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AVIFAUNAL SURVEYS IN LA VISITE NATIONAL PARK—LAST VESTIGES OF MONTANE BROADLEAF FOREST IN EASTERN HAITI

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Abstract: We surveyed the montane forest bird community at two sites in La Visite National Park, Haiti, during 26 January to 1 February 2005. We recorded 50 species among 182 mist net captures, 79 point count detections, and 476 incidental observations. These included 12 North American migrants and 38 permanent resident species, including 14 Hispaniolan endemics. The two sites showed similar overall diversity and abundance of birds. We confirmed the continued presence of globally endangered Black-capped Petrel (*Pterodroma hasitata*), locating at least four vocalizing birds during nocturnal surveys of cliffs along the Pic La Visite escarpment. We also confirmed Bicknell's Thrush (*Catharus bicknelli*) at both sites, capturing seven individuals, and we mist-netted the first Swainson's Warbler (*Limnothlypis swainsonii*) recorded for La Visite. We observed extensive human impacts on habitat throughout La Visite National Park. In 2009, we measured the remaining extent of the three forested fragments surveyed in 2005 and showed 19–43% losses of broadleaf forest during the 4-yr period. We believe that broadleaf forest in the park is threatened with complete disappearance, especially in light of increased human pressures following the January 2010 earthquake in Port-au-Prince, and we recommend immediate conservation measures to stop further deforestation.

Key words: bird conservation, endemic birds**,** Haiti, Hispaniola, La Visite National Park

Resumen: ESTUDIO DE LA AVIFAUNA EN EL PARQUE NACIONAL LA VISITE—ÚLTIMOS VESTIGIOS DEL BOSQUE MONTANO LATIFOLIADO EN EL ESTE DE HAITI. Se muestreó la comunidad de aves del bosque montano en dos sitios en el Parque Nacional La Visite Haití, entre el 26 de enero y el 1 de febrero del 2005. Fueron registradas 50 especies a partir de 182 capturas en redes de niebla, 79 detecciones en conteos de punto y 476 observaciones incidentales. Estas incluyeron 12 migratorias norteamericanas y 38 especies residentes permanentes, que incluyen 14 endémicos de La Española. Los dos sitios mostraron similares diversidades y abundancias de aves. Se confirmó la presencia del globalmente amenazado Diablotín (*Pterodroma hasitata*), localizándose al menos cuatro vocalizaciones durante los muestreos nocturnos en los farallones en las escarpadas de La Visite. También fue confirmada la presencia del Zorzal de Bicknell (*Catharus bicknelli*) en ambos sitios, capturándose siete individuos, así como se registró la primera captura de la Cigüíta de Swainson (*Limnothlypis swainsonii*) para La Visite. Se observó un extenso impacto humano en los hábitats a lo largo de todo el Parque Nacional La Visite. En el 2009, se midió la extensión remanente de los tres fragmentos muestreados en el 2005, y se observó la pérdida de entre un 19–43% del bosque latifoliado en solo un periodo de cuatro años. Se piensa que estos bosques están amenazados de una total desaparición, especialmente a partir del incremento de la presión humana que siguió el terremoto de enero del 2010 en Port-au-Prince, y se recomiendan medidas de conservación inmediatas para detener la deforestación.

Palabras clave: aves endémicas, conservación de las aves, Haití, La Española, Parque Nacional La Visite

Résumé : ETUDE DE LA FAUNE AVIAIRE DANS LE PARC NATIONAL LA VISITE—DERNIERS VESTIGES DES FORETS DE FEUILLUE DE MONTAGNE DANS L'EST D'HAÏTI. Nous avons étudié la communauté d'oiseaux des forets de montagne dans deux sites du Parc National La Visite (Haïti) entre le 26 Janvier et le 1er Février 2005. Nous avons enregistré 50 espèces dont 182 capturées dans des filets, 79 détectées lors des Points de Comptage, et 476 observées fortuitement. Ces enregistrements incluent 12 migrants Nord-Américains et 38 résidents permanents, dont 14 sont endémiques à l'Ile d'Hispaniola. Les deux sites sont globalement similaires en termes de diversité et abondance des oiseaux. Nous avons aussi confirmé la présence continue du Pétrel Diablotin (*Pterodroma hasitata*), une espèce d'oiseau globalement menacée d'extinction, en localisant au moins quatre de leurs vocalises au cours des contrôles nocturnes des falaises le long de l'escarpement du Pic La Visite. Nous avons également confirmé la présence de la Grive de Bicknell (*Catharus bicknelli*) dans les deux sites, en capturant sept individus et aussi capturée dans nos filets, la première Paruline de Swainson (*Limnothlypis swainsonii*) jamais enregistrée pour La Visite. Nous avons observé de vastes répercussions humaines sur les habitats des oiseaux à travers le Parc National La Visite. En 2009, nous avons mesuré la superficie restante pour les trois fragments de foret préalablement étudiés en 2005, de telles mesures ont révélé une perte entre 19 et 43% de forêts de feuillues sur une durée de 4 ans. Nous croyons que la forêt

de feuillues dans le parc est menacée de disparition totale, plus particulièrement à cause de la pression démographique croissante suite au tremblement de terre du 12 Janvier 2010 à Port-au-Prince, et nous recommandons des mesures immédiates de conservation afin d'arrêter la déforestation.

