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HABITATS, DENSITY, POPULATION SIZE, AND THE FUTURE OF THE GUADELOUPE WOODPECKER (*MELANERPES HERMINIERI*)

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Résumé. Dans les Petites Antilles, il existe une seule espèce de pic endémique: le Pic de la Guadeloupe (*Melanerpes herminieri*), localisé sur l'île de la Guadeloupe (Basse-Terre, 848 km^2, et Grande-Terre, 585 km^2), 16°N, 61°30'O. Cet oiseau vit depuis le niveau de la mer jusqu'à la limite supérieure des arbres (1000 m). Il occupe cinq types de végétation (la forêt semi-décidue sur sol volcanique, la forêt humide, la mangrove, la forêt inondable et la forêt semi-décidue sur sol calcaire), mais sa distribution n'est pas uniforme. La population totale est estimée à 10330 couples ± 1000. La perte d'habitat (coupe à blanc) et la suppression des arbres morts constituent la principale menace pour l'espèce. Les dommages occasionnés à l'environnement par les ouragans ont déjà un impact non négligeable sur le pic, aussi les constructions en cours et en projet (autoroute, agrandissement de l'aéroport, etc.) sont d'autant plus inquiétantes. Si un projet de protection de l'environnement ne se met pas rapidement en place, l'habitat forestier indispensable à la survie du Pic de la Guadeloupe sera détruit.

Abstract. The only sedentary woodpecker in the Lesser Antilles, the Guadeloupe Woodpecker (*Melanerpes herminieri*), is endemic to the Guadeloupe islands (Basse-Terre, 848 km^2, and Grande-Terre, 585 km^2), 16°N, 61°30'W. This woodpecker is found from sea level to the tree line (1000 m) and uses five habitat types (semi-deciduous forest on igneous ground, evergreen forest, mangrove forest, swamp forest and semi-deciduous forest on clay ground), but is unevenly distributed. The overall population number is estimated to be 10,330 pairs ± 1000. Loss of habitat (clear cutting) and dead tree removal are the main threat for the species. Environmental damage due to hurricanes are already costly for woodpeckers but actual highway constructions, airport enlargement and land development on the islands are of great concern. Without any future environmental planning and protection, the Guadeloupe Woodpecker's habitat types will be destroyed. *Accepted 21 October 1997*.

Keys words: Guadeloupe Woodpecker, Melanerpes herminieri*, Lesser Antilles, population size, distribution, conservation.*

INTRODUCTION

The Guadeloupe Woodpecker (*Melanerpes herminieri*) is the only sedentary woodpecker in the Lesser Antilles and is endemic to the Guadeloupean archipelago, 16°N, and 61°30'W (Short 1974, 1982; Bond 1979, Winkler *et al.* 1995). The species is found only on the two largest islands of the archipelago, Basse-Terre (848 km^2) and Grande-Terre (585 km^2) (Fig. 1). Basse-Terre is a volcanic island

