RELATIVE ABUNDANCES OF PECCARIES IN AREAS OF DIFFERENT HUMAN PRESSURES WITHIN THE BENI BIOSPHERE RESERVE, BOLIVIA

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Abstract: Relative abundances were compared for two species of peccary (*Tayassu pecari* and *T. tajacu*) and four species of diurnal primates (*Ateles paniscus chamek, Cebus apella, Saimiri sciureus boliviensis* and *Alouatta seniculus*) in the Beni Biosphere Reserve, Bolivia. The study area was divided into three zones based on differences in type and intensity of human interference. Patterns of abundance for different species are discussed relative to human uses in the three zones.

Keywords: Peccary, Primates, Human activity, Hunting pressure, Conservation.

1. Introduction

The Beni Biosphere Reserve covers 135,000 hectares within the Beni alluvial plains of Bolivia and comprises an archipelago of sub-humid forest surrounded by seasonally inundated savannah. These forests are predominantly low-lying seasonally inundated or gallery forests in which lianas and fast growing species such as *Cecropia* spp., *Ficus* spp., *Scheelea* spp. and *Astrocaryum* spp. predominate (Ribera, 1988).
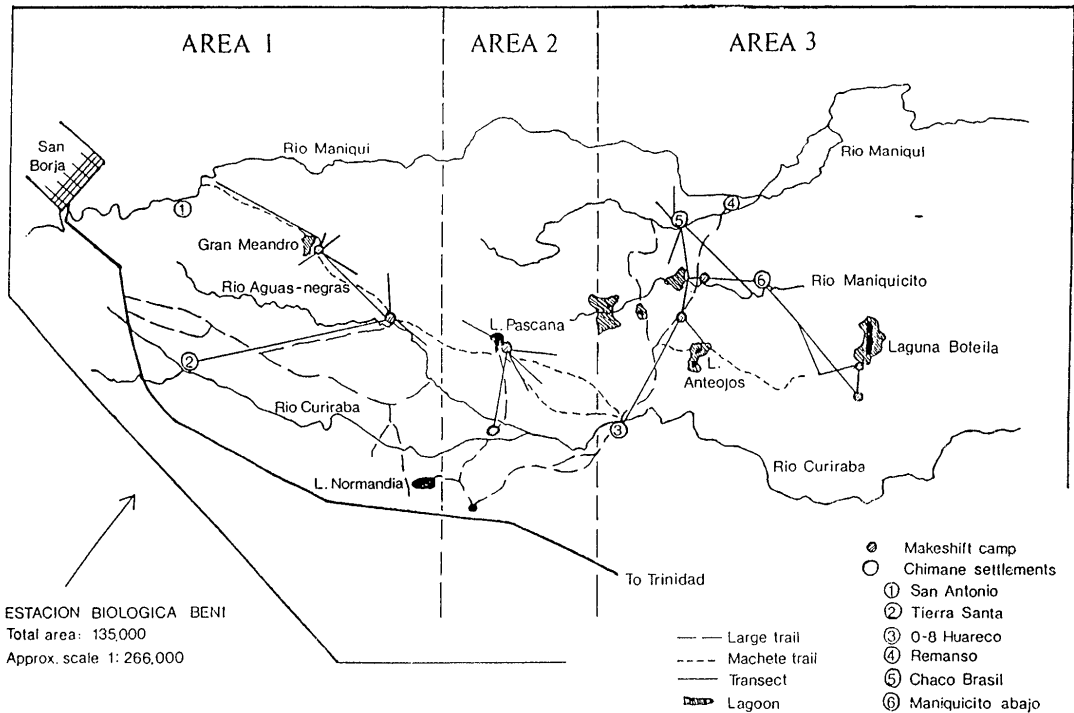Both indigenous Chimane and colonists inhabit the reserve and mammal populations are especially affected by this human presence through the direct effects of subsistence hunting. Colonist settlements are found along the banks of the Maniqui river, whereas Chimane settlements are more scattered through the reserve. In 1989 there were approximately 800 Chimane living in the reserve (Chicchón, 1992).
As documented through out Latin America (Redford & Robinson, 1991) peccaries are important prey species for subsistence hunters within the Beni Biosphere Reserve. Chicchón (*op. cit.*) found that peccaries account for almost one fourth of the total number of game animals obtained, followed by rodents and then primates. Peccaries and primates, especially the black spider monkey, *Ateles paniscus chamek*, are highly desired species by the Chimane. Colonists also favour peccary meat but rarely consume primates.
Due to the predominance of concern over deforestation more cryptic but possibly equally destructive effects of "low impact" forest activities may have been overlooked (Redford, 1992). Through the effects of subsistence hunting, large animals may become ecologically extinct despite the apparent integrity of the forest vegetation. Long term ecological effects of defaunation may be considerable because of their important role as seed and seedling predators, seed dispersers or pollinators (Janzen, 1970; Smythe, 1986; Terborgh, 1988). Peccaries are important seed predators that can consume the hard seeds of palms such as *Astrocaryum* spp. and *Socratea* spp. that other terrestrial frugivores are unable to crack (Kiltie & Terborgh, 1983). The white-lipped peccary, *T. pecari,* is also particularly interesting because of its atypical behaviour, for a forest ungulate, of forming large herds. White-lippeds are found in herd of 50-200 individuals and must therefore cover great distances in order to find sufficient food (Kiltie & Terborgh *op. cit.*). Although their wide-ranging behaviour buffers them against local habitat disturbances it renders them more vulnerable to habitat fragmentation.
In the light of these considerations, baseline information on game animal densities was a priority for the reserve administrators. In addition our study sought to provide early indications of any variation of hunting impact by comparing densities across the zones within the reserve.