Mots-clés : conservation des oiseaux, oiseaux endémiques, Haïti, Hispaniola, Le Parc National la Visite

Haiti is widely recognized as one of the world's most economically depressed and ecologically degraded countries (Stattersfield *et al.* 1998, Sergile and Woods 2001, Keith *et al.* 2003, Diamond 2005). From forest cover estimated at 99% in pre-Columbian times and 60% in 1925, Haiti now retains less than 1.5% of its original forests (Paryski *et al.* 1989, Ministry of Planning 2002 as cited in Swartley and Toussaint 2006, Sergile 2008). Most of the remaining forest tracts occur in two regions, Massif de la Selle in the southeast and Massif de la Hotte in the southwest. Despite their formal status as national parks, both areas suffer from severe and ongoing deforestation due to charcoal production, agricultural expansion, and daily cooking fuel needs (Sergile and Woods 2001, Diamond 2005). The smaller of the two protected areas, Parc National La Visite (hereafter Parc la Visite), is 22 km south-southeast of the Haitian capital, Port-au-Prince, and was established by governmental decree in 1983 (Woods *et al.* 1992). It consists of 2,000 ha on the western end of the Massif de la Selle escarpment and reaches a maximum elevation of 2,282 m on Morne Cabaio. Although the 1983 decree did not specify Parc La Visite's exact boundaries, we here adopt those suggested by Woods *et al.* (1992:334). Natural forests within La Visite are now restricted to elevations above 1600 m. On the south slope of the escarpment, these are dominated by Hispaniolan pine (*Pinus occidentalis*), with fragments of wet broadleaf montane or cloud forest confined to ravines, while scattered fragments of drier karst broadleaf forest are embedded within pine stands. The most extensive high-elevation broadleaf forest remnant is located on the north slope of the escarpment and measures ≤ 230 ha (Goetz 2009). These remnant broadleaf forests are arguably the country's most endangered natural habitat (Woods and Ottenwalder 1992, Davalos and Brooks 2001).

Chronic socioeconomic hardships, political instability, and inadequate governmental capacity have blocked efforts to implement an effective, sustainable conservation plan for Parc La Visite, as elsewhere in Haiti (Sergile and Woods 2001, Rimmer *et al.* 2005a, b). The earthquake that devastated Port-au-Prince on 12 January 2010 prompted a mass exodus of displaced Haitians into rural areas; estimates approach one million people fleeing the city (Environment News Service 2010). This is doubtless exacerbating pressures on vulnerable forested habitats, such as those remaining in La Visite (Environment News Service 2010). The need for coordinated efforts to prevent complete loss of eastern Haiti's last remnant montane forests is immediate and urgent.

Intensive floral and faunal surveys conducted from 1977 through 1985 by Charles Woods and associates documented the avian and mammalian fauna of the La Visite region, confirmed its ecological significance, and outlined an explicit stewardship plan for the park (Woods and Ottenwalder 1986, 1992, Woods *et al.* 1992). However, few resources have been available to implement this plan (Sergile and Woods 2001) or to conduct follow-up monitoring of ecological conditions in Parc La Visite (F. Sergile and C. Woods pers. comm.). In 2001, a 2-day expedition to the park produced numerous valuable observations, but yielded limited quantitative information on bird populations (Davalos and Brooks 2001). During the winter of 2005, we conducted the first extensive avifaunal survey of the park's montane pine and broadleaf forests since 1985. With an ultimate goal of advancing long-term conservation of Parc La Visite, our expedition had several discrete objectives: (1) documentation of the avifauna and habitat conditions within the park; (2) targeted surveys for species of conservation concern; and (3) evaluation of specific protection needs for Parc La Visite and development of follow-up strategies to achieve them.

STUDY AREAS AND METHODS

We conducted field research at two sites in Parc La Visite. From 26–29 January we established a field site in the wet karst limestone broadleaf forest, locally named "Bèrak," ~ 6 km west of the village of Seguin, at elevations ranging from 1175–1250 m (18°19.73' N, 72°17.61' W). This site occupied the steep eastern slopes and bottomland of a broad ravine, with high levels of precipitation and soils that appeared both rich and fairly deep. The forest corresponded to those described as "mature hardwood forest" or "cloud forest" by Woods and Ottenwalder (1992), or "cloud forest / moist hardwood forest" by

Judd (1987). Vegetation was characterized by broadleaf trees of mixed age classes that formed a closed canopy of 10–12 m, with isolated large emergent *Didymopanax tremulus* reaching estimated heights of 18–20 m, abundant tree ferns, and patchy dense thickets of vines and bamboo. Clearing to expand agriculture had spared only a small remnant of what had formerly covered the ravine. We estimated its total area at ≤ 20 ha, and most of this was heavily fragmented. Local residents were actively cutting trees and burning slash during our visit, while cattle (*Bos primigenius*) and goats (*Capra aegagrus*) grazed in many of the openings that penetrated the forest.

Using established foot trails and human-created openings throughout the forest at Bèrak, we operated 21 mist nets (12 × 2.6 m, 36 mm mesh) from 1630 (all times are Eastern Standard Time) until dusk on 26 January, from dawn to dusk on 27–28 January, and from dawn until 1200 on 29 January. We checked nets hourly and closed them at night. We also conducted Bicknell's Thrush (*Catharus bicknelli*) surveys throughout areas of intact and disturbed forest in a 1 km radius from our main study site, by broadcasting vocal playbacks of recorded calls to elicit thrush responses. We attempted to capture each thrush encountered, using vocal playback lures at 6- or 12-m mist nets. Each bird captured was identified, banded, aged, sexed, measured, and weighed. We collected 50–150 µl of blood from most individuals by brachial venipuncture, and we stored samples in plastic vials with 1.0 ml Queen's lysis buffer for subsequent determination of gender at the Cornell University Evolutionary Biology Laboratory. We determined sex of individuals by DNA extraction from blood samples, followed by polymerase chain reaction to amplify sex-chromosome based genes (Griffiths *et al.* 1998). In addition to mist-netting, we recorded all incidental observations of birds encountered during the 4-day visit, and we conducted five unlimited-distance, 10-min point counts between 0800–0930 on 29 January. Each point was separated by at least 100 m. The distances between points, while less than those generally recommended (e.g., Ralph *et al.* 1993), were selected to accommodate the small forest patch sizes at each site and to maximize detections of individual birds occupying the patches. We took care to avoid double-counting individuals that may have been detectable from adjacent points.