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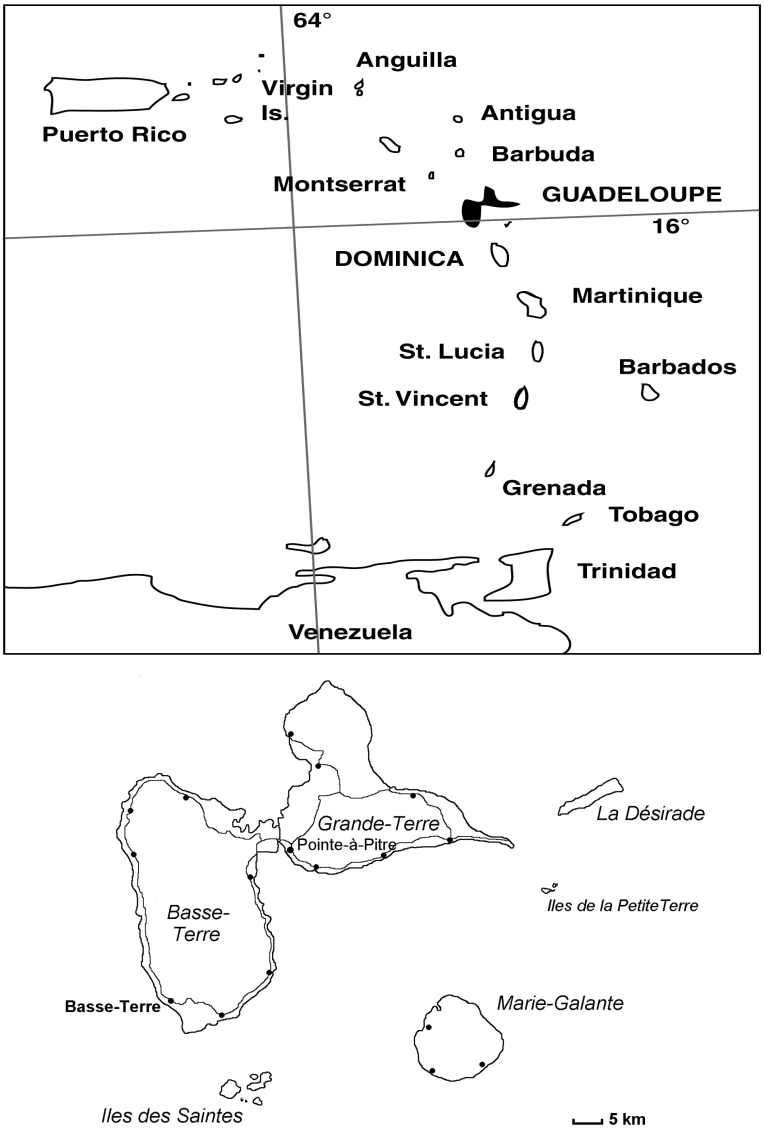

FIG. 1. Guadeloupe, main islands and small offshore islands.

with a maximum elevation of 1457 m. The central mountain region averages 500–800 m elevation. By contrast, Grande-Terre is a low, flat, coral island with a maximum elevation of only 135 m. Past reports have described the Guadeloupe Woodpecker as common on the east slope of Basse-Terre, less common on the western part, and rare on Grande-Terre (Noble 1916, Danforth 1939, Pinchon 1976, and Short 1982).

Our study was initiated to follow up on Johnson's recommendations (1988): "The

TABLE 1. Number of transects for each habitat type. Distance is total distance in a particular habitat type, and was calculated as the result of transect length multiplied by the number of samplings for both years.

Forest types	Number per year	Distance for two years
Semi-deciduous forest on	2/1993	
igneous soil	2/1994	8 km
Evergreen forest	4/1993	
	3/1994	17.4 km
Mangroove forest	1/1993	
	1/1994	11.7 km
Swamp forest	1/1993	
	1/1994	5.2 km
Semi-deciduous forest on	2/1993	
clay soil	2/1994	12.6 km

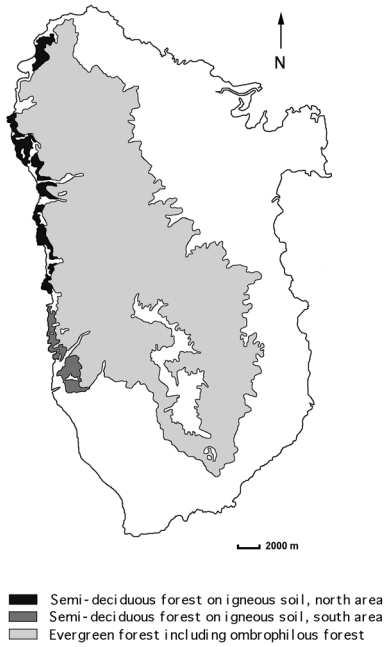

FIG. 2. Occurrence of the Guadeloupe Woodpeck on Basse Terre.

Guadeloupe Woodpecker is not thought to be in any danger at the moment, but since its range is restricted entirely to Guadeloupe, it would be prudent to learn more about its ecology and behavior while it is still relatively common. Breeding biology and habitat requirements need investigating, and a systematic, accurate estimate of its current population size would be very useful in the assessment of future population trends." We present details on density and habitats used by the Guadeloupe Woodpecker, an estimate of the overall population size, and a discussion of the future of the Guadeloupe Woodpecker.

