibula-fibula and extensive down on the head.

pleted. The male delivered a stick to the nest in his bill after searching on the ground and in low trees, while occasionally uttering "kic" calls. Meanwhile, the female perched nearby giving slurred "kic" calls in response. After the male left the nest, the female flew to it and rearranged some sticks. An adult was seen in an incubation posture at the nest on 5 May. On 14 June, the young were 3 to 7 days old. On 4 July, the chicks left the nest, or nearly so, perching 1 to 2 m from it. On 3 September, about 61 days after fledging, one young was calling for food 20 to 25 m from the nest although I could see no adults. On 5 May, I found a nearly completed nest of another pair in a tall tree but it was later abandoned for unknown reasons. In 1980, I saw an adult carrying a half-consumed Squirrel Cuckoo (*Piaya cayana*) in its claws. Hewitt (1937) collected a one-egg clutch of the Bicolored Hawk in the Rio Orinoco District of Venezuela in what was probably the early wet season (April 28).

Buteogallus urubitinga. Great Black Hawk. I found one nest (wet season) with one egg (28 August 1978) in a palm (*C. tectorum*); the young bird fledged in mid-October. This immature was seen perched near one of the adults on 10 May 1979 and was calling for food. Two adults were present and calling in the same territory in 1979. Two territories, when measured from their centers, were about 1.8 km apart. Renessen (in Haverschmidt 1968) found a nest with a nearly fledged young at the end of the dry season. He reported another with a "sitting" bird in the wet season. A nest in Trinidad contained one egg at the beginning of the wet season (ffrench 1976). At a ranch 50 km north of Montecal, I saw an individual of this species carrying an unidentified fish and another with a rodent. At Fundo Pequario Masaguaral, I observed an immature eating pig intestines in company with Black Vultures (*Coragyps atratus*), Turkey Vultures (*Cathartes aura*), and Crested Caracaras (*Polyborus plancus*).

Buteo magnirostris. Roadside Hawk. I found eight nests, each in a tree (all wet season). Six had eggs (all one-egg clutches on 5, 6, 11, 17 May, 1 June, 11 August) and two contained chicks (both about 2–3 days old on 5 May and 10 June). On 4 April an adult engaged in undulating flight, presumably part of a courtship or territorial display, in an open clearing and flew to a two-thirds completed nest. Friedmann and Smith (1950) found a fledgling just out of the nest in Venezuela in the wet season, while Brown and Amadon (1968) cited another with two eggs in the early wet season. Renessen and Haverschmidt (in Haverschmidt 1968) reported a nest with a nearly fledged young at the end of the dry season and a "sitting" bird in the wet season in Surinam.

Buteo albicaudatus. White-tailed Hawk. Four nests (three in dry, one in wet season) were found, three in palms (*C. tectorum*) and one in a tree. Two were found with eggs (both two-egg clutches on 14 February, 19 August) and two with one chick each (one about 3.5 weeks old on 17 May and the other near 6 weeks old on 12 May. The 19 August clutch was a second attempt by the adults for that year after the 14 February nest failed during incubation. The August clutch produced one chick, which was still with the adults and calling for food on 1 October 1979, about 10 months after departing the nest. One adult of this pair was trapped and color-banded on 1 August 1978 (wing chord 400 mm, weight 850 g). It was still with an adult in the same locality 21 months later on 1 May 1980. These adults were resident and called throughout the year. I found four pairs in an area (about 32 km^2) of mixed palm savanna and forest. Prey remains found at these nests were three iguana (*I. iguana*), two doves, and one rodent (*Zygodontomys brevicauda*). Haverschmidt (1968) found a nest with a nearly fledged young in the last part of the dry season in Surinam. Stomach contents of White-tailed Hawks in Surinam included two unidentified mammals, two frogs, one centipede and a beetle (Voous 1969).