We conducted field work at a second site, "La Visite" (18º20.91' N, 72º16.88' W), located 2.5 km east-northeast of Bèrak, from 30 January to 1 February. This site was characterized by two patches of mesic karst broadleaf forest, embedded within a large and relatively intact pine forest, at elevations from 1995–2060 m. Both patches were moderately disturbed and fragmented, and both were characterized by predominantly second-growth vegetation 3–6 m high, with very few scattered emergent trees up to 10 m in height. This forest type corresponds to the successional broadleaf forest, or "Bwa Raje," described by Woods and Ottenwalder (1986). Dominant vegetation was characterized by several species of small-leaved shrubs and trees, forming a very dense understory. This habitat was markedly more xeric than at Bèrak, with shallower soils and much exposed karst limestone. Dense thickets of low shrubs and thorny *Rubus* covered some regenerating openings in and around the forest patches. Global positioning satellite (GPS) readings every 10 m around the perimeter of each patch revealed them to be 1.21 and 1.99 ha in size, respectively. They were separated by 120 m at their closest points. We operated 19.5 mist nets (12 × 2.6 m, 36 mm mesh) at La Visite from 1700 until dusk on 30 January, from dawn to dusk on 31 January, and from dawn until 1230 on 1 February. Netting and banding protocols followed those at the Bèrak site. As at Bèrak, we recorded all incidental observations of birds encountered during the 3-day visit, and we conducted four unlimited-distance, 10-min point counts between 0730-0810 on 1 February.

To scout for nocturnal Black-capped Petrel surveys, we ascended to the ridgeline between Pic La Visite and Morne Cabaio on 30 January, at 0130. We returned that night, arriving at Pic La Visite at 2020 and walked east along the escarpment for approximately 1.5 km, conducting 5–10 min passive listening surveys at seven sites, ending at 2150. We counted the number of vocalizing petrels at each listening point.

To quantify changes in extent and condition of the two forest patches at La Visite, we revisited the site on 1 May 2009 and recorded GPS coordinates of the patch boundaries and interior clearings within each fragment. A local colleague obtained GPS coordinates at Bèrak's remaining forest from 26–30 August 2009.

RESULTS AND DISCUSSION

We recorded 50 species of birds among 182 mist net captures, 79 point count detections, and 476 total observations during our 7 days of field work in Parc La Visite (Table 1). These included 12 North American migrant species and 38 permanent resi-

dent species, of which 14 were Hispaniolan endemics. The Bèrak and La Visite sites showed similar overall diversity and abundance of birds. While we captured nearly twice the number of individuals at Bèrak (120) as at La Visite (62), this is largely attributable to the greater number of net-hours at Bèrak, since capture rates and species richness were similar at both sites (Table 1). Of the 21 species mist-netted at the two sites, 14 were recorded at both, five only at Bèrak, and two only at La Visite. Point count detection rates were higher at La Visite, while overall detections of individual birds were slightly higher at Bèrak.

The proportion of migrant to resident species captured was almost identical at Bèrak (26%) and at La Visite (25%), while the percentage of migrant individuals captured at Bèrak (25%) was slightly higher than at La Visite (13%; Table 1). The ratio of migrants to residents calculated from point count detections was similarly low at both sites and was higher, but still similar between sites, via opportunistic observations. Two migrant species were detected only through mist-netting, while eight were detected only visually or aurally. Among residents, 13 species at Bèrak and six species at La Visite were detected only by point counts or general observations. All field methods yielded similar proportions of endemic species and individuals at the two sites.

Six species accounted for 61% of all passive mist net captures at Bèrak, while the four most numerically abundant species at La Visite accounted for 65% of captures (Table 1). Green-tailed Ground-Tanager (*Microligea palustris*) was the most frequently captured species at Bèrak and second in abundance at La Visite, whereas Greater Antillean Bullfinch (*Loxigilla violacea*) was by far the most abundant species in mist net samples at La Visite. Two migrants, Black-throated Blue Warbler (*Dendroica caerulescens*) and Ovenbird (*Seiurus aurocapillus*), were among the five most commonly mist-netted species at Bèrak, while Ovenbird was the only migrant among the five most frequently captured species at La Visite. Despite the limitations of mist net data to quantify the relative abundance of birds within or between habitats (e.g., Remsen and Good 1996), we believe that our three sampling methods combined provide reliable population assessments at these two sites.

SELECTED SPECIES ACCOUNTS

Eight species of global conservation concern (Woods and Ottenwalder 1992, Stattersfield *et al.* 1998, Latta *et al*. 2006), and four species for which we provide new or significant information in Haiti, are discussed below.

Black-capped Petrel (*Pterodroma hasitata*).–A specific focus of our trip was to investigate the continued presence of this globally "endangered" species (BirdLife International 2009) within the park. Logistic and time constraints precluded our systematically surveying colonies and individual birds along the Pic La Visite-Morne Cabaio ridgeline surveyed in 1963 by Wingate (1964). We conducted nocturnal surveys on 30 January to establish the presence or presumed absence of Black-capped Petrels and to estimate the locations and numbers of birds detected. A reconnaissance of the Pic La Visite area that afternoon revealed severe human impacts on the ridgeline. Only scattered pines remained, and we noted extensive evidence of recent cutting and burning. Even the steeper slopes were terraced for crop production, and we passed through a planted maize field just east of the Pic La Visite summit (18º21.29' N, 72º16.84' W; 2190 m elevation). The north-facing cliffs appeared to be well vegetated and little impacted, but clearing and agriculture from below had advanced closely to their bases.

At 1955, while ascending to Pic La Visite, we heard several distant, low, wailing calls of a Black-capped Petrel. Less than 1 min later, we heard the unmistakable cutting sound of a large bird flying rapidly overhead and towards the escarpment. At 2020 we arrived at the summit, where winds were blowing 10–15 km / h and the sky was completely clear. Wingate's (1964) detailed account of his extensive petrel surveys in January and February of 1963 indicated that these weather conditions were suboptimal for petrel flights. However, we clearly heard a minimum of two birds wailing near the peak. One or two seemed to be flying in large, slow circles, while a third seemed more stationary to the west. They appeared to be ≥ 75 m away from our observation point, but the wind and apparent distance of the calls made it difficult to estimate their location accurately. From the Pic La Visite summit, we continued eastward towards Morne Cabaio, stopping at four additional survey points, each separated by 300–500 m. At the first and third stops we heard birds to the west but could not conclusively determine if these were separate from the individuals detected near Pic La Visite. At our final stop at 2140, another single bird clearly called below us.

