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Aspects of the Breeding Biology of Pollen's Vanga (*Xenopirostris polleni*) in Southeastern Madagascar

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The radiation of trophic structures among the 14 species of Malagasy vangas (Vangidae or, more recently, as members of Vangini, Malaconotinae, Corvidae; Sibley and Monroe 1990) is comparable to that of the Hawaiian drepanids and the finches of Galapagos (Amadon 1950, Carlquist 1965). Despite their interest to biologists, many basic aspects of vanga biology remain unknown. In particular, little is known of the breeding biology of the rare (Collar and Stuart 1985) or endangered (King 1981) Pollen's Vanga (*Xenopirostris polleni*), which ranges along the length of the eastern Malagasy rain forest, from Marojejy (14°S) to near Tolagnaro (25°S; Dee 1986). Nesting occurs October through December, and the clutch size is two (Langrand 1990, Safford and Duckworth 1990). Here I provide the first detailed information on the breeding biology of Pollen's Vanga. I also examine dichromatism in this species, as disagreement exists in the literature on distinguishing the sexes.

I observed one nest from 28 to 30 September 1988 at what is now Ranomafana National Park (21°16'S, 47°28'E) at an elevation of 1,000 m above sea level. The nest was 10 m off a trail, near trail marker A1150 m, in a part of the park once cleared of many of its trees and near a former village (P. Daniels and P. Wright pers. comm.). During three days of observa-

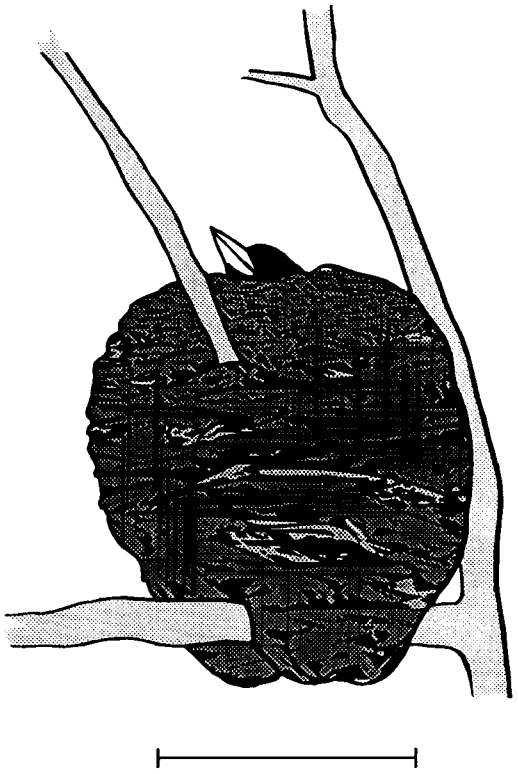

Fig. 1. Nest and brooding adult of Pollen's Vanga based on color transparencies by author (scale indicates ca. 10 cm).

tion, I watched the nest with 10× binoculars for a total of 15 h 56 min. I recorded the arrivals, departures, vocalizations and behaviors of the unbanded birds at 1-min intervals from an unconcealed spot on the forest floor, 5 m from the nest.

The nest was attended by a white-breasted and a rufous-breasted individual, which I took to be the male and female respectively (see below). The nest—a compactly built, deep cup (see Fig. 1)—was situated 5 m above the ground in a dense stand of guava (*Psidium* sp.) saplings with a scattering of other larger trees. The nearly vertical outside walls were made of plant fiber, coarser on the lower half. Black wiry material, possibly rootlets, was evident near the rim. The nest was attached to the trunk and branch of a sloping sapling and to a branch of another tree. The branch rising from the supporting trunk was enclosed in the bottom half of the nest by fibers extending beyond the regular contours of the nest. Fibers were looped underneath the nest to anchor it to a branch passing under the supporting trunk.

Two chicks, with closed eyes and yellow gapes, had naked pink skin with dark spotting of incipient pinfeathers along the dorsal and femoral feather tracts. While covering the nestlings, both adults sat low in the nest with only the head and tail visible. On several occasions, black ants (Hymenoptera) walked about the rim of the nest and over the head and back of the adults with little apparent reaction by the birds. The adults rarely raised up to peer into the nest cup or to reposition themselves while brooding. Both sexes inspected and poked at the interior of the nest where they picked up unidentified items and swallowed them.