AREA 1   AREA 2   AREA 3

San Borja

Rio Maniqui

Gran Meandro

Rio Aguas-negras

① San Antonio

② Tierra Santa

L. Pascana

Rio Curiraba

③ 0-8 Huareco

L. Normandia

To Trinidad

Rio Maniqui

④

⑤

⑥   Rio Maniquicito

L. Anteojos

Laguna Boteila

Rio Curiraba

ESTACION BIOLOGICA BENI
Total area: 135,000
Approx. scale 1: 266,000

⊘   Makeshift camp
○   Chimane settlements
①   San Antonio
②   Tierra Santa
③   0-8 Huareco
④   Remanso
⑤   Chaco Brasil
⑥   Maniquicito abajo

— — Large trail
- - - Machete trail
—— Transect
▱▱ Lagoon

Map. 1

2. Methods

Research was conducted between July and September 1990. For censusing purposes the reserve was divided into three zones on the basis of perceived differences in the type and intensity of human interference (Map 1). Zone 1 comprised the area closest to San Borja, which is characterized by the greatest number of human settlements, increased encroachment of mestizo agriculturalist and illegal logging. As well as suffering the most habitat disturbance and hunting impact, this area has been settled for at least fifty years. Zone 2 comprised a strip in the centre of the reserve, contains no human settlements and is frequently visited by park guards, tourists or scientists. Thus, human presence is predominantly benign in that hunting pressure and habitat disturbance is minimal. Zone 3 contains a colonist settlement, El Remanso, and the Chimane settlements of Chaco Brasil, Maniquicito and 08 or Maraca. El Remanso was originally established by colonists who were involved in the trade of animal skins and live animals. Today this trade is no

longer important, but this area is still affected by subsistence and some commercial hunting.

Transect systems in each of the three study zones comprised a mixture of established and fresh cut trails. Transect length was determined through pacing. For each group of target organisms encountered the position of the group was noted, the number of individuals in the group counted, where possible, and estimated when numbers were too high (frequently for *T. pecari* and *Saimiri sciureus boliviensis*). The perpendicular distance from the transect line to the point where the group was first observed was estimated in the hope of obtaining sufficient sightings for the calculation of absolute densities using line transect methods (Burnham *et. al.*, 1980).

3. Results

A total of 311.6 km was covered in the three zones of the reserve as outward transects. However, not enough encounters with any of the species were obtained for absolute densities to be calculated. Nonetheless, the number of
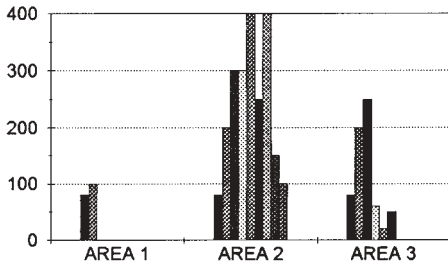
Figure 1. White-lipped peccary (*Tajassu pecari*) group sizes.

Cebus apella   Ateles paniscus Saimiri sciureus Alouatta seniculus
X2 = 9.46   X2 = 3.3   X2 = 1.13   X2 = 9.9
d.f = 2   d.f = 2   d.f = 2   d.f = 2
p<0.01   n.s   n.s   p<0.01

Figure 3. Primate group encounters.

encounters with each species where compared with those expected relative to the number of kilometres walked in each area. Only outward walks along trails were used in the number of encounters, but all encounters were used to calculate mean group sizes.