We detected at least four, but possibly as many as seven, Black-capped Petrels during this nocturnal survey. Our guide reported that local residents his-

Table 1. Number of birds mist-netted and observed in La Visite National Park, Haiti, 26 January to 1 February 2005. Taxonomy is based on the American Ornithologists' Union (1998) and subsequent supplements (www.aou.org/checklist/north/print.php), with the exception of Green-tailed Ground-Tanager (*Microligea palustris*), which follows Latta *et al*. (2006).

	Mist-netted		Point Counts		Total Detected[a]	
Species	Bèrak	La Visite	Bèrak	La Visite	Bèrak	La Visite
Black-capped Petrel (*Pterodroma hasitata*)	–	–	–	–	–	5
Northern Bobwhite (*Colinus virginianus*)	–	–	–	–	–	2
Limpkin (*Aramus guarauna*)	–	–	–	–	2	–
Sharp-shinned Hawk (*Accipiter striatus*)	–	–	–	–	–	1
Red-tailed Hawk (*Buteo jamaicensis*)	–	–	–	–	2	2
American Kestrel (*Falco sparverius*)	–	–	–	–	1	–
Plain Pigeon (*Patagioenis inornata*)	–	–	–	–	3	–
Mourning Dove (*Zenaida macroura*)	–	–	1	3	16	12
Hispaniolan Parakeet (*Aratinga chloroptera*)	–	–	–	–	4	–
Hispaniolan Lizard-Cuckoo (*Saurotheria longirostris*)	–	–	1	–	3	2
White-collared Swift (*Streptoprocne zonaris*)	–	–	–	–	–	2
Antillean Palm Swift (*Tachornis phoenicobia*)	–	–	–	–	12	–
Vervain Hummingbird (*Mellisuga minima*)	–	–	–	–	1	–
Antillean Mango (*Anthracothorax dominicus*)	–	–	–	–	1	–
Hispaniolan Emerald (*Chlorostilbon swainsonii*)	10[b]	7[b]	1	1	12	12
Hispaniolan Trogon (*Priotelus roseigaster*)	–	–	1	–	3	–
Narrow-billed Tody (*Todus angustrostris*)	9	1	4	5	18	11
Hispaniolan Woodpecker (*Melanerpes striatus*)	4	1	5	4	10	12
Yellow-bellied Sapsucker (*Sphyrapicus varius*)	–	–	–	–	–	2
Greater Antillean Elaenia (*Elaenia fallax*)	–	2	1	3	2	6
Hispaniolan Pewee (*Contopus hispaniolensis*)	3	3	–	1	6	8
Loggerhead Kingbird (*Tyrannus caudifasciatus*)	–	–	–	–	2	–
Golden Swallow (*Tachycineta euchrysea*)	–	–	3	–	20	14
Cave Swallow (*Hirundo fulva*)	–	–	–	–	1	–
Palm Crow (*Corvus palmarum*)	–	–	–	–	5	–
Rufous-throated Solitaire (*Myadestes genibarbis*)	4	1	1	–	4	1
Bicknell's Thrush (*Catharus bicknelli*)	6[c]	1[c]	–	–	8	2
La Selle Thrush (*Turdus swalesi*)	1	2	–	–	5	5
Red-legged Thrush (*Turdus plumbeus*)	6	1	2	–	10	10
Northern Mockingbird (*Mimus polyglottus*)	–	–	–	–	1	–
Cape May Warbler (*Dendroica tigrina*)	–	–	–	–	1	–
Black-throated Blue Warbler (*Dendroica caerulescens*)	10	2	2	2	20	8
Yellow-rumped Warbler (*Dendroica coronata*)	–	–	–	–	3	2
Yellow-throated Warbler (*Dendroica dominica*)	–	–	–	–	–	1
Pine Warbler (*Dendroica pinus*)	–	–	–	7	–	16
Black-and-white Warbler (*Mnioltilta varia*)	–	–	–	–	3	2
American Redstart (*Setophaga ruticilla*)	2	–	–	–	6	2
Worm-eating Warbler (*Helmintheros vermivorus*)	1	–	–	–	–	–
Swainson's Warbler (*Limnothlypis swainsonii*)	–	1	–	–	–	–
Ovenbird (*Seiurus aurocapillus*)	11	4	1	–	4	2
Common Yellowthroat (*Geothlypis trichas*)	–	–	–	–	1	–
Green-tailed Ground-Tanager (*Microligea palustris*)	21	8	3	1	22	20
Bananaquit (*Coereba flaveola*)	8	–	4	–	4	3
Hispaniolan Spindalis (*Spindalis dominicensis*)	4	–	1	–	8	–
Black-crowned Palm-Tanager (*Phaenicophilus palmarum*)	1	6	1	3	2	12
Western Chat-Tanager (*Calyptophilus tertius*)	6	–	2	1	14	8
Black-faced Grassquit (*Tiaris bicolor*)	1	3	–	2	2	6
Greater Antillean Bullfinch (*Loxigilla violacea*)	12	19	2	2	8	22

Table 1 continued.

Species	Mist-netted		Point Counts		Total Detected[a]	
	Bèrak	La Visite	Bèrak	La Visite	Bèrak	La Visite
Antillean Siskin (*Carduelis dominicensis*)	–	–	1	3	3	4
Hispaniolan Crossbill (*Loxia megaplaga*)	–	–	–	7	–	8
Total number of individuals	120	62	36	43	253	223
Total number of species	19	16	18	14	40	32
Total number of mist-net-hours[d]	528.5	304	–	–	–	–
Number of birds/100 net-hours[e]	22.14	20.07	–	–	–	–
Number of birds/point count	–	–	7.2	10.8	–	–
% migrant species	26	25	11	7	20	22
Number of species/number of individuals	5/30	4/8	2/3	1/2	8/46	7/19
% resident species	74	75	89	93	80	78
Number of species/number of individuals	14/90	12/54	16/33	13/41	32/107	25/204
% endemic species	47	50	50	50	32	31
Number of species/number of individuals	9/59	9/19	9/19	7/22	13/112	10/98

torically harvested up to 20-30 birds per night using *Sen Sel* fires (described by Wingate [1964]), but that they have abandoned the practice because of diminished numbers of petrels (Jean-Claude Exantus pers. comm.). We likely encountered birds from only a single colony on or near Pic La Visite, but far fewer than the 50 pairs per colony estimated in 1963 by Wingate (1964). Woods and coworkers were unable to accurately estimate numbers in the Pic La Visite-Tete Opaque area during March of 1982, December of 1983, and January of 1985; however, they reported "many fewer than 50 pairs" on the Pic La Visite escarpment (Woods and Ottenwalder 1983), and they estimated fewer colonies within the park, with an overall population of $\leq$ 300 birds, 40% lower than Wingate's 1963 estimate (Woods and Ottenwalder 1986). Our survey results are consistent with those of Woods and Ottenwalder (1983) showing steep declines in Black-capped Petrel populations at this site.

