

Community structure and bird species composition in a *caatinga* of Pernambuco, Brazil.

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Received on 9 March 2012. Accepted on 19 June 2012.

ABSTRACT: The present study aimed to survey the avian community in *caatinga* vegetation of Serra do Pará massif within the “agreste” region of Pernambuco, Brazil. We recorded a total of 140 species of 43 families. Analyses of community structure and composition show that among the species listed, approximately 46% are non-passerines, and 54% are passerines, with Columbidae (n=7) and Tyrannidae (n=23) being the most representative families, respectively. The bird community in the Serra do Pará massif is composed mainly by resident species, forest independent and of low sensitivity to the human disturbances, but also included endemic and migratory species. The region represents an important area for the local bird community and for the *caatinga* biome, and should be considered for effective protection.

KEY-WORDS: Birds; *caatinga*; community; semi-arid; survey.

INTRODUCTION

The *caatinga* biome is a large and one of the most distinct regions located over a large depression in the low latitudes of northeastern Brazil (Ab'Saber 1974, Sarmiento 1975, Ferri 1980, CI 2003, Leal *et al.* 2003). It covers near 11% of the Brazilian territory (Rizzini 1997) and, as a result of geomorphologic processes, climate and topography, the biome is characterized by a high number of vegetation types (Egler 1951, Ferri 1980, Andrade-Lima 1981, Silva *et al.* 2003b), including a mosaic of thorny shrubs amid xerophytic deciduous forests (Leal *et al.* 2005). Climate is strongly seasonal and marked by high temperatures with sparse and irregularly distributed rains. The drought period can last between seven and ten months with annual average precipitation ranging between 240 and 1500 mm (Nimer 1977, RADAMBRASIL 1983, Sampaio 1995, Prado 2003, Leal *et al.* 2005).

The region is poorly represented within the Network of National Conservation Units (Sistema Nacional de Unidades de Conservação - SNUC), as only 2.3% of its extent is currently protected by federal and state reserves (CI 2003, Leal *et al.* 2003). Additionally, the

caatinga biome is the least known among the Brazilian biomes regarding the distribution, evolution, ecological interactions and natural history of bird communities (Silva *et al.* 2003a, Tabarelli & Silva 2003, Telino-Júnior *et al.* 2005b, Roos *et al.* 2006).

The *caatinga* has long been submitted to intense pressure of human activities (Tabarelli & Vicente 2002, Castelletti *et al.* 2003), and several studies show that the biome is severely fragmented, with approximately 30 to 51% of the natural landscape already transformed into land for pastures, agriculture and road expansion (IBGE 1993, Castelletti *et al.* 2003, Leal *et al.* 2005). Disturbance of landscape structure can affect both habitat and species conservation, potentially causing extirpation of endemic species, changes in species composition and interruption of ecological process which are essential for ecosystem functionality and biodiversity conservation (Wiens 1994, Hagan *et al.* 1996, Castelletti *et al.* 2003), particularly in the *caatinga* biome, considered one of the most important areas of bird endemism in South America (Cracraft 1985, CI 2003).

Recent studies have shown the high biological importance of the *caatinga* biome to global biodiversity (e.g. Santos 2004, Olmos *et al.* 2005, Telino-Júnior *et al.*

2005b, Leal *et al.* 2006, Assis *et al.* 2007, Farias 2007, Pereira e Azevedo-Júnior 2011, Las-Casas *et al.* 2012), through novel records or distribution extension of several species, including regions in the state of Pernambuco (e.g. Farias *et al.* 2005, Dantas *et al.* 2007, Las-Casas e Azevedo-Júnior 2008, Pereira *et al.* 2008, Telino-Júnior *et al.* 2008, Souza *et al.* 2009).

The Serra do Pará is a massif of 17 km in length and 750 m of altitude, located in the municipality of Santa Cruz do Capibaribe, in the agreste region of Pernambuco state. It is considered an important archeological and touristic site, with a significant diversity of *caatinga* species (SAMA SCC 2010). The study area is a semi-arid landscape that belongs to the Borborema Geological Province, which includes vegetation forms of xerophytic *caatinga* and deciduous forest (CPRM 2005).