Polyborus plancus. Crested Caracara. I located six nests during the dry season. One was found with two eggs (16 March), one with a two-day old chick and an egg (16 March; egg later hatched), three with one chick each (one about four weeks old on 16 March, the second one-and-a-half weeks on 1 May, and another about five weeks on 3 May), and the last with two nearly fledged chicks (3 May). One nest in 1978 was rebuilt and used again in 1979. Two recently-fledged young were observed near a nest on 20 March. Two newly-constructed nests were found in September, but I do not know if eggs were later laid. All nests were located in palms (*C. tectorum*). I saw adults give a "head roll call" consisting of rolling the back of the head across the shoulders and cackling. Brown and Amadon (1968) reported this same behavior and postulated that it may have some sexual significance. When I visited nests, the disturbed adults exhibited this behavior. However, I saw others behave similarly away from nests when Crested Caracaras were close by and clearly not because of my presence. Prey remains at nests included a water turtle, an iguana (*I. iguana*), and a crab (*D. dentatus*).

Milvago chimachima. Yellow-headed Caracara. Two nests (wet season) were found with nearly-fledged chicks in palms (*C. tectorum*; one nest had two chicks 16 August and the other one chick 19 August). Young (1925) found a nest with two eggs in the wet season in Guyana. Renessen (in Haverschmidt 1968) found a nearly-fledged bird at the end of the dry season in Surinam. Friedmann and Smith (1950) found a fledgling just out of the nest in Venezuela in the wet season. I saw two adults at dusk catching insects in flight with their feet. As described elsewhere (Brown and Amadon 1968), adults and immatures often ate parasitic arthropods, presumably ticks, off the backs of cattle and horses. These caracaras generally consume carrion (Haverschmidt 1962, Brown and Amadon 1968); this was the most common food of birds in my study area. They will also eat fruits and other plant matter (Voous 1969).

FIGURE 2. Nest cavity of a Laughing Falcon 8.5 m from the ground in a tree. The single egg was laid in the bottom of the cavity 2 cm below the bottom of the vertical slit which measured 2–25 cm wide and 60 cm long.

Herpetotheres cachinnans. Laughing Falcon. One nest (wet season) was found with one egg (19 September). A hole in the main trunk of a tree served as the nest (Fig. 2). The egg was laid on the bare floor of the cavity and, as is true of other falcons, no nest material had been added. Renessen (in Haverschmidt 1968) saw a "sitting" bird in the fork of a tree near the beginning of the wet season. Natural cavities in trees are probably used most often as nesting sites (Wolfe 1954). Adults called and duetted throughout the year but more so in the wet season; this included nocturnal calls. I saw a member of another pair consume an entire 25 to 30 cm snake head-first. Later I observed another adult carrying a partially consumed snake, supporting the contention that this falcon preys principally on snakes (Haverschmidt 1962, Brown and Amadon 1968). Four pairs were found in an area (about 13.4 km²) of mixed palm savanna and forest.

Falco femoralis. Aplomado Falcon. I located one nest (dry season) containing three nearly fledged young in a palm (*C. tectorum,* 17 March). The nest appeared to be an old nest of a Savanna Hawk (*Heterospizias meridionalis*). I witnessed one of the adults catching bats at dusk; within five minutes, one adult caught two bats in flight. Each was immediately taken directly to a palm and eaten. At dusk on 25 March, after the young had fledged, an adult caught a bat in flight and carried it to a palm, when an immature arrived and received the prey. An adult of a different pair was seen to catch a bat at dusk on 5 March. Aplomado Falcons in Mexico catch principally birds and insects (Dean Hector, pers. comm.). Ffrench (1976) saw this falcon chasing bats in Trinidad. At an unflooded savanna, I regularly watched a pair of falcons from June through August hunting together and apparently cooperating in chasing and twice catching doves that I flushed with a motorcycle. The falcons often followed me overhead for up to five minutes.

Bubo virginianus. Great Horned Owl. One nest (dry season) was found on the edge of a savanna with one newly fledged young (30 April) in an old Crested Caracara nest 7 m high in a palm (*C. tectorum*). Pellets below the nest contained two beetles and feathers from a Green-rumped Parrotlet (*Forpus passerinus*).