METHODS

We surveyed every habitat type throughout Basse-Terre and Grande-Terre. We drove on island roads and on Basse-Terre we hiked at least once on all forest trails (300 km). We used a row boat to survey mangrove forests. We located woodpeckers visually and by ear. We also located and mapped nesting holes.

To assess the size of a pair's territory during the breeding season, we employed three techniques: Line transect, full distance measuring (Bibby *et al.* 1992), and setting up transect lines in every habitat structure (Table 1). On Grande-Terre, during the 1993 breeding season, we marked three woodpecker pairs with colored plastic tags glued to the upper part of their tail and, using binoculars, we followed the marked birds. During the 1994 breeding season, we radio-tagged five birds, one male in evergreen forest and 2 pairs in swamp forest. The radio tags (4% of overall weight) weighed 2.6 g for the females and 3.6 g for the males and were attached to

TABLE 2. Features for each habitat. Altitude, rainfall and seasonality from Lasserre (1961) and Rousteau (1996a). Forest typres from UNESCO (1973). In the text, evergreen seasonal and ombrophilous forests are combined as "evergreen forest".

Forest types	Altitude (m)	Rainfall (mm/year)	Seasonality	Canopy height (m)
Semi-deciduous forest on igneous soil	0–300	1300–2000	3-6 months dry season	< 20
Evergreen seasonal forest	Windward 10–100 Leeward 250–500	2000–4000	No dry season	20–30
Ombrophilous forest	Windward 560–600 Leeward 550–1000	2500–6000	No dry season	20–35
Mangroove forest	0	1500	One dry season	10–20
Swamp forest	1	1500–1700	One dry season	25
Semi-deciduous forest on clay soil	5–130	1450–1750	One dry season	20

the 2 inner rectrices. We used two ways to find out territory size: triangulation (Kenward 1987) and we followed radio tag birds moving in the forest and putting flags on trees. Later we came back and mapped the territory using paces and a compass.

RESULTS

On Guadeloupe, rainfall varies greatly, depending on altitude and location, and this results in 5 different habitat types (Tables 2 and 3). On Basse-Terre, coconut trees (*Cocos*

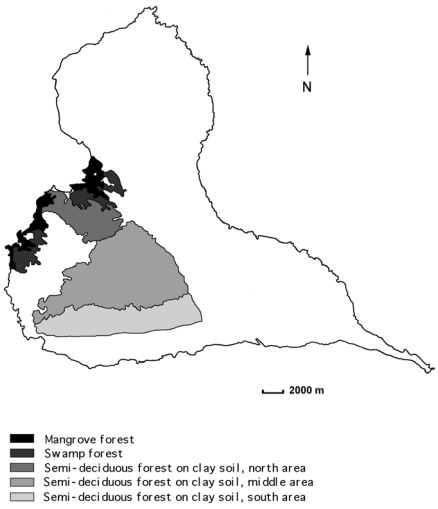

FIG. 3. Occurrence of the Guadeloupe Woodpecker on Grande Terre.

TABLE 3. Dominant tree species within each habitat. Data from Rousteau (1996a, 1996b); nomenclature according to Howard (1979, 1988, 1989a, 1989b); forest types from UNESCO (1973).

Forest types	Dominant tree species
Semi-deciduous forest	*Lonchocarpus violaceus*
on igneous soil	*Tabebuia pallida*
	Cordia alliodora
	Acacia muricata[1]
Evergreen seasonal	*Hymenaea courbaril*
forest	*Margaritaria nobilis*
	Inga ingoides
	Cordia sulcata
	Calophyllum calaba
	Cecropia schreberiana
Ombrophilous forest	*Amanoa caribaea*
	Tapura latifolia
	Richeria grandis
	Dacryodes excelsa
	Pouteria pallida
	Byrsonima trinitensis
	Ilex sideroxyloides
Mangroove forest	*Rhizophora mangle*
	Avicennia germinans
	Laguncularia racemosa
	Conocarpus erecta[2]
Swamp forest	*Pterocarpus officinalis*[3]
Semi-deciduous forest	*Ocotea coriacea*
on clay soil	*Ocotea membranacea*
	Inga ingoides
	Inga laurina
	Zanthoxylum martinicense
	Erythroxylum havanense