There are no records of previous surveys focusing on birds or any other faunistic group in the area, therefore, in this paper we present novel information about bird species, community structure and composition at a site of *caatinga* in the state of Pernambuco, emphasizing on endemic and migratory species, habitat use and sensitivity to disturbance. We also discuss possible strategies for the conservation of the Serra do Pará and its avifauna.

MATERIAL AND METHODS

Study Area

The study was carried out in Vila do Pará (7°52'29.20"S and 36°24'10.06"W), a district that belongs to the municipality of Santa Cruz do Capibaribe, Pernambuco State, where the Serra do Pará (hereafter SDP) massif is located (Figure 1). The vegetation in the study site is formed by well-preserved patches of dense shrubby *caatinga*, mixed with open vegetation neighboring exposed rocks (lajedos). Overall, the area is well preserved although disturbed *caatinga* of secondary

growth can be found in the surrounding farms, and also large forest patches of mesquite *Prosopis juliflora* (Fabaceae), an invasive species introduced in the *caatinga* biome long ago (Oliveira *et al.* 1999).

Temporary and perennial water bodies and dams are formed during the rainy season in the surroundings of Serra do Pará. Climate is typical of semi-arid (Bss'h de Köppen), with average annual temperature ranging from 23 to 27°C. The rainy season occurs between March and July with an average annual precipitation of 503 mm (SUDENE 1990).

Methods

We carried out twelve monthly expeditions of five days each, between June 2007 and May 2008, comprising both dry and rainy seasons and, adding up to 447 hours of observation. In March and May 2008, given unfavorable weather conditions, we obtained 8.5 and 25 hours of observations, respectively. Birds sampling was performed by walking trails during mornings (05h30 to 09h30) and afternoons (14h to 18h; Vielliard *et al.* 2010). Additionally, we did several incursions of different intervals and durations to sites nearby the study area, including the Distrito do Pará, between June 2007 and May 2008 and April to July 2009. Bird identification was based on direct observation with binoculars and/or vocalizations, and taxonomic names followed the Brazilian Committee of Ornithological Records (CBRO 2011).

We classified species based on their endemic or threatened status, according to Sick (1997) and the Brazilian red list (MMA 2008); other classifications adopted were: habitat use (Silva *et al.* 2003a) and sensitivity to human disturbance (Stotz *et al.* 1996).

We also classified species according to trophic guilds based on information from the literature (Moojen *et al.* 1941, Motta-Junior 1990, Sick 1997, Piratelli & Pereira 2002, Donatelli *et al.* 2004, Scherer *et al.* 2005, Telino-



FIGURE 1. Location of the study area in the Brazilian State of Pernambuco.

júnior *et al.* 2005a, Dario 2008, Araújo 2009), using a model proposed by Araújo (2009) with the following categories: Carnivore (C), Detritivore (D), Frugivore (F), Granivore (G), Frugivore/Granivore (FG), Insectivore (I), Insectivore/Granivore (IG), Insectivore/Frugivore (IF), Nectarivore/Insectivore (NI), Omnivore (O) e Piscivore (P).

Species richness was estimated using estimators Jack 1, Chao 1 and Bootstrap from program EstimateS 8.2 (Colwell 2009). All species records were used to build a cumulative curve of species richness, with randomization parameter set to one hundred

RESULTS

We recorded a total of 140 species of 43 famílias, being 65 (46.4%) non-passerines and 75 (53.6%) passerines. Columbidae (7 spp.), Accipitridae (6 spp.) and Trochilidae (6 spp.) e Falconidae (5 spp.) were the most representative among non-passerines, while Tyrannidae (23 spp.) was the most representative among passerines, followed by Thraupidae (8 spp.), Icteridae (7 spp.),

Furnariidae (6 spp.) and Emberizidae (6 spp.; Table 1).

The cumulative curve of species richness suggests that more species are still to be found in the study area. More specifically, given the results of the three estimators used (Bootstrap, Jack1 e Chao1), an increase between 4 and 16 new species should be expected, considering that the expected richness ranged between 144 and 156 species (Figure 2). Regarding habitat use, 54% (n=75) of the species are considered forest independent while 31% (n=42) are semi-dependent and only 17% (n=23) forest dependent. Although the majority of species (72%) was classified as not sensitive to human disturbance, three highly sensitive species deserve attention: the Broad-tipped Hermit *Anopetia gounellei*, the Tawny Piculet *Picumnus fulvescens*, and the Scarlet-throated Tanager *Compsothraupis loricata*. Finally, we recorded a total of 12 endemic species (Table 1).

