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AVIFAUNAL DIVERSITY IN A MANGROVE RESERVE IN GUYANA, SOUTH AMERICA

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Abstract: The Government of Guyana is actively promoting mangrove conservation through the Guyana Mangrove Restoration Project (GMRP). Given that the extent of mangroves has declined over the years in Guyana the mangrove rehabilitation exercise is critical. In Guyana little work has been done specifically studying avifaunal diversity in mangrove ecosystems. This study examined the avifaunal diversity of the mangrove ecosystem at one mangrove reserve, the Wellington Park Mangrove Reserve. Observational and walking transect methods were used to conduct the study. A total of 1184 birds comprising thirty-seven (37) species were observed during the study period. This represented seven (7) Orders, fourteen (14) Families and thirty seven (37) Genera. The family with the greatest number of species was the Ardeidae with seven species, followed by Tyrannidae and Accipitridae with five species each. Three families had three species each, two families had two species each and five families had one species each. Because of the limited studies and data available on avifauna in mangrove ecosystems in Guyana this research could form an important baseline data set for future studies on avifaunal diversity in mangrove ecosystems in Guyana.
Keywords: Avifaunal species, mangroves, Wellington Park Mangrove Reserve, Guyana, South America.

BACKGROUND

Guyana is located in the northeastern corner of South America and is divided into five main bio-physical regions: the Low Coastal Plain, the Pre-cambrian Lowland Region, the Pakaraima Highlands, the Southern Upland Region and the Interior Savannahs. The coastline is flat and low-lying and is a narrow strip of land of varying width that stretches approximately 425km. This coastal area is below mean high tide levels and consists of natural and man-made sea-defences, mud banks, mangroves and sand flats all of which serve to protect the coast from flooding (Daniel, 1984). There is constant accretion taking place and have been and are still being colonized by mangroves, mainly black mangrove, *Avicennia germinans*. With pronounced human activity in this area, mangroves are under threat not only from natural processes but also from anthropogenic activities such as kitchen gardens and livestock rearing (Pastakia, 1991).

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Although the taxonomic diversity and ecological importance of mangroves is well documented and well known around the world (Alongi, 2002; Blasco and Aizpuru, 2002) not much has been done in Guyana in terms of studies of avian diversity in mangrove ecosystems. The present study was undertaken to address this dearth of information especially at a time when much mangrove rehabilitation is taking place and a major rehabilitation project for mangroves, the Guyana Mangrove Rehabilitation Project (GMRP) is being undertaken in Guyana.

Wellington Park Mangrove Reserve (WPMR) is found in the East Berbice-Corentyne Administrative Region (Region 6) one of ten (10) administrative regions in Guyana. Mangrove Reserves such as the Wellington Park Mangrove Reserve are being developed to promote coastal protection while preserving floral and faunal diversity among mangroves in Guyana

MANGROVE SPECIES AND MANGROVE ASSOCIATES IN GUYANA

Three true floral species of mangroves from the taxonomic class Dicotyledonae and three families (Avicenniaceae, Rhizophoraceae and Combretaceae) are currently recognized in Guyana; the black mangrove (*Avicennia germinans*), the red mangrove (*Rhizophora mangle*), and the white mangrove (*Laguncalaria racemosa*). Research by Holowell (2000) listed *Rhizophora racemosa* as occurring in the Barima-Waini region of the country while herbarium records show the possibility of a fourth species, *Rhizophora harisonii.* Although the FAO 2007 document 'The World's Mangroves 1980-2005' reports that *Avicennia schaueriana* is present in Guyana, there is no herbarium evidence in Guyana to support this latter claim. There are fifteen common mangrove associates recorded in the WPMR belonging to eleven families with *Conocarpus erectus* and *Batis maritima* being the most common. *Batis maritima* is present in tidally inundated areas while *Conocarpus erectus* is found on the higher ground.

Over the past twenty-five years the total area covered by mangrove forests in Guyana has declined (FAO 2007) and it is often assumed that natural as well as anthropogenic factors are mainly responsible for this decline. Recent estimates provided by the Guyana Forestry Commission (GFC) using 2009 data has shown that the estimated regional coverage of mangroves in the country is approximately 22,632.4 hectares; representing a marked decline from estimates of 91,000 hectares in 1980 and 80,000 hectares in 2005.