[1]Located in areas with fair weather conditions.
[2]Trees with diameter up to 50 cm are very rare.
[3]Counts for 90–100% of the tree species.

nucifera) have been planted in semi-deciduous forest and evergreen forest specially around habitations and near cultivated patches and on Grande-Terre coconut trees are scattered throughout the area called "les Grands-Fonds". In September 1989, Hurricane Hugo struck Grande-Terre and northern Basse-Terre, killing many coconut trees. Dead, upright trunks were heavily used by woodpeckers for nesting.

We found the Guadeloupe Woodpecker from sea level to the upper altitudinal limit of trees (1000 m). On Figures 2 and 3, for every vegetation types, only the woodpecker's range is represented. The species used all five forests habitats but did so unevenly. Partners for a pair remain together even after breeding season and keep a territory year around. On Basse-Terre (Fig. 2), line transects indicated that in semi-deciduous forest on igneous soil, territory size was 2 ha in the north and 5 ha in the south. In evergreen forest, territory sizes averaged 2.3 ± 0.8 (SD) ha (n = 4; range = 1.3–3.2). On Grande-Terre (Fig. 3), in swamp and mangrove forests, territory size averaged 3.3 and 3.0 ha, respectively. The greatest difference was found in semi-deciduous forest on clay soil where territories averaged 2.5 ha in the north and 11 ha in the south. In the northern habitat, three marked pairs had territories of 2.8 ha, 3.0 ha, and 3.5 ha respectively. On clay soil, woodpecker density decreases from 0.35 to 0.09 pair/ha when annual precipitations goes down from 1750 to 1450 mm. A similar trend can be observed between northern and southern areas of semi-deciduous forest on igneous soil.

In evergreen forest, using radio tracking for 16.6 h during 5 days, the area covered by one male during feeding of nestling was 2.5 ha. After the young left the nest this male used 2.7 ha. Including the overlap between the two territories, this male used a total area of 4.2 ha. In swamp forest, while feeding

TABLE 4. Estimate of the number of pairs of the Guadeloupe Woodpecker for each habitat type. BT = Basse-Terre, GT: Grande-Terre. See text for details on territory size.

Forest types	Island	Area (ha)	Estimated pairs
Semi-deciduous forest on igneous soil: northern area	BT	1250	420
southern area	BT	680	140
Evergreen forest	BT	36500	7360
Mangrove forest	GT	1000	330
Swamp forest	GT	1000	250
Semi-deciduous forest on clay soil: northern area	GT	1700	580
middle area	GT	6950	1000
southern area	GT	2750	250
TOTAL	BT-GT	51830	10330

nestlings and fledglings, territory sizes for 2 pairs with contiguous territories (followed 25.8 h spread on 8 days) were 2.7 ha and 5.8 ha (mean = 4.25 ha), respectively.

Combining the results of all 3 techniques, estimations of woodpecker densities in each habitat type were obtained by dividing available areas by territory size measured. When several measurements of territory size were available, we used the average territory size to compute bird numbers. However, for two of eight distinguished forest types, such evaluations likely led to heavy over estimation of actual populations. In northern part of semi-deciduous forest on igneous soil, we were able to identify a dry littoral belt which is not suitable with woodpecker survival. Moreover, the forest cover in this area was heavily damaged by Hurricane Hugo. So we evaluated the area really occupied by the woodpecker as 2/3 of this ecological unit. In evergreen forest, which is a montane formation, ridges, steeply slopes and streams are not suitable locations for woodpeckers. When affected by landslides, slopes are specially not convenient for nesting or living. Given the preference for tall trees, large parts of forest are also not compatible with bird needs. Finally, woodpecker habitat seems to approximate only 20,000 ha among the 36,500 ha of evergreen forests where woodpecker is unevenly distributed. The estimated densities in different habitats are presented in table 4. Population size for Basse Terre is estimated to be 7920 pairs and 2410 pairs for Grande Terre. Overall it is 10,330 pairs with an estimation error of about 1000 pairs.