Glaucidium brasilianum. Ferruginous Pygmy Owl. I located one nest (dry season) with three eggs (11 April) in a tree cavity 5 to 8 m from the ground and 15 to 25 cm deep. On 16 May, this nest contained three owlets within one week of fledging. The remains of a lizard and a flying insect were found in the nest. Ten of 14 nests in Trinidad were active with eggs or young in the dry season (ffrench 1976).

DISCUSSION

In my study, raptors of eight species nested in the wet season and five species in the dry season. One nesting attempt by White-tailed Hawks in the wet season was a renest after a failure in the dry season. This indicates that occasionally some species will nest at both times of the year. Present data, however limited, suggest that a given species breeds principally in one or the other season in the llanos. For example, most Savanna Hawks nested in the wet season even though a few laid in the last part of the dry just before the rains (n = 131 nests; Mader unpubl. data). Where I had five or more nest records for a species (Roadside Hawk, Crane Hawk, Crested Caracara), egg-laying was largely unsynchronized and prolonged for the population as a whole but still was in one season or the other.

My observations on breeding dates (i.e., wet or dry season) were not consistent with those of Haverschmidt's (1959, 1962, 1968) in Surinam. Surinam has two wet seasons and two dry seasons while the llanos of Venezuela has one of each. The discrepancies in times of breeding may have two reasons. First, the approximate wet and dry season dates given by Haverschmidt (1968) are only approximate because precipitation patterns vary each year. For example, eggs recorded in early April, which is normally the end of the dry season, might actually have been laid at the beginning of the wet season if the rains came early that year. Second, different habitats differ greatly in response to rains, some flooding up to a meter or more. Availability of prey presumably differs as well. Thus, it may be more important for a species in a drastically changing environment, influenced by one wet and one dry season, to nest principally in one period or the other, when prey for that hawk is most available. In another region, under two wet and two dry seasons, prey availability might fluctuate less, with the result that the same species breeds in both seasons.

The periods of fledgling dependency in the White-tailed Hawk and Great Black Hawk are two to three times longer than those for comparably sized buteonines in

North America (Mader unpubl. data). In tropical areas a long fledgling dependency period may provide added parental care and increased chances of survival for small, infrequent broods.

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RECENT PUBLICATIONS

The Birds of the Gambia/An annotated check-list and guide to localities in The Gambia.—J. V. Jensen and J. Kirkeby. 1980. Aros Nature Guides. 284 p. Paper cover. D. kr. 148.00. Source: Aros Nature Guides, Skolebakken 5-4. tv., DK-8000, Aarhus C, Denmark. Situated at the extreme west of Africa, the Gambia is an enclave in Senegal, being essentially the valley of the lower River Gambia. Although the country is smaller than Connecticut, nearly 500 species of birds have been reported there. It is well suited for bird study, thanks to the variety of habitats and a fairly good system of roads. This manual describes first the country in general and then a number of birding localities. Most of the book is a systematic list, giving for each species its status, habitat, and breeding records, if any, within the Gambia. For each Ethiopian species, the range within the avifaunal zones of West Africa is also given. This book will be indispensable for birders in the region and may persuade more of them to visit there. Many maps and photographs, references, index.

The Breeding Seasons of East African Birds.—L. H. Brown and P. L. Britton. 1980. The East Africa Natural History Society, Nairobi. 164 p. $15.00. Source: Secretary, E.A.N.H.S., P.O. Box 44486, Nairobi, Kenya. This monograph "attempts to bring together all that is known, to date, of the breeding seasons of East African birds, and to relate these, so far as possible, to the climatic factors (especially rainfall) controlling scarcity or abundance and seasonal changes of various foods." After a thorough introduction, there follows a systematic list of the species for which indicative or definite breeding records could be found. Given for each species is a summary and analysis of the records as far as they permit. The compilation of these data is an enormous accomplishment. In a long and meaty essay, the authors then discuss the factors affecting the breeding seasons of these birds and the seasonal availability of food. While the annotated list will be of use only to ornithologists working in East Africa, the discussion should be of wide interest to students of reproduction ecology. Maps, graphs, references.