

A comparison of terrestrial large-mammal communities between Brownsberg, Raleighvallen and Coesewijne, Suriname

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Research funding: Flemish Inter University Counsel (VLIR) (partly): funding to project 5

Abstract

Data on terrestrial large-mammal communities were collected in the Brownsberg Nature Park, Raleighvallen/ Voltzberg area of the Central Suriname Nature Reserve and the Boven Coesewijne Nature Reserve. In the Brownsberg Nature Park we worked on the plateau, at approx. 500m elevation, in an area with limited illegal hunting. The Raleighvallen/ Voltzberg area is a lowland tropical rainforest, where hunting does not occur. The Boven Coesewijne area is a mosaic of savannas and savanna forests with hunting carried out by the local community. The mammal communities of Brownsberg and Coesewijne were most similar, probably related to the relative dryness of these areas as compared to the swampy Raleighvallen site. Several species that were only observed at Raleighvallen show a preference for swamps. Hunting in the Coesewijne area was reflected in low numbers of ungulates and large rodents. On the contrary, carnivore diversity in Coesewijne was high.

Key words: mammal community, habitat, hunting pressure, Suriname, camera trapping

Introduction

The mammal fauna of Suriname is relatively well-known, due to collections made during many expeditions between 1800 and 1980 (Holthuis, 1959, Hoogmoed, 1973, Genoways *et al.*, 1982). In 1978, the mammals of Suriname were treated in a monograph by Husson. However, ecological work on mammals remained limited to monkeys (e.g. Mittermeier & Roosmalen, 1981) and giant otters (e.g. Duplaix, 1980) for a long time. This was mainly due to the secretive habits of most terrestrial mammals. The development of camera traps in the 1980's made it possible for the first time to focus on ecological questions regarding terrestrial mammals. During a research project on the impact of eco-tourism on large mammals, many data were collected with camera

traps at Brownsberg Nature Park and the Raleighvallen/ Voltzberg area of the Central Suriname Nature Reserve. A small research project for the BSc course Biodiversity and Monitoring of the Faculty of Technology of the University of Suriname provided the opportunity to extend the mammal observations to the Boven Coesewijne Nature Reserve. The three areas differ in habitat and in hunting pressure. From our own observations over a period of more than 20 years it is clear that the distribution of mammal species in Suriname is primarily based on specific habitat characteristics and human disturbances such as hunting. Here we compare the terrestrial large-mammal communities of the Brownsberg Nature Park Raleighvallen/ Voltzberg area and Boven Coesewijne Nature Reserve, and expect to find extensive differences in mammal communities

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Available on-line July 27, 2011

between these areas based on differences in habitat and hunting pressure.

Methodology

Camera traps (Stealthcam STC-DVIR5 and STC-V650MTR) were established on infrequently used roads and trails in all three areas. The type of camera trap used is triggered by infrared rays. At one triggering three photographs were made, after which the camera remained inactive for 3 minutes. Cameras were positioned at an average height of 60 cm. At Brownsberg Nature Park an average of six camera traps were set for 6 days in sequence and were checked regularly, because of the large number of people present in the area. The 6 day sequence was repeated four times. At Raleighvallen/ Voltzberg 13 camera traps remained in the field for three months and were serviced every month. At Boven Coesewijne 10 cameras remained in the field for a month and were serviced every week. The resulting number of camera days differed considerably between the three study areas (Raleighvallen 786, Boven Coesewijne 291 and Brownsberg 114 days). To be able to make a representative comparison between these areas, animal numbers were re-calculated to 100 camera-days.

Photographs were analyzed for the presence of mammals and photographs were improved with Adobe Photoshop Elements and Nikon Capture NX2. Mammals were identified with Emmons (1997). Data analysis was carried out with Microsoft Excel and the software Community Analysis Package 4 and Species Diversity & Richness 4 of PIsces. Community differences were statistically tested with ANOSIM (Clarke, 1993). Similarity between communities was calculated with the Bray Curtis similarity measure (Bray & Curtis, 1957). Evenness and diversity were calculated with Simpson's measure of evenness and Simpson's diversity index (Magurran, 2004).

Study areas

Brownsberg is a 500 m high bauxite plateau with a length of approximately 20 km and an average width of 10 km. It is located at the northwestern corner of the Brokopondo Reservoir, 90km south of Paramaribo. The Brownsberg Nature Park was established in 1969, has a size of 12,200 hectares and covers most of the plateau and slopes (Ouboter, 2002). The mountain is almost fully covered by mesophytic tropical rainforest, although small areas of mist forest and rock savanna are present as well. Officially the park is fully protected and hunting is not allowed, nevertheless illegal hunting is known to occur. The main threats to the park are the potential future mining of bauxite (Brownsberg is also a mining

concession of Suralco) and legal and illegal gold mining, mostly carried out at the foot of the mountain (Ouboter, 2002), but in recent years extending to the lower slopes. Illegal hunting occurs infrequently on the plateau, but hunting pressure increases near the northern foot of the mountain due to the vicinity of the large village of Brownsweg. Hunting pressure also increases near the gold mining localities on all sites of the mountain. At Brownsberg, most camera traps were set on the plateau, with two camera locations placed at Witi Creek on the eastern foot of the mountain.