Hispaniolan Parakeet (*Aratinga chloroptera*).—We recorded this species on only one occasion, when two vocalizing pairs flew overhead up the ravine at Bèrak on 28 January. The species appears to have declined sharply in the park since Woods and Ottenwalder (1986) reported it as "still common" in the early 1980s, in flocks of up to 30 individuals, although much less abundant than in the 1930s. Davalos and Brooks (2001) failed to find Hispaniolan Parakeets during their visit in January of 2000. Local extirpations and the overall rapid decline of this species on Hispaniola have raised serious concerns about its conservation status.

Hispaniolan Trogon (*Priotelus roseigaster*).—We observed only three individuals of this species, all at Bèrak. One male called repeatedly near our banding site. It was seen on two occasions with another bird of unknown sex. A third trogon was observed briefly on 29 January. Although reportedly common during the early 1900s in Massif de La Selle (Wetmore and Swales 1931), Woods and Ottenwalder (1986, 1992) considered Hispaniolan Trogons to be uncommon and threatened in the park. Davalos and Brooks (2001) did not report the species during their brief visit in 2000. The reliance of Hispaniolan Trogon on undisturbed humid broadleaf and pine forests (Latta *et al*. 2006) suggests that its status in Parc La Visite is tenuous. It is declining island-wide and considered threatened with extinction (Latta *et al*. 2006).

Golden Swallow (*Tachycineta euchrysea*).—This species was relatively common at both study sites. We recorded a maximum of 20 individuals foraging over cleared areas of Bèrak's uppermost slopes, and several birds could be heard overhead almost continually during daylight hours. At La Visite, we counted a maximum of 14 Golden Swallows, many of which foraged in small clearings within the pine forest. We observed six birds from the summit of Pic La Visite on 30 January. The status of this species is not well known in Haiti, but it is believed to have declined sharply (Keith *et al*. 2003) and is

classified as globally "vulnearble" (Statters-field *et al*. 1998). Latta *et al*. (2006) considered Golden Swallows endangered on Hispaniola, where populations have declined steeply overall since the 1970s. Woods and Ottenwalder (1986) reported Golden Swallows as "very common" and "not in need of special consideration" in Parc La Visite. Our limited observations suggest that the species continues to be fairly common around forested areas within the national park. The Bèrak site, which currently features many large, dead or dying standing trees, may offer numerous nesting opportunities. At current rates of forest loss, however, it is unlikely that suitable nest cavity trees will persist. Although Golden Swallows nest in karst cliffs near this site (J. Goetz unpubl. data), and in bauxite cliffs in the Dominican Repbublic's adjacent Sierra de Bahoruco (Townsend *et al.* 2008), the species may be expected to decline to the extent that it is reliant on tree cavities for nesting. A nest box program in the park might enhance breeding opportunities for Golden Swallows and provide educational benefits for local residents and visitors.

Bicknell's Thrush (*Catharus bicknelli*).—We detected a total of ten Bicknell's Thrushes in Parc La Visite and captured seven of these. Eight birds were found at the Bèrak site, while a single bird occupied each of the two forest patches at our La Visite site. We thoroughly surveyed both sites and were unlikely to have missed any vocally responsive individuals. The dense understory that characterized the broadleaf forests at Bèrak and La Visite, while patchy and moderately disturbed, was structurally similar to montane forests of the Dominican Republic, which support the highest known densities of wintering Bicknell's Thrush (Rimmer *et al*. 2001).

The seven mist-netted thrushes provide the first conclusive documentation of Bicknell's Thrush in Massif de la Selle. An individual mist-netted at 1900 m on the ridge of Formon in January of 1983 (Woods and Ottenwalder 1983, 1986), and at that time still considered Gray-cheeked Thrush (*Catharus minimus*), was very likely of this species, but no morphometric data were obtained. Of the seven birds we captured, four were yearlings and three were older (> 2 yr) individuals. Six of the seven birds were male, exceeding the male bias typical of other Hispaniolan montane forest sites, where males outnumber females by an overall ratio of > 2:1 (Townsend *et al*. 2009a). Island-wide data suggest that habitat segregation by sex of Bicknell's Thrush occurs on Hispaniola. In Haiti's Macaya Biosphere Reserve, nine of 13 Bicknell's Thrushes mist-netted in 2004 and 2006 were male (J. Townsend and C. Rimmer unpubl. data). In the Dominican Republic, 121 of 166 (73%) known-sex individuals from undisturbed montane forests in Sierra de Bahoruco and 29 of 37 (78%) in cloud forests of the Cordillera Central were male, while 49 of 88 (56%) birds from mid-elevation, moderately disturbed forests in the Cordillera Septentrional were male (J. Townsend and C. Rimmer unpubl. data). These findings suggest that males and females occupy different habitats, with potentially important consequences for overwinter survivorship and maintenance of good body condition prior to spring migration. If availability of preferred winter habitats limits female survivorship, sex- and age-related habitat segregation may have profound implications for long-term conservation of Bicknell's Thrush, which is classified as globally "vulnerable" (Bird-Life International 2000, 2009).