Regarding the trophic guilds, we found a large number of insectivore species (58 spp.), followed by omnivores (35 spp.), and carnivores (11 spp.). Among the insectivores, the majority of species are passerines (42 spp.), with Tyrannidae being the most representative family with 16 species.

TABLE 1. List of bird species recorded at Serra do Pará and Distrito do Pará, municipality of Santa Cruz do Capibaribe, state of Pernambuco, Brazil.

Legend:

Status: R – resident, E – Brazilian endemic, VN – northern hemisphere migrant, VS – southern hemisphere migrant.

HU – Habitat use: ind – Forest independent, sem – Forest semi-dependent, dep – Forest dependent;

DS – human disturbance sensitivity: L – low, M – medium, H – high;

TG – trophic guild: O- omnivore, G – granivore, I – insectivore, C – carnivore, D – detritivore, F – frugivore, P – piscivore, FG – frugivore/granivore, NI – nectarivore/insectivore, IF – insectivore/frugivore, IG – insectivore/granivore.

^{CE} *Caatinga* endemic

^{NE} Northeastern endemic

Táxon Name	Common name	Status	HU	DS	TG
Tinamiformes					
Tinamidae					
<i>Crypturellus parvirostris</i>	Small-billed Tinamou	R	ind	L	O
<i>Crypturellus tataupa</i>	Tataupa Tinamou	R	dep	L	G
<i>Nothura boraquira</i>	White-bellied Nothura	R	ind	L	I
Anseriformes					
Anatidae					
<i>Dendrocygna viduata</i>	White-faced Whistling-duck	R	ind	L	O
<i>Dendrocygna autumnalis</i>	Black-bellied Whistling-duck	R	ind	L	O
<i>Amazonetta brasiliensis</i>	Brazilian Teal	R	ind	L	O
Podicipediformes					
Podicipedidae					
<i>Tachybaptus dominicus</i>	Least Grebe	R	ind	L	C
Ciconiiformes					
Ardeidae					
<i>Butorides striata</i>	Striated Heron	R	ind	L	O
<i>Bubulcus ibis</i>	Cattle Egret	R	ind	L	O
<i>Ardea alba</i>	Great Egret	R	ind	L	O
<i>Egretta thula</i>	Snowy Egret	R	ind	L	O