The Raleighvallen/ Voltzberg area of the Central Suriname Nature Reserve (CSNR) is located at the Coppename River in the central area of Suriname. Before the establishment of the CSNR in 2000, the area was a nature reserve on its own since 1966 (Mohadin, 1993). The main vegetation in this area is lowland tropical rainforest, including swamp forests of the palm *Euterpe oleracea*, but some extensive inselbergs and associated rock savannas also occur there. Although the local communities of Witagron and Kaaimanston are allowed to hunt in certain parts of the CSNR, no hunting occurs in the study area. In this area cameras were located in lowland forest west of the Coppename River and in lowland forest surrounding the inselberg Voltzberg, east of the Coppename River. One camera was set up in a rock savanna on the northern part of the Voltzberg.

The Boven Coesewijne Nature Reserve was established in 1986 based on vegetation inventories carried out by Teunissen (1978). The area was protected because it contains the largest unbleached brown-sand savanna of Suriname, many additional ecosystems and a black water river with healthy populations of caimans, giant otters and manatees. The local community of Bigi Poika is allowed to hunt in the area for subsistence, and we indeed encountered hunters in the area on a regular basis. In the Boven Coesewijne Nature Reserve cameras were positioned along unpaved roads in savanna forest, savanna and in edge situations between forest and savanna.

Results

In all three areas a total number 177 specimens belonging to 13 species of large to medium-sized mammals was captured on photographs (Tab. 1, Fig. 1). The most common species in all three areas is the Red-Rumped Agouti, in Brownsberg followed by the Red Brocket Deer and the Jaguar; in Boven Coesewijne by the Common Opossum and the Jaguar and in Raleighvallen by both the Red Brocket Deer and the Brazilian Tapir (Fig. 1). The most common

predator captured on the photographs is the Jaguar. Raleighvallen/ Voltzberg showed the highest number of species (10) and the highest diversity (Tab. 2). At Boven Coesewijne 9 species were recorded, but due to the high number of agoutis compared to other species, evenness and diversity is lowest (Tab. 2). The three communities differ significantly in community structure (ANOSIM, $p=0.001$), but not when compared pair-wise (ANOSIM, $p=0.5$). Brownsberg and Boven Coesewijne are most similar (0.36), while Raleighvallen/ Voltzberg versus Brownsberg differ 0.58, and Raleighvallen/ Voltzberg versus Boven Coesewijne 0.62.

The main differences between localities are that herbivores are most abundant at Raleighvallen and least abundant at Boven Coesewijne, except for the Red-Rumped Agouti (Fig. 1). Agoutis, deer, peccaries and tapir (Fig. 2) are most abundant at Raleighvallen. However, predators are least abundant and diverse at Raleighvallen, but show their highest abundance in the other two areas and the highest diversity at Boven Coesewijne, with jaguars (Fig. 3) and ocelots (Fig. 4) being the most common. These differences in community composition are well illustrated in a Principle Component Analysis Plot (Fig. 5).

Table 1. Scientific and common names and number of specimens of large mammal species captured on cameras at Brownsberg, Raleighvallen/Voltzberg and Boven Coesewijne

| Scientific name | Common name | Brownsberg | Raleighvallen | Boven Coesewijne | Total number of specimens |
|-----------------------------------|----------------------------------|------------|---------------|------------------|---------------------------|
| CARNIVORES | | | | | |
| <i>Nasua nasua</i> | South American Coati | 0 | 0 | 1 | 1 |
| <i>Eira barbara</i> | Tayra | 0 | 0 | 1 | 1 |
| <i>Leopardus pardalis</i> | Ocelot | 2 | 0 | 4 | 6 |
| <i>Puma concolor</i> | Puma | 3 | 2 | 1 | 6 |
| <i>Panthera onca</i> | Jaguar | 5 | 2 | 6 | 13 |
| HERBIVORES & OMNIVORES | | | | | |
| <i>Didelphis marsupialis</i> | Common Opossum | 0 | 2 | 6 | 8 |
| <i>Dasybus kappleri</i> | Great Long-nosed Armadillo | 0 | 2 | 0 | 2 |
| <i>Dasybus novemcinctus</i> | Nine-banded Long-nosed Armadillo | 2 | 3 | 0 | 5 |
| <i>Tapirus terrestris</i> | Brazilian Tapir | 0 | 20 | 0 | 20 |
| <i>Tayassu pecari</i> | White-lipped Peccary | 0 | 9 | 0 | 9 |
| <i>Mazama americana</i> | Red Brocket Deer | 5 | 19 | 1 | 25 |
| <i>Agouti paca</i> | Paca | 3 | 7 | 1 | 11 |
| <i>Dasyprocta agouti</i> | Red-rumped Agouti | 14 | 34 | 20 | 68 |
| Total number of specimens | | 34 | 100 | 41 | 175 |