Group size did not differ significantly between the three areas for any of the species, with great overlaps in the mean group size and their 95% confidence limits. Because of this group encounters were considered an accurate index of relative abundance. The overlap in group sizes of white-lipped peccary between areas is illustrated in figure 1. The numbers of encounters in each area are summarised in figures 2 and 3. In area 1 there were significantly more encounters with *T. tajacu* than areas 2 and 3 but significantly less encounters with *T. pecari*. Encounters with *Cebus apella* were significantly greater in Area 1, whereas *Alouatta seniculus* encounters were significantly reduced. *Saimiri sciureus boliviensis* and *Ateles paniscus chamek* encounters did not differ significantly between the areas.
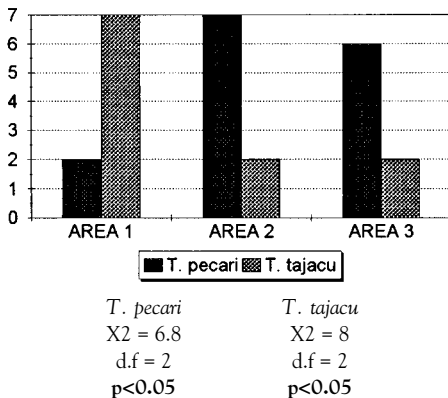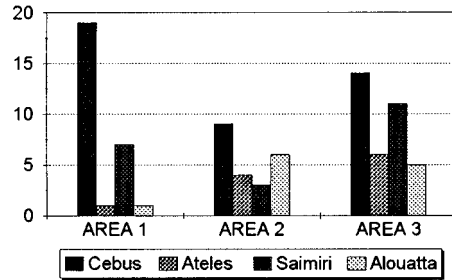
4. Discussion

The relative abundance of white-lipped peccaries (*T. pecari*) found within the reserve correspond closely to the results we would expect when considering the different pressures from human activity in the separate areas. Collared peccary (*T. tajacu*) relative abundances show some unexpected distribution patterns. The red howler monkey (*Alouatta seniculus*) relative abundances followed the pattern of distribution of white-lipped peccaries. Black spider monkeys (*Ateles paniscus chamek*) are rare through out the reserve and capuchin (*Cebus apella*) and squirrel monkeys (*Saimiri sciureus boliviensis*) seem to mirror patterns of small-sized primate population densities in hunted areas.

Both species of peccaries have similar intrinsic rates of population increase and are highly sought after species by both the Chimane and colonists. However, the proximity of Area 1 to San Borja makes it more prone to visits by commercial hunters. Commercial hunters frequently target white-lipped peccaries in preference of other species because of the facility of harvesting large numbers from one herd. Additionally, collared peccaries are known to inhabit one of the largest ranges of any living ungulate and can therefore adapt to a variety of conditions, whereas white-lippeds are more specialized in their habitat needs (Sowls, 1984). Therefore patterns in habitat disturbance in this area, caused by the increased activity of agriculturalists and the clandestine loggers, could be responsible for the reduced numbers

T. pecari   T. tajacu
X2 = 6.8   X2 = 8
d.f = 2   d.f = 2
p<0.05   p<0.05

Figure 2. Peccary group encounters.

of white-lipped. It is also possible that collared peccaries are benefitting from the reduced numbers of white-lipped in this area as both species share a preference for palm nuts, although only the latter can crack the hardest. However, we are unable to test this hypothesis at present.

The red howler monkey has been described as an emergency source of protein for the Chimanes, due to their large size and the ease with which they can be located. It is therefore interesting that its pattern of population density follows that of the white-lipped peccaries. Both the black spider monkey and red howler monkey appeared scarce in the reserve. The spider monkey has become patchily distributed over much of its former range, due to local extinction after excessive hunting pressure (Mittermeier & Coimbra-Filho, 1977).

Capuchin monkeys appear not to have suffered from the activities near San Borja. Both capuchin and squirrel monkeys are sometimes hunted, however their smaller size makes them less attractive. Other studies on hunting of primates have shown a shift to higher densities of smaller species and a reduction in the abundance of larger species (Freese *et. al.*, 1982; Emmons, 1984).

These results are preliminary and regular censusing should be used to corroborate them and monitor wildlife populations in the reserve. However, they do reflect the reduced hunting yields of large species which has been reported in Area 1. Chicchón (*op. cit.*) found that Chimanes in this area concentrate in the hunting of large rodents (Caviomorpha) which frequent their agricultural fallows, due to a reduction in the harvesting rates of larger species.

If the reserve is to ensure species survival and genetic diversity an element of animal population monitoring must be incorporated into its management. Subsistence hunting of vulnerable species should be discouraged and alternatives sought. The simple procedure outlined above could easily be carried out by parkguards as part of their regular routine patrols. Additionally at present the Beni Biosphere Reserve is an isolated conservation unit for large mammals because of the prevalence of hunting in the surrounding logging concessions. Species such as the white-lipped peccaries, with large area requirements will benefit the greatest from the inclusion of wildlife conservation into the mandate of logging concessions. The legal ban on hunting by loggers must be enforced.

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