Táxon Name	Common name	Status	HU	DS	TG
Cathartiformes					
Cathartidae					
<i>Cathartes aura</i>	Turkey Vulture	R	ind	L	D
<i>Coragyps atratus</i>	Black Vulture	R	ind	L	D
Accipitriformes					
Accipitridae					
<i>Elanoides forficatus</i>	American Swallow-tailed Kite	R	ind	M	O
<i>Gampsonyx swainsonii</i>	Pearl Kite	R	ind	L	O
<i>Geranospiza caeruleascens</i>	Crane Hawk	R	sem	M	C
<i>Heterospizias meridionalis</i>	Savanna Hawk	R	ind	L	O
<i>Rupornis magnirostris</i>	Roadside Hawk	R	ind	L	C
<i>Geranoaetus melanoleucus</i>	Black-chested Buzzard-Eagle	R	ind	M	C
Falconiformes					
Falconidae					
<i>Caracara plancus</i>	Southern Caracara	R	ind	L	O
<i>Milvago chimachima</i>	Yellow-headed Caracara	R	ind	L	O
<i>Herpetotheres cachinnans</i>	Laughing Falcon	R	sem	L	C
<i>Falco sparverius</i>	American Kestrel	R	ind	L	C
<i>Falco femoralis</i>	Aplomado Falcon	R	ind	L	C
Gruiformes					
Rallidae					
<i>Gallinula galeata</i>	Common Gallinule	R	ind	L	O
Cariamiformes					
Cariamidae					
<i>Cariama cristata</i>	Red-legged Seriema	R	ind	L	C
Charadriiformes					
Charadriidae					
<i>Vanellus chilensis</i>	Southern Lapwing	R	ind	L	O
Scolopacidae					
<i>Actitis macularius</i>	Spotted Sandpiper	VN	ind	L	O
Jacanidae					
<i>Jacana jacana</i>	Wattled Jacana	R	ind	L	O
Columbiformes					
Columbidae					
<i>Columbina minuta</i>	Plain-breasted Ground-dove	R	ind	L	G
<i>Columbina talpacoti</i>	Ruddy Ground-dove	R	ind	L	G
<i>Columbina squammata</i>	Scaled Dove	R	ind	L	G
<i>Columbina picui</i>	Picui Ground-Dove	R	ind	L	FG
<i>Patagioenas picazuro</i>	Picazuro Pigeon	R	sem	M	FG
<i>Zenaida auriculata</i>	Eared Dove	R	ind	L	G
<i>Leptotila verreauxi</i>	White-tipped Dove	R	sem	L	FG
Psittaciformes					
Psittacidae					
<i>Aratinga cactorum</i> ^{FC}	Cactus Parakeet	R, E	sem	M	F
<i>Forpus xanthopterygius</i>	Blue-winged Parrotlet	R	ind	L	F
<i>Amazona aestiva</i>	Blue-fronted Amazon	R	dep	M	F
Cuculiformes					
Cuculidae					
<i>Piaya cayana</i>	Squirrel Cuckoo	R	sem	L	I
<i>Coccyzus melacoryphus</i>	Dark-billed Cuckoo	R	sem	L	I
<i>Crotophaga ani</i>	Smooth-billed Ani	R	ind	L	I

Táxon Name	Common name	Status	HU	DS	TG
<i>Guira guira</i>	Guira Cuckoo	R	ind	L	I
<i>Tapera naevia</i>	Striped Cuckoo	R	ind	L	I
Strigiformes					
Tytonidae					
<i>Tyto alba</i>	Barn Owl	R	ind	L	C
Strigidae					
<i>Megascops choliba</i>	Tropical Screech-owl	R	sem	L	C
<i>Glaucidium brasilianum</i>	Ferruginous Pygmy-owl	R	sem	L	C
<i>Athene cunicularia</i>	Burrowing Owl	R	ind	M	I
Caprimulgiformes					
Nyctibiidae					
<i>Nyctibius griseus</i>	Grey Potoo	R	sem	L	I
Caprimulgidae					
<i>Hydropsalis parvula</i>	Little Nightjar	R	ind	L	I
<i>Hydropsalis hirundinacea</i> ^{EC}	Pygmy Nightjar	R, E	ind	M	I
<i>Hydropsalis torquata</i>	Scissor-tailed Nightjar	R	ind	L	I
<i>Chordeiles pusillus</i>	Least Nighthawk	R	ind	M	I
Apodiformes					
Trochilidae					
<i>Anopetia gounellei</i> ^{EC}	Broad-tipped Hermit	R, E	dep	H	NI
<i>Eupetomena macroura</i>	Swallow-tailed Hummingbird	R	ind	L	NI
<i>Chrysolampis mosquitus</i>	Ruby-topaz Hummingbird	R	ind	L	NI
<i>Chlorostilbon lucidus</i>	Glittering-bellied Emerald	R	sem	L	NI
<i>Heliomaster squamosus</i>	Stripe-breasted Starthroat	R, E	dep	M	NI
<i>Calliphlox amethystina</i>	Amethyst Woodstar	R	sem	L	NI
Coraciiformes					
Alcedinidae					
<i>Megaceryle torquata</i>	Ringed Kingfisher	R	ind	L	P
Galbuliformes					
Bucconidae					
<i>Nystalus maculatus</i>	Spot-backed Puffbird	R	sem	M	I
Piciformes					
Picidae					
<i>Picumnus fulvescens</i> ^{EN}	Tawny Piculet	R, E	sem	H	I
<i>Veniliornis passerinus</i>	Little Woodpecker	R	sem	L	I
<i>Colaptes melanochlorus</i>	Green-barred Woodpecker	R	sem	L	I
<i>Celeus flavescens</i>	Blond-crested Woodpecker	R	dep	M	IF
Passeriformes					
Thamnophilidae					
<i>Myrmorchilus strigilatus</i>	Stripe-backed Antbird	R	sem	M	I
<i>Formicivora melanogaster</i>	Black-bellied Antwren	R	sem	M	I
<i>Thamnophilus capistratus</i> ^{EN}	Caatinga Barred Antshrike	R, E	sem	L	I
<i>Taraba major</i>	Great Antshrike	R	sem	L	I
Dendrocolaptidae					
<i>Sittasomus griseicapillus</i>	Olivaceous Woodcreeper	R	dep	M	I
<i>Lepidocolaptes angustirostris</i>	Narrow-billed Woodcreeper	R	ind	M	I
Furnariidae					
<i>Furnarius fgulus</i>	Wing-banded Hornero	R, E	ind	L	I
<i>Furnarius leucopus</i>	Pale-legged Hornero	R	sem	L	I
<i>Pseudoseisura cristata</i> ^{EC}	Caatinga Cacholote	R, E	sem	M	I
<i>Phacellodomus rufifrons</i>	Rufous-fronted Thornbird	R	sem	M	I