Table 2. Number of species, Simpsons diversity index and Simpsons evenness for the three study areas

| Study area | Number of species observed | Simpsons diversity index D | Simpsons evenness E |
|------------------|----------------------------|----------------------------|---------------------|
| Brownsberg | 7 | 4.71 | 0.67 |
| Raleighvallen | 10 | 5.02 | 0.50 |
| Boven-Coesewijne | 9 | 3.63 | 0.40 |

Figure 1. Number of specimens of large mammal species captured on cameras per 100 camera days at Brownsberg, Raleighvallen/ Voltzberg and Boven Coesewijne

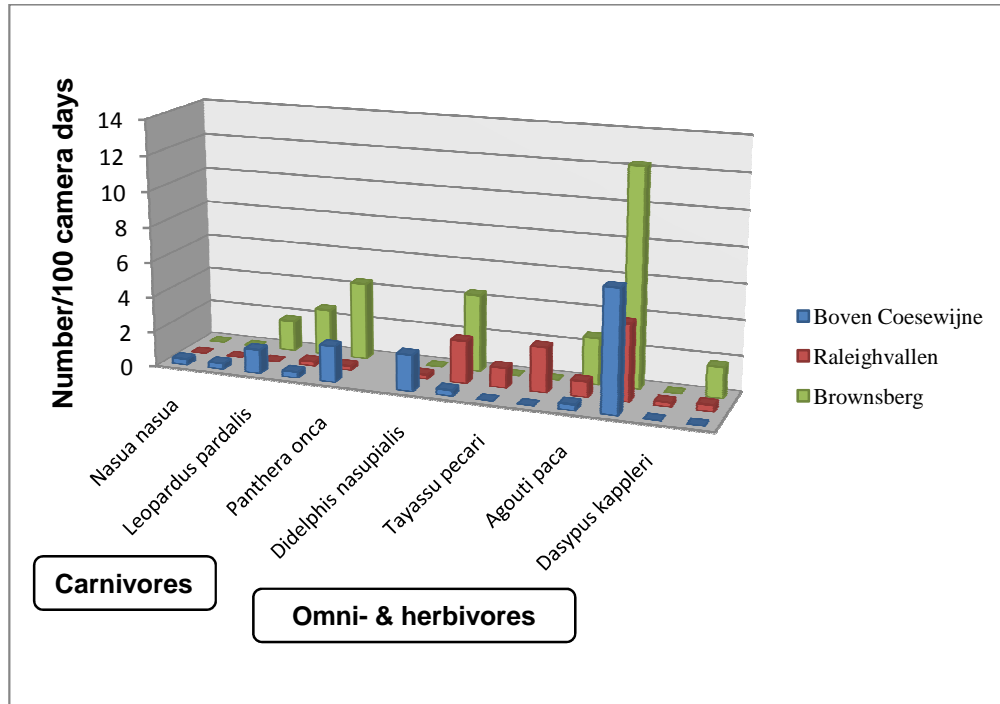


Figure 2. Tapir photographed in a palm swamp at the foot of Voltzberg on March 13th 2010 at 8:01 pm.