Adults brooded 84.0% of the time and perched near the nest 7.5% of the time. The remaining 8.5% of the time the nest appeared unattended for periods averaging 8.9 ± SD of 6.1 min. Brooding sessions averaged 20.9 ± 14.4 min for the female and 24.8 ± 11.9 min for the male. Brooding occupied 40.0 and 41.8% of female and male diurnal time budgets, respectively. The female and male were each away from the nest 50.1 and 52.5% of their respective time budgets. There was no significant difference between the time the female (33.8 ± 21.7 min, $n = 14$) and male (26.8 ± 19.1 min, $n = 11$) were away from the nest (Wilcoxon rank sum test, $P > 0.10$). The female and male each perched at or near the nest 7.5 and 7.9% of their time budgets, respectively. On the two occasions when I observed until sunset, the female was on the nest at sunset, including once when the male approached the nest and called.

Nest exchanges were often preceded by vocalizations of the arriving adult. Almost immediately the brooding adult flew away and the vocalizing bird came to the nest. I observed 28 nest exchanges, equally divided between the arrival of the male or the female, and one apparent attempt by the male. The female and male vocalized before returning to the nest on 100.0 and 66.7% of occasions, respectively. The female once left the nest before the male vocalized while the male left the nest three times before the female called. The softly whistled vocalization given by the returning bird is variously described in my field notes as "whit," "wheat," "whut," "whooit," and "whoot." The number of calls varied from one to eight, with one sequence given as "whit, whit, whit-whit, whit, whit-whit." The "whit" calls were once given by the male while the female was feeding young.

Other vocalizations were given in different contexts. Once the female gave three chirplike calls as she departed the nest. Another time the female gave two clucking calls, louder and harsher than the "whit" calls. The male gave a louder rendition of the "whit" call while chasing a conspecific near the nest. On three occasions when the adults were not brooding and once when the female was brooding, I heard faint murmurings from within the nest presumbly made by the young.

The female fed 11 of 13 items brought during 15 visits to the nest, while the male fed all nine of the items brought during 14 visits. Chicks were fed at the rate of 0.7 feedings·h^{-1}·$chick^{-1}$. Ten items were tan-

colored crickets (Orthoptera) with a black cast on the dorsal surface and longer than the adult bill (i.e. 24 mm; Gadow 1883). Other prey included a brown caterpillar (Lepidoptera), a chrysalis, an unidentified insect, and nine unidentified items. One cricket and the chrysalis were consumed by the female after being offered to the young. The average interval between a previous visit to the nest and a subsequent feeding was not significantly different between the female (45.3 ± 25.1 min, $n = 7$) and the male (47.7 ± 22.0 min, $n = 4$; Wilcoxon rank sum test, $P > 0.05$). Adults did not pass food to each other.

This pair responded variably to potential threats near the nest. At 1739 on 29 September, another Pollen's Vanga, with a rufous-colored breast, landed on a branch 3 m from the nest. The male flew in and displaced the new bird from its perch. The new bird flew 13 m to another perch, was again displaced by the male, and then left my field of view. The female remained silently on the nest throughout this episode. A diademed sifaka (*Propithecus diadema edwardsi*) group, a Madagascar Bulbul (*Hypsipetes madagascariensis*), and a Malagasy civet (*Fossa fossa*) each stopped within 3 to 8 m of the nest, but were seemingly ignored by the vangas. This nesting attempt failed for unknown reasons. While two chicks were in the nest on 28 and 29 September, only one remained on the 30th and was gone on 5 October (C. Kremen pers. comm.).