Táxon Name	Common name	Status	HU	DS	TG
<i>Certhiaxis cinnamomeus</i>	Yellow-chinned Spinetail	R	ind	M	I
<i>Synallaxis frontalis</i>	Sooty-fronted Spinetail	R	dep	L	I
Tityridae					
<i>Pachyramphus polychopterus</i>	White-winged Becard	R	dep	L	IF
<i>Pachyramphus validus</i>	Crested Becard	R	sem	L	I
Rhynchocyclidae					
<i>Tolmomyias flaviventris</i>	Yellow-breasted Flycatcher		dep	M	I
<i>Todirostrum cinereum</i>	Common Tody-flycatcher		dep	M	I
<i>Hemitriccus margaritaceiventer</i>	Pearly-vented Tody-Tyrant	R	sem	M	I
Tyrannidae					
<i>Hirundinea ferruginea</i>	Cliff Flycatcher	R	sem	L	I
<i>Stigmatura napensis</i>	Lesser Wagtail-Tyrant	R	ind	M	I
<i>Euscarthmus meloryphus</i>	Tawny-crowned Pygmy-Tyrant	R	sem	L	I
<i>Camptostoma obsoletum</i>	Southern Beardless-tyrannulet	R	ind	L	I
<i>Elaenia spectabilis</i>	Large Elaenia	R	dep	L	I
<i>Elaenia chilensis</i>	White-crested Elaenia	VS	ind	L	IF
<i>Elaenia cristata</i>	Plain-crested Elaenia	R	ind	M	O
<i>Myiopagis viridicata</i>	Greenish Elaenia	R	dep	M	I
<i>Phaeomyias murina</i>	Mouse-coloured Tyrannulet	R	ind	L	IF
<i>Phyllomyias fasciatus</i>	Planalto Tyrannulet	R	sem	M	I
<i>Myiarchus tyrannulus</i>	Brown-crested Flycatcher	R	ind	L	I
<i>Casiornis fuscus</i> ^{EN}	Ash-throated Casiornis	R, E	dep	M	I
<i>Pitangus sulphuratus</i>	Great Kiskadee	R	ind	L	O
<i>Myiodynastes maculatus</i>	Streaked Flycatcher	R	dep	L	IF
<i>Megarynchus pitangua</i>	Boat-billed Flycatcher	R	sem	L	O
<i>Tyrannus melancholicus</i>	Tropical Kingbird	R	sem	L	I
<i>Empidonomus varius</i>	Variiegated Flycatcher	R	ind	M	IF
<i>Fluvicola albiventer</i>	Black-backed Water-Tyrant	R	ind	M	I
<i>Fluvicola nengeta</i>	Masked Water-Tyrant	R	ind	L	I
<i>Arundinicola leucocephala</i>	White-headed Marsh-Tyrant	R	ind	L	I
<i>Cnemotriccus fuscatus</i>	Fuscous Flycatcher	R	dep	L	I
<i>Knipolegus nigerrimus</i>	Velvety Black-Tyrant	R	sem	L	I
<i>Xolmis irupero</i>	White Monjita	R	dep	M	I
Vireonidae					
<i>Cyclarhis gujanensis</i>	Rufous-browed Peppershrike	R	sem	L	I
<i>Vireo olivaceus</i>	Red-eyed Vireo	R	dep	L	I
<i>Hylophilus amaurocephalus</i>	Grey-eyed Greenlet	R, E	dep	M	IF
Corvidae					
<i>Cyanocorax cyanopogon</i> ^{EN}	White-naped Jay	R, E	sem	M	O
Hirundinidae					
<i>Progne chalybea</i>	Grey-breasted Martin	R	ind	L	I
Troglodytidae					
<i>Troglodytes musculus</i>	House Wren	R	ind	L	I
<i>Cantorchilus longirostris</i>	Long-billed Wren	R, E	dep	L	I
Poliopitidae					
<i>Poliopitila plumbea</i>	Tropical Gnatcatcher	R	sem	M	I
Turdidae					
<i>Turdus rufiventris</i>	Rufous-bellied Thrush	R	ind	L	I
<i>Turdus amaurochalinus</i>	Creamy-bellied Thrush	R	sem	L	I
Mimidae					
<i>Mimus saturninus</i>	Chalk-browed Mockingbird	R	ind	L	O