La Selle Thrush (*Turdus swalesi*).—We detected at least five vocalizing individuals at dawn and dusk at each site, but none during morning point counts, likely because these counts took place outside the narrow window of dawn calling. We banded one bird at Bèrak and two individuals at La Visite. In contrast to the observations of Wetmore and Swales (1931), Woods and Ottenwalder (1986) found La Selle Thrush to be "very common" and reported that the species appeared to be "doing well in the park," as it inhabited dense broadleaf forest, as well as more open, disturbed areas of successional forest and cultivated gardens. Davalos and Brooks (2001) found the species "easily observed in small numbers in early morning." As the forests in Parc La Visite have become increasingly fragmented, La Selle Thrush may have adapted its foraging to take advantage of human-altered habitats. However, as both Woods and Ottenwalder (1986) and Davalos and Brooks (2001) caution, the core broadleaf forest habitat of La Selle Thrush is dwindling in La Visite and elsewhere, and the continued viability of this globally "endangered" species (BirdLife International 2000, 2009) is at serious risk within the park.

Black-throated Blue Warbler (*Dendroica caerulescens*).—This species far outnumbered any other migrant in point count detections and overall detections at both sites (Table 1). Females were more frequently detected than males in opportunistic observations, but we captured equal numbers (n = 6) of both sexes at the two sites combined. This is contrary to earlier findings from other montane broadleaf forest sites on Hispaniola, where females pre-

dominate over males (e.g., Wetmore and Swales 1931, Woods 1975, Latta *et al*. 2003, Rimmer *et al*. 2005), but the small sample of netted individuals precludes any firm conclusion about sex ratios in the local Black-throated Blue Warbler population.

Swainson's Warbler (*Limnothlypis swainsonii*).—We mist-netted one Swainson's Warbler at La Visite, providing the first documentation of this species in Massif de La Selle. Intensive surveys throughout the park from 1977–1985 by Woods *et al*. (1992) did not detect Swainson's Warblers. The species was only recently discovered on Hispaniola, where five individuals were mist-netted in montane forests of Macaya Biosphere Reserve during February of 2004 (Rimmer *et al*. 2005), and seven individuals have been mist-netted and banded since 1997 at 1700 m elevation in Sierra de Bahoruco (Rimmer and Almonte 2001, unpubl. data). The confirmation of this species in Parc La Visite suggests that it might be a regular, if uncommon, winter resident of Massif de la Selle. Questions remain whether the recent discovery of Swainson's Warbler on Hispaniola reflects a winter range expansion and/or increases in local abundance, or whether previous surveys simply failed to detect this secretive species.

Green-tailed Ground-Tanager (*Microligea palustris*).—This species ranked first among total detections and second among mist net captures over both sites combined, and it was the most abundant species by both measures at Bèrak (Table 1). Birds were encountered alone and in small single- and mixed-species flocks. This habitat generalist (*cf.* Latta *et al*. 2003) was also found to be abundant in Parc La Visite by Wetmore and Swales (1931) and Woods and Ottenwalder (1986), suggesting that its overall status in remaining broadleaf forest habitat has changed little. However, all 29 individuals that we examined were > 2 years old, suggesting little or no recruitment of young birds. In contrast, the proportion of yearlings mist-netted in montane forests of Sierra de Bahoruco 10 days later was 26% (n = 19). Ongoing fragmentation and loss of montane broadleaf forests in Massif de la Selle may contribute to very low reproductive success in this species, and a reduction in its population viability. As fragments like Bèrak and La Visite continue to decrease in size and ecological integrity, local populations of Green-tailed Ground-Tanagers can be expected to experience commensurate declines.

Black-crowned Palm-Tanager (*Phaenicophilus palmarum*).—This species was much less common at Bèrak than at the La Visite site, where it ranked third in mist net samples and fifth in overall detections (Table 1). This was comparable to its status as reported by Woods and Ottenwalder (1986), who found it more common in patchy and regenerating "Bwa Raje" forest than in the more extensive and diverse stands of mature "Rak Bwa" forest. All seven individuals that we captured were > 2 years old, in contrast to a sample obtained 10 days later from Sierra de Bahoruco, where 36% (n = 19) of mist-netted birds were yearlings. Similar to Green-tailed Ground-Tanagers, breeding success of Black-crowned Palm-Tanagers may be inadequate to sustain populations over time. We did not find any Gray-crowned Palm-Tanagers *(Phaeniocophilus poliocephalus)*, an endemic species of western Haiti (Rimmer *et al*. 2005) that has yet to be unambiguously documented in Massif de la Selle.

Western Chat-Tanager (*Calyptophilus tertius*).—We encountered this species at both sites, where it ranked seventh in total detections at Bèrak and eleventh at La Visite, but was mist-netted only at Bèrak (Table 1). Several birds at both sites were heard singing at dawn, and most appeared to occupy discrete territories. Woods and Ottenwalder (1986) found Western Chat-Tanagers to be fairly common in wet, dense forest as low as 1000 m elevation in La Visite, yet they considered it among the most endangered birds in Haiti. Birdlife International designates the *Calyptophilus* species complex as globally "vulnerable" (Stattersfield *et al*. 1998), while Latta *et al*. (2006) considered the two recognized *Calyptophilus* species as "critically endangered". Our limited observations suggest that the species is still locally common in Parc La Visite, but its status is tenuous overall, as the wet broadleaf forests it requires become increasingly small and fragmented. A recent phylogeographic analysis of genetic variation in the *Calyptophilus* complex supports the recognition of two species, but cautions that further genetic divergence among isolated populations, such as La Visite's, may be occurring (Townsend *et al*. 2007). With three of the seven extant Chat-Tanager populations restricted to highly vulnerable forest remnants, the species complex is at serious risk of extinction.