Breast plumage coloration varies among Pollen's Vangas. Milon et al. (1973:plate 17) showed an unsexed bird with a white upper breast faintly washed with rufous. According to Langrand (1990:295), males and females are similar. While both sexes are portrayed on plate 38 with rufous breasts and underparts, they differ in other details. The female is different from the male in that she has a less extensive black throat, paler rufous underparts, a paler gray back, and a more massive bill. Others believed that older birds, have white breasts (Milne-Edwards and Grandidier 1875–1885 *in* Lavauden 1932, Lavauden 1932, 1937, Benson 1971, Benson et al. 1977). Gadow (1883) stated that males are white-breasted while females are rufous-breasted, and they are illustrated as such in Mountfort (1988:plate 18).

To clarify color differences in Pollen's Vanga, I examined four specimens at the Muséum National d'Histoire Naturelle, Paris. A specimen (no. 3799) labelled as a male had entirely white underparts, with a faint rufous tint not likely to be visible in the field, extending from the black throat downward. Two specimens (nos. 497 and 2457), labelled as females, each had a white band separating the black throat from otherwise rufous underparts. The fourth specimen (no. 4339, collected 26 May 1948), labelled as a male, had rufous extending from the lower breast downward, a less extensive black throat than the white-breasted bird and a sprinkling of black feathers in the white band separating the black and rufous. Inspection of the Paris specimens supports Gadow's claim. It seems that immatures, like females, are rufous-breasted and have less black on the throat. Males later acquire the more extensive black throat coloration and eventually replace their rufous underparts with white. Similarly, young male Rufous Vangas (*Schetba rufa*) have scattered black feathers on their otherwise white throats and upper breasts before acquiring black throats and upper breasts as adults (Yamagishi et al. 1992). I saw no evidence in the museum specimens, or in the field, that the dorsal coloration of male and female differed. Likewise, females did not have more massive bills.

My observations of the structure and location of a nest of Pollen's Vanga agree with the only published description in which the "very robust" nest was at a height of 3 to 4 m (Safford and Duckworth 1990). The structure of the nest of Pollen's Vanga (Fig. 1) is quite similar to that of Lafresnaye's Vanga (*Xenopirostris xenopirostris;* see photographs in Appert 1970, 1973, Campbell 1974) and generally resembles the nests of four or more other genera of vangas (Appert 1970, M. Putnam pers. observ.). My observation of young nestlings in late September suggests that egg laying and nest construction were completed by mid-September; this extends the previously reported October through December breeding season (Langrand 1990). An incubating Pollen's Vanga was noted at Ranomafana on 21 November (Safford and Duckworth 1990: 163).

The male and female participate equally in brooding and feeding the young, while the female may brood at night. Both sexes of seven other vangas participate in nest construction, incubation, or feeding the young (Appert 1970). Brooding behavior by both adult Pollen's Vangas is similar to that of Rufous Vanga (Yamagishi et al. 1992), but contrasts with Graetz's (unpubl. report) observations of a pair of Helmet Vangas (*Euryceros prevostii*), in which only one adult brooded.

The insects brought to the nest agree with the diet described for Pollen's Vanga by Langrand (1990). While one species of cricket made up nearly one-half of the nestlings' diet, it is not known whether this represents resource specialization by Pollen's Vanga or if these crickets were simply abundant at the time of my brief study.

This pair of Pollen's Vangas appeared not to have helpers, as is known for Rufous Vangas (Yamagishi et al. 1992) and may occur in Chabert's Vanga (Appert 1970). The only time a third conspecific appeared near the nest it was driven away by the male.

The rarity of Pollen's Vanga cannot yet be explained. The ability of Pollen's Vanga to nest in disturbed forest suggests that nesting requirements are not so stringent as to preclude the use of disturbed forest, although this nesting later failed for unknown reasons.

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Nesting of the Buff-throated Woodcreeper (*Xiphorhynchus guttatus*)

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The Buff-throated Woodcreeper (*Xiphorhynchus guttatus*) is about 22 cm long and clad in the browns and buffs widespread in its family. The sexes are alike. From Guatemala to Bolivia, Amazonian and southeastern Brazil, it inhabits rain forests, humid gallery forests in more arid regions, and mangroves. It wanders into lighter second-growth woods and shady clearings near the old forests that are its true home. These woodcreepers usually are solitary, or one may join a mixed flock of woodland birds. They subsist