AVIFAUNA AND MANGROVES IN GUYANA

Although mangrove ecosystems are known to be among the most productive ecosystems in the world (Mann, 1982) serving as major habitats while providing shelter and feeding sites for many faunal species (Mestre, Krul and Moraes 2007), there is little published information about avifauna in mangroves in Guyana. Most of the available information, about bird species in mangroves in Guyana, comes from Singh and Fernandes, 2004; Braun, Finch, Robbins and Schmidt, 2007); Prince and Bernard, 1997; Bayney and Da Silva, 2005. The afore mentioned documents focused in general on birds of Guyana and birds of Guyana's coast and present checklists of birds with summary information on their habitats, biogeographical affinities, migratory behavior and abundance (Braun, et al 2007). The first edition of the Braun, et al 2000 checklist included 786 avian species while the second list by Braun, et al in 2007 included 814 avian pecies. The work by Braun, et al 2000 and Braun, et al 2007) built on the long-out-of-print work of Snyder (1966) who listed 720 avian species for Guyana (Braun, et. al. 2007).

Pastakia (1991) reported that avifauna is rich within the mangal and the inland pans and lagoons in Guyana. Among the main species noted were the water-fowl inclusive of various herons and egrets, carnivorous birds inclusive of the snail kite and the turkey vulture. Pastakia (1991) also noted that although not identified, woodpeckers and owls have been seen within the mangal in coastal areas in the Pomeroon. It has also been suggested that the pans and lagoons may possibly be areas for wintering migratory birds, although the effect of human impact so close to the shore in most areas of Guyana may tend to reduce the number of places where such over-wintering may occur (Pastakia, 1991). Within the scrub vegetation and the pan areas there is expected to be a number of terrestrial birds, taking up all available niches and many of these species have been recorded by Singh and Fernandes (2004) and Braun, et al (2007).

GOAL AND OBJECTIVES OF STUDY

The goal of this study was to prepare an inventory of the avifauna observed in the Wellington Park Mangrove Reserve, an area that was recently identified as a site for mangrove rehabilitation in Guyana. It is thought that the results of this study could serve as a justification in support of the conservation and restoration efforts of the Guyana Mangrove Restoration Project in terms of habitat function of mangroves for avifauna. The objectives of the study were to:

- prepare an inventory of avian species associated with the Wellington Park Mangrove Reserve.
- undertake data collection that would be used to inform decision making regarding the Wellington Park Mangrove Reserve.

METHODOLOGY

The study site was divided into four main areas based on vegetation and habitat types and walking transects were demarcated (Table 1).

Table 1: Description of walking transects within the study site

Transect	Description of Areas
1	Area consisted of a patch of mature mangrove trees, *Avicennia germinans*.
2	This area followed the existing coastline with juvenile recently planted mangrove, *Avicennia germinans,* trees. The mudflat was extensive and very visible. Area is directly inundated by tidal changes.
3	Area consisted of predominantly crab grass, *Batis maritima*, and some open muddy areas with numerous burrowing crabs. There were no mangrove trees in this immediate area.
4	Relatively mature mangrove vegetation, *Avicennia germinans,* Includes shrubby vegetation with mangrove associates and other coastal vegetation.

Birds were surveyed for one day each week over a six month period between June and November. The survey was conducted on foot using a walking transect method. Binoculars were used for observing the birds. Observations were made early in the mornings, between 06.00 hours and 07.30 hours and in the evenings between 17.00 hours and 18.30 hours. Birds were identified using references from identification guides and books on avifauna of Guyana (Snyder, 1966; Singh and Fernandes, 2004 and Braun, et al 2007). The relative abundance of species was determined using a combination of the scheme (Table 2) which was developed by Khan (2005) and the coding system (Table 3) that was developed by the Smithsonian Institution and used by Braun, et al (2000).