Táxon Name	Common name	Status	HU	DS	TG
Coerebidae					
<i>Coereba flaveola</i>	Bananaquit	R	sem	L	O
Thraupidae					
<i>Compsothraupis loricata</i> ^{EN}	Scarlet-throated Tanager	R, E	sem	H	O
<i>Nemosia pileata</i>	Hooded Tanager	R	dep	L	I
<i>Tachyphonus rufus</i>	White-lined Tanager	R	dep	L	O
<i>Lanio pileatus</i>	Pileated Finch	R	sem	L	IG
<i>Tangara sayaca</i>	Sayaca Tanager	R	sem	L	O
<i>Tangara cayana</i>	Burnished-buff Tanager	R	ind	M	O
<i>Paroaria dominicana</i>	Red-cowled Cardinal	R, E	ind	L	G
<i>Conirostrum speciosum</i> ^{EC}	Chestnut-vented Conebill	R	dep	L	I
Emberizidae					
<i>Zonotrichia capensis</i>	Rufous-collared Sparrow	R	ind	L	G
<i>Ammodramus humeralis</i>	Grassland Sparrow	R	ind	L	FG
<i>Sicalis flaveola</i>	Saffron Finch	R	ind	L	FG
<i>Volatinia jacarina</i>	Blue-black Grassquit	R	ind	L	G
<i>Sporophila lineola</i>	Lined Seedeater	R	ind	L	G
<i>Sporophila albogularis</i> ^{EC}	White-throated Seedeater	R, E	ind	M	G
Cardinalidae					
<i>Cyanoloxia brissonii</i>	Ultramarine Grosbeak	R	dep	M	IG
Icteridae					
<i>Icterus cayanensis</i>	Epulet Oriole	R	sem	M	O
<i>Icterus jamacaii</i> ^{EC}	Campo Troupial	R, E	sem	L	O
<i>Gnorimopsar chopi</i>	Chopi Blackbird	R	ind	L	O
<i>Chrysomus ruficapillus</i>	Chestnut-capped Blackbird	R	ind	L	O
<i>Agelaioides fringillarius</i>	Pale Baywing	R	ind	L	O
<i>Molothrus bonariensis</i>	Shiny Cowbird	R	ind	L	O
<i>Sturnella superciliaris</i>	White-browed Blackbird	R	ind	L	O
Fringillidae					
<i>Euphonia chlorotica</i>	Purple-throated Euphonia	R	sem	L	O