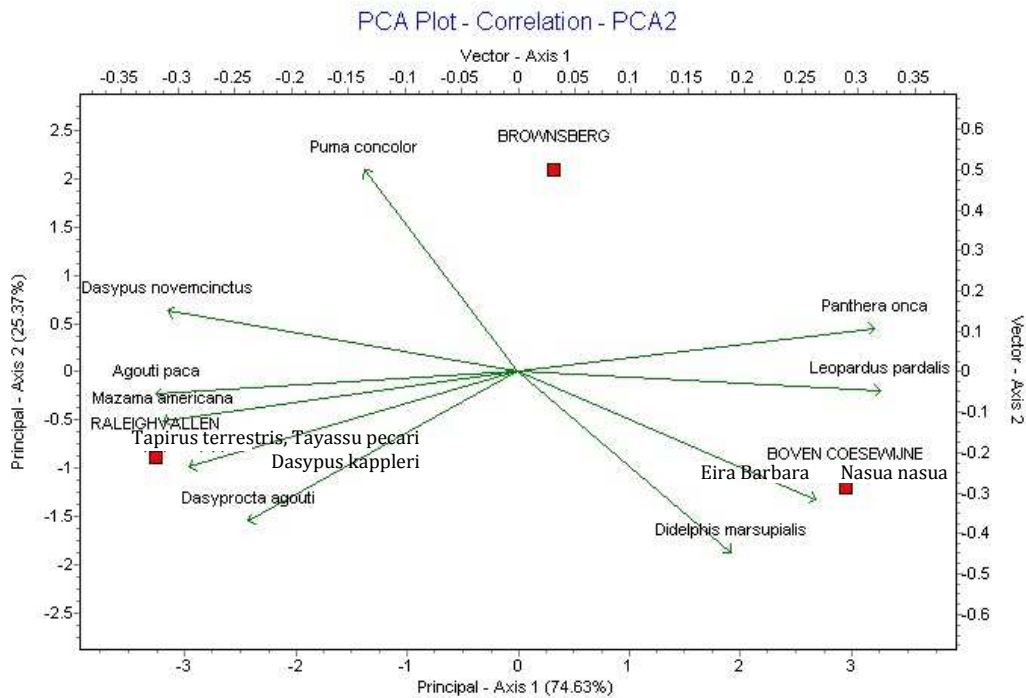
Figure 3. Jaguar photographed in an edge situation between savanna forest and savanna at Boven Coesewijne Nature Reserve on June 3rd 2010 at 3:21 am.



Figure 4. Ocelot photographed in a savanna forest at Boven Coesewijne Nature Reserve on June 1st 2010 at 10:21 pm.



Figure 5. Principle Component Analysis of large mammal species captured on cameras at Brownsberg, Raleighvallen/ Voltzberg and Boven Coesewijne



Discussion

Unfortunately, data were only derived from camera trapping, and consequently large proportions of the mammalian communities are missing (most marsupials and smaller rodents, bats and primates). Still the comparison of the

community of large terrestrial mammals of the three different areas provides some interesting results.

The differences in habitat seem to be most pronounced between the Boven Coesewijne area, with large open savanna areas and the two other,

mostly forested areas. Eisenberg (1990) indicates that savannas have a lower species richness than tropical rainforests. From our data, these differences are only visible in the relatively low similarity between Raleighvallen and Boven Coesewijne, but not at all in the high similarity between Brownsberg and Boven Coesewijne. Also, not a single, typical savanna species (like White-tailed Deer or Crab-eating Fox) was observed at Boven Coesewijne. Habitat differences seem to be more pronounced between communities of relatively swampy lowland forests and much dryer areas such as savannas and bauxite plateaus. The Brazilian Tapir and White-lipped Peccary prefer to forage in swamps (Emmons, 1997), and although known to occur in all three localities (Ouboter, pers. obs.), were only found at Raleighvallen during this study. Red Brocket Deer and Paca were much more abundant at Raleighvallen, which is probably also related to palm swamps with many fruiting palms. The savannas in the Coesewijne area are relatively small and forest is always nearby. Therefore an effect of low biomass in savannas resulting in low species richness of mammalian communities (Eisenberg, 1990) was not found in the Coesewijne savannas.

Hunting pressure is highest in the Boven-Coesewijne Nature Reserve and lowest in the Raleighvallen/ Voltzberg area. This is reflected in the low number of herbivorous mammals in the Coesewijne area. Favorite mammal species targeted by hunters are all herbivores, including tapir, peccaries, deer, pacas and agoutis. The only herbivore that is still quite numerous in the accessible areas of the Boven Coesewijne Nature Reserve is the Red- Rumped Agouti.

The decline of herbivorous mammals in the Boven Coesewijne Nature Reserve is not reflected in the abundance and diversity of carnivores in the area. Most carnivores prey on smaller animals of course, but several jaguars and one puma were also observed in the area. These larger cats preferably prey on agoutis, pacas and deer (Janson & Emmons, 1990). Their survival is possible because of the low population pressure from the nearby village of Bigi Poika, having less than 300 inhabitants. This is also observed in other areas in South America (Esteban Payan, pers. comm). In these hunted areas the large cats probably mainly eat agoutis, which were still abundant in Coesewijne. In addition they may shift their diet to smaller mammals like opossums, and to terrestrial birds, such as trumpet birds and black curassow.

Acknowledgements

This study was financially supported by the Flemish Inter University Counsel (VLIR).

Permits for the research were provided by the Nature Conservation Division of the Ministry of Planning and Land Management. Rawien Jairam, Shamita Sahdew, Kenneth Wan Tong You and Usha Satnarain assisted in the field at Brownsberg and Raleighvallen/ Voltzberg.

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