Table 2: Scheme for determining relative abundance of bird species (Khan (2005)

RELATIVE ABUNDANCE	**FREQUENCY OF OBSERVATION**
Very common	Seen on 75 – 100 % of visits
Common	Seen on 50 - 74 % of visits
Uncommon	Seen on 25 – 49 % of visits
Rare	Seen on < 25% of visits

Table 3: Scheme for determining relative abundance of each bird species based on the Smithsonian Institution's coding system

CODE	**RELATIVE ABUNDANCE**	**DESCRIPTION**
U	Uncommon	Small numbers recorded, but not encountered daily
F	Fairly common	Less than five (5) individuals recorded daily
C	Common	Observed between one (1) and ten (10) individuals daily
A	Abundant	Observed more than ten (10) individuals daily
O	Status uncertain	Observed once

RESULTS

The total number of birds observed over the period of study was 1184. Thirty-seven (37) species of birds were recorded from seven (7) orders, fourteen (14) families and thirty seven (37) genera. The greatest representation of species was from the Order Passeriformes, which had 37.80% of all species recorded followed by Pelicaniformes with 21.60% of all species recorded. The Caprimulgiformes contained the least recorded number of species with 2.80%. The family with the greatest number of species was the Ardeidae with seven (7) species, followed by Tyrannidae and Accipitridae with five (5) species each. Three families had three (3) species each, three families had two (2) species each and five families had one (1) species each. The most abundant species recorded were the Rufous Crab-hawk (*Buteogallus aequinoctialis*), Great egret (*Ardea alba*), greater kiskadee (*Pitangus sulphuratus*), Scarlet Ibis (*Eudocimus ruber*) and the washer woman or pied water tyrant (*Fluvicola pica*). Twenty-four (24) of the thirty-seven (37) species of species were observed during all of the

site visits, seven (7) species were observed on four of the six site visits, three (3) species were observed on three of the site visits and three (3) were observed on two of the six site visits.

The percentage relative abundance of the species was recorded based on categories of abundance after Khan (2005) and Braun, Finch, Robbins and Schmidt (2000) and are shown in Figure 1.

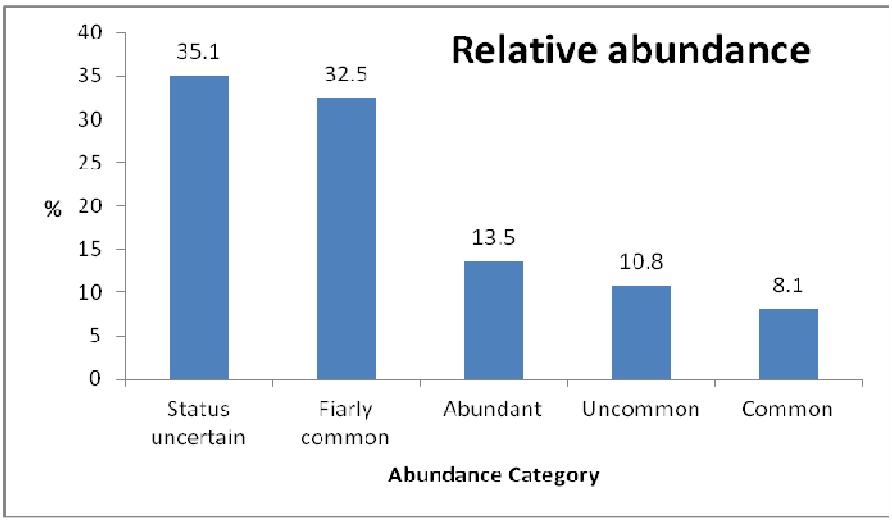

Figure 1: Relative abundance of observed species

The greatest proportion of abundance was recorded for the Status Uncertain category with (35.10%) followed by the Fairly Common category with 32.50%, Abundant (13.50%), Uncommon (10.80%). The abundance category Common had the least percentage of species with 8.10% of the species recorded.

Four families, Ardeidae (24.8%), Accipitridae (17.7%), Tyrannidae (17.5%) and Threskiornithidae (10.8%) accounted for 70.8% of the total number of birds observed. The next highest families were Scolopacidae (5.9%), Icteridae (5.7%) and Cuculidae (5.4%) which together accounted for 17% of the total birds observed. The remaining 12.2% were accounted for by the remaining seven (7) families: Alcedinidae, Emberizidae, Jacanidae, Nyctibidae, Parulidae, Traupidae and Troglodytidae.