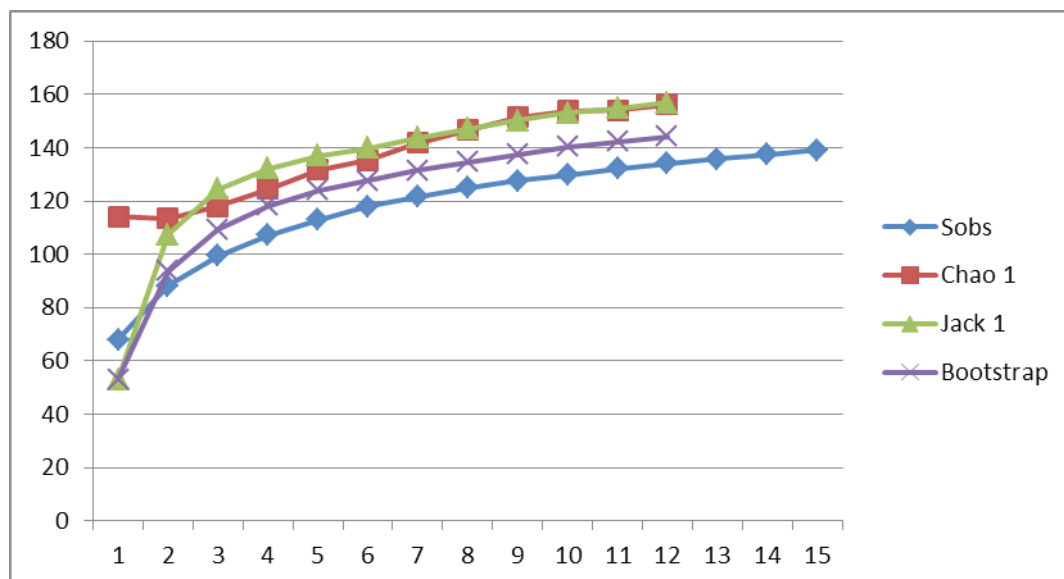


FIGURE 2. Cumulative curve, observed richness, and richness estimators for the avian community recorded at Serra do Pará, Santa Cruz do Capibaribe, Brasil. Axis X corresponds to the number of months, and axis Y to the number of species.

DISCUSSION

The bird community at Serra do Pará and surroundings comprises 27% of bird species recorded for the *caatinga* biome (Silva *et al.* 2003a), and 26% of the 535 bird species recorded for the state of Pernambuco (Farias *et al.* 2008). Species richness for the study area, estimated at 140 species, is within the expected boundaries estimated by Jackknife e Chao 1 estimators, respectively with 144 and 156 species. These results suggest that our sampling effort was enough to record more than 89% of local species richness. Other studies and inventories in the *caatinga* biome have found similar richness patterns. Santos (2004) reported 115 bird species from shrubby *caatinga* formation in southern Piauí; Telino-Júnior *et al.* (2005b) found 145 species in a private reserve (RPPN Fazenda Tamanduá) in the state of Paraíba; Farias *et al.* (2005) recorded, respectively, 165, 94 and 174 species in three areas of high biological importance in the states of Pernambuco, Paraíba and Ceará; Farias (2007) reported 141 species in four different sites in center-western of Pernambuco; and Pereira & Azevedo Júnior (2011) found 138 species in two *caatinga* fragments also in the state of Pernambuco.

The vast majority of bird species in the community studied is composed of resident species. Three migratory species were observed: the Spotted Sandpiper *Actitis macularius*, a visitor from the northern hemisphere; the White-crested Elaenia *Elaenia chilensis*, a visitor from southern South America; and the Lined Seedeater *Sporophila lineola* a migrant from the northeastern Brazil that moves to the Llanos in Venezuela during the dry season (Silva *et al.* 2003, CBRO 2011). Two resident species observed in the study area are known to have regional movements: the Creamy-bellied Thrush *Turdus amaurochalinus*; and the Eared Dove *Zenaida auriculata noronha* (Sick 1997, CBRO 2011). We also observed shorebirds and aquatic species of the families Anatidae, Podicipedidae, Ardeidae, Rallidae, Scolopacidae, and Jacanidae during the rainy season.