Hispaniolan Crossbill (*Loxia megaplaga*).—We observed small flocks of crossbills on several occasions at the La Visite site, in areas with large emergent pines. One flock of eight birds was seen foraging in a pine canopy, while other smaller flocks were sporadically seen and heard flying overhead. Because we cannot exclude the possibility of repeat observations, we conservatively estimate that we

encountered a total of eight crossbills (Table 1). Wetmore and Swales (1931) reported the species to be abundant in the La Visite area, but Woods and Ottenwalder (1986, 1992) apparently found fewer crossbills in the late 1970s and early 1980s. They considered the species still common in La Visite, although endangered overall in Haiti. Our observations reveal little about the current status of Hispaniolan Crossbills, but the species may continue to breed in La Visite's pine forests. A recovery plan for the Hispaniolan Crossbill has been outlined by Woods *et al*. (1992), with primary goals of preventing further loss of mature pine forest habitat and determining the species' current population status. Subsequent conservation measures proposed by Benkman (1994) and Latta *et al*. (2000) similarly focus on retaining large expanses of mature pines, but further recommend protecting unfragmented areas with greater extent of canopy closure and reducing uncontrolled fires. Island-wide estimates of population size of Hispaniolan Crossbill range from fewer than 1,000 individuals (Benkman 1994) to 3,375 birds (Latta *et al*. 2000) and underscore its extreme rarity. Compounded by severe, ongoing threats to Hispaniolan pine forests, especially in Haiti, the status of this globally "endangered" species (BirdLife International 2009) must be considered precarious; targeted, island-wide surveys are warranted.

COMPARISON WITH PREVIOUS STUDIES

Several species recorded during the late 1970s and 1980s in Parc La Visite by Charles Woods and associates (Woods and Ottenwalder 1986, 1992, Woods *et al*. 1992) were notably absent during our surveys. We did not detect any of the following resident species previously reported by Woods and Ottenwalder (1986): Hispaniolan Parrot (*Amazona ventralis*), Scaly-naped Pigeon (*Patagioenas squamosa*), Vervain Hummingbird (*Mellisuga minima*), Hispaniolan Highland-Tanager (*Xenoligea montana*, formerly White-winged Warbler), and Antillean Euphonia (*Euphonia musica*). Our extensive experience with these species elsewhere on Hispaniola indicates that all are vocally and/or visually conspicuous, suggesting very low current abundances in La Visite, or complete absence.

The absence of Hispaniolan Parrot in La Visite was unsurprising, given its recent widespread declines, and the fact that Davalos and Brooks (2001) did not locate it in January of 2000. Although Wetmore and Swales (1931) reported Hispaniolan Parrots as common on the ridge of La Selle, Woods and Ottenwalder (1986) described the species as "almost missing" and "rare and endangered" during their several years of study. Given the typically noisy and conspicuous behavior of parrots, we believe it is unlikely that we failed to detect birds that were present. An island-wide decline has been documented since the 1930s, with many local extirpations, largely due to the illegal domestic trade in cage parrots (Keith *et al*. 2003, Latta *et al*. 2006). Hispaniolan Parrots have been only sparsely reported in Haiti since 2000, and it appears likely that the species is extirpated in Parc La Visite.

The continued absence of Hispaniolan Highland-Tanagers in Parc La Visite, and possibly the entire Massif de La Selle, underscores the extensive loss and fragmentation that have reduced the region's montane broadleaf forests. Reported as common by Bond (1928) and Wetmore and Swales (1931), Hispaniolan Highland-Tanagers were found to be "very rare and possibly extirpated from La Visite" by Woods and Ottenwalder (1983, 1986). Davalos and Brooks (2001) failed to locate the species during 4 days of surveys in January of 2000. In the Macaya Biosphere Reserve, Hispaniolan Highland-Tanagers are locally common in mid-elevation, mesic karst broadleaf forests, but scarce or absent in higher elevation wet broadleaf forest (Wetmore and Swales 1931, Woods and Ottenwalder 1986, Rimmer *et al*. 2005). Although Woods and Ottenwalder (1986) considered the species to be secretive, our field experience elsewhere on Hispaniola indicates that it often occurs in conspicuous, actively-foraging flocks and shows inquisitive behavior (Rimmer pers. obs.). We believe it is unlikely that we failed to detect any Hispaniolan Highland-Tanagers that may have been present in the broadleaf forest fragments at our Bèrak and La Visite study sites. Although this species' ecology has not been well-studied, it may exhibit area sensitivity or have limited dispersal abilities that restrict it to tracts of forest larger than those we visited in Parc La Visite. Careful identification and targeted surveys of all remnant broadleaf forest in Massif de la Selle are needed to confirm the status of Hispaniolan Highland-Tanagers, which Woods *et al*. (1992) considered to be Haiti's most endangered bird species.

Our netting and survey methods were similar to those used by Woods *et al*. in the 1970s and 1980s (Woods and Ottenwalder 1986, 1992, Woods *et al*. 1992), and we sampled the same habitats, specifically both mesic and wet karst limestone forest ("Rak Bwa" and "Bwa Raje" of Woods and Ottenwalder [1986], or "Mature Broadleaved Forest" and

"Fragmented Broadleaved Forest" of Woods and Ottenwalder [1992]). Our results therefore provide a broad context for evaluating changes in patterns of avian distribution and abundance during the nearly 25 yr since Woods *et al.*'s last formal surveys. It appears that the overall status of common resident species has changed little, with the exception of Hispaniolan Parrot. However, we lack access to quantitative data from previous surveys and so can make only qualitative comparisons. We believe that our most noteworthy findings include the continued presence of Black-capped Petrels at historic colony sites, documentation of regular occupancy by Bicknell's Thrush of broadleaf forest fragments, and the continued apparent extirpation of several species such as Hispaniolan Parrots and Hispaniolan Highland-Tanagers in the park. We further believe that the persistence of many migrant and resident species in forest fragments indicates that these patches continue to provide viable habitat.

HABITAT ASSESSMENT

Florence Sergile, a core member of Woods *et al.*'s field teams in the 1970s and 1980s, accompanied us in February of 2005 and was struck by the increased loss of habitat within the park. Our field observations indicated that the park's broadleaf forests were greatly reduced in extent, heavily fragmented, and severely threatened by continued expansion of already extensive agriculture inside park boundaries. Follow-up measurements in 2009 confirmed this. The larger habitat patch at Bèrak, which we estimated at 20 ha in 2005, had been reduced to 13.3 ha in 2009, a total loss of 43.5%, and an annual rate of > 10%. The remaining forest fragment contained numerous, recently-created interior clearings for subsistence agriculture (Y-A. Wainwright pers. comm.). At the La Visite site, total forested extent of the two patches, after subtracting the cleared interior areas within each, measured 0.99 ha and 1.56 ha in 2009, indicating a loss of 19% and 22%, respectively, since February of 2005. At these rates of loss, we estimate that the dwindling tracts of forest at Bèrak and La Visite will effectively disappear within as few as 5 yr.