DISCUSSION

The survey of avifauna at Wellington Park Mangrove Reserve has resulted in the recording of thirty-seven (37) different species of birds across the four sub-divided habitats observed: old growth mangroves, coastal beach and mudflat area with newly planted mangroves, aquatic waterway and *Batis maritima* dominated area.

It should be noted that there are no contiguous forest areas neither are there any forests in close proximity to the WPMR. Hence there is little chance of this area sharing species with forested areas that could lead to higher numbers of species and greater species diversity and density.

The number of avifaunal species observed in the replanted area, increased from October through to December. During the period of study the birds frequenting the beach mudflats with newly planted mangroves were also observed to fluctuate in numbers depending on the tide. Changes in the tidal cycles may have exposed some advantageous foraging sites for the birds to feed. It is generally known that shorebirds feed on a variety of small invertebrates and insects present in mudflat areas (Robert, McNeil, and Leduc, 1989). No temporal separation was observed since many different bird species were observed foraging together on the exposed mudflats. This may be an indication of either of two situations: either the food available was adequate to supply the needs of the varied bird populations, or, there was some amount of trophic separation between species.

Raghukumar and Anil (2003) notes that biodiversity and community structure are important determinants of ecosystem functioning. Given this fact it is important for continuous monitoring of the area so that changes in species could be detected. It has been noted by researchers that avifauna are not only sensitive to changes in the habitat but are also very good and useful bio-indicators of environmental and ecological health (Ripley, 1978; Morrison, 1986; Diamond and Filion, 1987; Pawar, 2011).

Herons and egrets were present in greater numbers over the entire study area. This is in keeping with findings reported by Kumar and Kumara (2011) who stated that "Herons, egrets and ibises are the most conspicuous group of birds that are found in mangroves". This is probably linked to the fact that there may have been abundant food sources in a relatively safe habitat. Most of these species of Ardeidae feed on fishes and crabs which were very abundant in the study area in all of the subhabitats, the beach mudflat and the area dominated by *Batis maritima*. Of the Ardeidae the Great Egret (*Ardea alba*) was the most abundant and the Little Blue Heron, *Egretta caerulea*, was the most common in this family. The scarlet ibis (*Eudocimus ruber*) was the only member of the family Threskiornithidae that was recorded and based on the numbers of this species observed over the study period this species was determined as being abundant. The Rufous Crab Hawk (*Buteogallus aequinoctialis*) was the most abundant of the Accipitridae with the snail kite (*Rostrhamus sociabilis*)and the roadside hawk (*Buteo magnirostris*) being the most common. This is not too surprising given the

prevalence of food for the Rufous Crab-hawk and the proximity to freshwater habitats where snails abound as food for the snail kite.

CONCLUSION

This preliminary study could serve as a baseline for further more detailed and systematic studies of avifauna in mangrove ecosystems in Guyana. The ecological conditions at Wellington Park Mangrove Reserve appear to be good for supporting a fair diversity of avifauna. Since no other reports are available for this location the information gathered during this study can be taken as a baseline for further study and to learn about the status of avifaunal species at the Wellington Park Mangrove Reserve. Such studies will be beneficial since the Wellington Park Mangrove Reserve is in close proximity to a number of coastal villages where residents make use of coastal areas for agriculture and livestock rearing. These are activities which can pose direct and indirect threats for the mangroves at Wellington Park Mangrove Reserve.

Given the results and observations made during this study it may be concluded that the mangrove environment at Wellington Park is important to local avifauna, most of which are resident species since only one migrant species was observed during the study period.

The study of avifauna populations at Wellington Park Mangrove Reserve and other mangrove areas will help to better understand and appreciate the roles mangroves play in maintaining healthy ecosystems and associated biodiversity populations. Further research should be conducted to record changes over time of the listed species to determine any change in the bird populations at the location. In an effort to gather more data on the bird populations at Wellington Park Mangrove Reserve further research should be conducted towards providing population counts of keystone and bio-indicator species for the area.

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