Additionally, other species were also recorded only during the rainy season such as the Ash-throated Cuckoo *Casiornis fuscus*, the Dark-billed Cuckoo *Coccyzus melacoryphus*, the Variegated Flycatcher *Empidonomus varius*, the Streaked Flycatcher *Myiodynastes maculatus*, the Greenish Elaenia *Myiopagis viridicata*, the Chestnut-capped Blackbird *Chrysomus ruficapillus*, the Pale Baywing *Agelaioides fringillarius*, the Shiny Cowbird *Molothrus bonariensis*, the Fuscous Flycatcher *Cnemotriccus fuscatus*, and the Blue-black Grassquit *Volatinia jacarina*. Patterns of increase in the number of species during the rains in the *caatinga* biome have also been observed by several other authors (e.g. Telino-Júnior *et al.* 2005b, Farias 2007, Pereira & Azevedo-Júnior 2011).

The majority of birds observed in the community of

Serra do Pará and Distrito do Pará is composed by forest independent and semi-dependent species, as well as of low and medium sensitivity to disturbance caused by human activities. On the other hand, the three species highly sensitive to human pressure are forest semi-dependent (*P. fulvescens* and *C. loricata*) and forest dependent (*A. gounellei*). These results support what has been suggested by Silva *et al.* (2003) and Pereira & Azevedo-Júnior (2011), that most of the bird species in the *caatinga* biome are low to medium sensitivity to anthropogenic activities and that there is a positive correlation between highly sensitive species and forest dependency. According to Stotz *et al.* (1996) bird species associated with dry vegetation forms are relatively tolerant to disturbances as they are more adapted to frequent stress caused by seasonal changes in their environments. In this way, environments that have been through fast, intense and frequent changes in their climatic conditions, such as the *caatinga* biome, are considered to be more resilient than more stable environments (e.g. forests) to changes caused by human activities (Silva *et al.* 2003).

The trophic structure of the community we studied at Serra do Pará was quite similar to that found in other neotropical regions. According to Sick (1997), the tropics usually have a high number of insectivorous species, a pattern that has been observed in different vegetation physiognomies in the *caatinga* (Santos 2004; Farias *et al.* 2005; Pereira & 2011) and also in other biomes such as the *cerrado* (Piratelli & Pereira 2002) and the Atlantic Forest (Durães & Marini 2005). The omnivores represent the second largest group in our study site, comprising species that are favored by temporal resource variation, as they are usually tolerant to phenological fluctuations and therefore, evolved opportunistic foraging habits (Poulin & Lefebvre 1996). The carnivores are the third largest group among the trophic guilds, represented by the families Accipitridae, Falconidae, Strigidae, Tytonidae, Podicipedidae and Cariamidae. Within this group, the first three families are birds of prey, and therefore, considered top predators, known to be good indicators of habitat quality as they are usually sensitive to human disturbances (Newton 1979, Bildstein 2001, Granzinoli & Motta-Júnior 2010).

During the entire study, we recorded the presence of the Velvety Black-Tyrant *Knipolegus nigerrimus* at Serra do Pará, adding a new record of this species to the southern “agreste” of Pernambuco (Las-Casas & 2008). This species is restricted to the eastern part of the Brazilian territory and, despite its disjoint distribution, occurring in the south, southeast and northeast regions, it was recently recorded by Farias *et al.* (2008) in the semi-arid of Pernambuco.

According to local people, two species were commonly seen in the region about two decades ago, the Yellow-faced Siskin *Sporagra yarrellii*, and the Blue-

fronted Amazon *Amazona aestiva*, however, we not only failed to find these species in our study site but also were informed by locals about the extinction of *S. yarrelli* in the region of Distrito do Pará.

The archaeological value of the region associated with the diverse community of birds, including endemic and migratory species, makes the Serra do Pará and surroundings an important site for the conservation of the *caatinga* biome.

Reserves are among the most effective tools for nature conservation, as they protect biological diversity, genetic diversity, threatened species and natural landscapes. We feel that the establishment of a reserve of less restrictive use (e.g. Environmental Protection Area – APA) in the Serra do Pará could represent an important benefit to the area, potentially reducing human disturbance such as selective logging and hunting and contributing to sustainable activities already implemented in this important archaeological and touristic site of the *caatinga*.

ACKNOWLEDGEMENTS

We are grateful to CAPES for providing financial support to FMGLC and to Thyago Albuquerque Damascena de Almeida for his valuable contribution to statistical analysis.

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Associate Editor: Marcos Pérsio Dantas Santos