In addition to direct human impacts on forest habitat in the park, introduced mammalian predators may also be adversely impacting avian populations. On 31 January, we found five freshly-killed birds in a mist net at the La Visite site. A domestic cat (*Felis silvestris*) was seen nearby, and the pattern of predation was consistent with that of the species, which is known to take entangled birds from mist nets (Rimmer pers. obs.). Domestic cats have been extensively documented as major predators of small birds, particularly in areas that have been fragmented and settled by humans (e.g., Coleman *et al*. 1997, Crooks and Soule 1999). Introduced rats (*Rattus* spp.), which occur at high densities in forested sites on Hispaniola, are also known to depredate both migrant and resident species (Townsend *et al*. 2009b).

The two small broadleaf forest patches at our La Visite study site are unlikely to provide conditions that will maintain long-term viability of local bird populations. Both fragments, while subject to less active agriculture and tree-cutting than the forest at Bèrak, were nonetheless heavily impacted. Each lost an additional ~ 20% of its forest cover between 2005 and 2009. Our observations indicate that all remaining patches of broadleaf habitat type are now small and dwindling within La Visite; we encountered no other patches greater than 0.1 ha in size during our surveys of Pic la Visite in 2005. Our local guides indicated that these two fragments were the largest remaining on the western ridgeline's south slopes. The drier and more rocky conditions of these patches may enable them to persist longer than the forest at Bèrak, but they will be inadequate to sustain bird populations that require broadleaf forests.

We saw no evidence of regenerating broadleaf forests in the park, and we suspect that this habitat type is afforded few opportunities to recover following disturbance. Broadleaf forests support La Visite's highest avian and floristic diversity (Woods *et al*. 1992), yet they are completely unprotected. The lack of any conservation enforcement within the park has enabled unregulated access by local residents to natural resources. Despite the existence of a nearby non-profit conservation organization, Fondation Seguin (www.fondationseguin.org), to promote conservation of La Visite's flora and fauna, no coordinated program of education or enforcement is apparent. The government of Haiti has not defined boundaries within this nationally designated protected area, and people continue to live and farm throughout the park, freely accessing its natural resources. The resulting crisis situation requires immediate and effective measures to prevent further loss of broadleaf forests, combined with concerted reforestation efforts. Without this, we predict that resident and migrant populations dependent on broadleaf forests within Parc La Visite will be extirpated from the park within 5–10 yr.

The pine forests on the La Visite escarpment's

south slopes are also severely threatened. Many pines were scarred by fire or recent cutting, and understory development was extremely poor. Although we noted a few mature emergent pines at higher elevations, we observed few trees in young age classes, indicating that reproduction may be compromised. We believe that the composition and dynamics of La Visite's pine forests will be significantly altered if cutting of mature trees is not stopped. Overstory pines are the primary producers of cones and seeds in the species, and they likely provide essential local breeding and foraging habitat for Hispaniolan Crossbills (*cf.* Latta *et al*. 2000). They may also perform important ecological functions such as shading, moisture retention, and erosion control. The protection of mature pines throughout Parc La Visite should be a high priority, as should conservation of trees in all age classes.

The north-facing cliffs of the La Visite escarpment support the largest and most globally important confirmed breeding site for Black-capped Petrel (Wingate 1964, Woods and Ottenwalder 1986, Goetz 2009). The species is known with certainty only from the Massif de la Selle and Massif de la Hotte in Haiti, and Sierra de Bahoruco in the Dominican Republic. Its status in Cuba's Sierra Maestra is unclear (Lee and Viña 1993, Norton *et al*. 2004), and it appears to be extirpated from former colony sites elsewhere in the West Indies (Lee 2000). Our surveys in February of 2005 established the continued presence of Black-capped Petrels along the La Visite-Morne Cabaio ridgeline, but may indicate further declines in the breeding population. We believe that ongoing habitat loss above and below the nesting cliffs has likely increased its susceptibility to introduced mammalian predators and direct human exploitation for food. More exhaustive surveys are needed to clarify the status of Black-capped Petrels in Parc La Visite, in order to implement recovery actions as outlined by Woods *et al*. (1992).

CONSERVATION AND MANAGEMENT RECOMMENDATIONS

The comprehensive stewardship plan outlined by Woods *et al*. (1992) details concrete actions that are no less urgent and relevant today than they were nearly two decades ago. We believe that this plan must be carefully revisited, and that strong local coordination must be marshaled to ensure its implementation. A committed network of Haitian conservationists must work in tandem with international cooperators to collectively achieve long-term, sustainable conservation of Parc La Visite. We recommend the following actions, which are more explicitly detailed in Rimmer *et al*. (2005):

1. Take immediate, effective measures to protect remnant broadleaf forests within Parc La Visite. Further loss and fragmentation of these forests are unsustainable, and we believe they constitute the single most important habitat type within the Park. They are unquestionably its most restricted and endangered. Specific actions should include: (a) accurate definition and subsequent demarcation of park boundaries; (b) special designation of a minimum 100 ha core ecological area around Bèrak, with complete exclusion of human activities that degrade the natural habitat; (c) development and implementation of an explicit management plan for La Visite's broadleaf forests and surrounding agricultural areas; (d) training and certification programs for local park guides and wardens, who must be properly equipped, educated, trained, paid, and held accountable for their job performance; and (e) assessment of the viability of promoting ecotourism that directly benefits locals in a way that promotes conservation of forest habitat.

2. Design and implement a long-term avian monitoring and research program, whose scope encompasses the broad floral and faunal biodiversity of La Visite.

3. Design, fund, and implement innovative programs that provide economically and ecologically sustainable incentives to local residents to conserve habitat. Incentives for conservation must exceed those for clearing forest. Without a major commitment of human and financial resources, both within and outside of Haiti, La Visite's vulnerable flora and fauna have little chance of long-term viability.

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