DISCUSSION

This is the first systematic survey of the distribution and relative abundance of the Guadeloupe Woodpecker. Our results differ markedly from previous reports. The Guadeloupe Woodpecker is living in all forest habitat types. This may be a result of island setting (MacArthur *et al.* 1972). In semi-deciduous forest on clay soil, there is a gradient from north to south regarding the water. In the north where rainfall is higher, the trees are taller and woodpecker's density is high. Tree size, rainfall, and density decrease southward. No prey survey was done but higher rainfall permits more vegetation to grow, perhaps leading to greater food abundance.

The Guadeloupe Woodpecker requires

access to forest with tall trees and some dead substrate (trunk, branch, coconut) big enough to allow a breeding cavity to be excavated. So, clear cutting and dead tree removal threatens the species. At the present time, logging is not allowed except management for purposes of tourism in the 17,300 ha of evergreen forest and 3,700 ha of mangrove inside the National Park. Outside the park, forest survival is less certain. For example, the refuse dump of the major city in Guadeloupe, Pointe à Pitre, has destroyed about 20 ha of mangrove forest. Airport extension has resulted in the destruction of 136 ha of habitat. A highway under construction penetrates mangrove and swamp forests, fragmenting these already vulnerable habitats. People cut numerous trails through mangrove forest. Unfortunately, the area under heaviest use is also the best mangrove forest in Guadeloupe. On Grande-Terre, in "les Grands-Fonds", a hilly area, owners are burning remaining patches of forest for sugar cane, vegetable crops, cattle and goats grazing, and housing. In order for the Guadeloupe Woodpecker to be able to live in a semi-open habitat with scattered fruit trees (like mango) at least one ha of dense forest is necessary to sustain one pair through the year. At the present rate of deforestation, we estimate that in 10 years the forest will be gone from Grande-Terre and with it the Guadeloupe Woodpecker. The disappearing woodpecker will, in fact, be a bioindicator (Short & Horne 1990) for the deforestation.

We urge the competent authorities in Guadeloupe to protect the remaining patches of forest and to begin a program of forest restoration. Our work was carried out four years after hurricane Hugo, which left a lot of nesting sites, and so the woodpecker population had probably reached a high level. Hurricanes have a negative direct impact on woodpeckers, killing individual (Wiley & Wunderle 1993), especially fledglings. But when they leave behind dead standing trees, hurricanes have a longer term positive affect by providing good nesting sites, which help woodpeckers to rebuilt the population level. The total number of pairs is estimated at 10,330 ± 1000. On Basse Terre, 45% of the island is occupied by woodpecker and 23% on Grande Terre. Regarding forest coverage, this is close to the islands' carry capacities. The 1500 ha forest located on "les Monts Caraïbes" could be colonized by woodpeckers in the future. As in other endemic island species, population bottlenecks (Soulé & Kohn 1989) can lead to loss of genetic variation for the Guadeloupe Woodpecker. The species was already known to have a strong sexual dimorphism (Selander 1966), but measurements taken on individuals caught on Basse-Terre and Grande-Terre showed the presence of two woodpecker populations (manuscript in preparation). Woodpeckers were larger on Basse-Terre than on Grande-Terre. This let us expect the presence of 2 genetic pools. To maintain this genetic diversity, all forests on Grande-Terre must be preserved.

CONCLUSION

Environmental damage due to hurricanes (Labbé & Meloni 1993) is already costly for woodpeckers and land development on the islands are of great concern. Woodpecker niche is limited to forest, thus indirectly to rain. However its habitat is limited today essentially by man-caused deforestation. Without environmental planning and protection, the Guadeloupe Woodpecker's habitat will be destroyed. Because of this, the Guadeloupe Woodpecker is classified near threatened (Collar *et al.* 1994).

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