



Population Monitoring and Habitat Preferences of Primates in the Pacaya Samiria Reserve

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The forest located in the Amazon basin can be characterized into two distinct habitat types: Terra firma (unflooded forest) and varzea (seasonally flooded forest). Terra firma forests generally have high canopies (>30m), high diversity of tree species, and the forests lie on well-drained terrains that tend to be heavily leached and nutrient poor (Haugaasen & Peres, 2005a). Solar radiation and rainfall are the major determinants of food availability in terra firma with pulses of new leaves occurring primarily in the dry season, flowering strongly correlated with the decrease in rainfall and a fruiting peak at the end of the dry season leading into the onset of the wet season (Haugaasen & Peres, 2005a). Varzea forest generally has a lower canopy than terra firma and lower diversity of tree species (Haugaasen & Peres, 2005a). Food availability in varzea forest is determined by the seasonal flood. Fruiting starts at the onset of the wet season, but continues well into the rainy season and the availability of fruit during this time is considerably higher than during the fruiting peak in terra firma (Haugaasen & Peres, 2007). However, when the water levels reach their peak, food production in varzea forest is minimal as the majority of trees shed their leaves, and fruit and flowers are absent (Haugaasen & Peres, 2005a). In addition, these two forest types are interspersed with palm swamp (aguajale). Aguajale palm swamp is often dominated by the Mauritia palm, which produces lots of fruit, eaten by a wide diversity of wildlife. This mosaic of food resources provided by the different forest types has important implications for the conservation and maintenance of wide-ranging frugivore populations in Amazonian forests.

Primate densities are affected by the availability of fruit, or fruit bearing plant species because these are the major food sources in a forest environment. For example, increased food production is reportedly associated with higher abundance of primary consumers such as primates (Stevenson, 2000). The diversity of tree species in terra firma is able to support a larger number of different primate species than varzea, but the abundance of primates is considerably higher in varzea than terra firma due to abundant fruit supply throughout the rainy season (Peres, 1993; Haugaasen & Peres, 2005b; 2007).

The Pacaya Samiria National Reserve in Peru is situated deep in the rainforests of the western Amazon basin, teems with aquatic and terrestrial wildlife. As a result of seasonal variation in rainfall in the Andean headwaters, the rivers of the Amazon basin are subject to large fluctuations in water levels throughout the year that flood the surrounding forest. The Pacaya Samiria National Reserve is no exception, with as little as 2% of land in the reserve above water at the height of the flooded season. In recent years these normal seasonal changes in rainfall patterns have become more intense, which has been tentatively attributed to climate change. Consequently, dry and rainy seasons are more pronounced resulting in unpredictable food supply and the extent to which primate populations can adapt to these changes is not yet known. The aim of this project is therefore to investigate the distribution patterns of primates across the different forest habitat types and create reliable estimates of population density. The long-term data set may also be used to monitor seasonal changes to primate abundance in different habitat types or changes to primate abundance over time.

Methods

Study Site

The Pacaya-Samiria National Reserve is the largest protected area in Peru spanning over 20,000 km² of tropical rainforest and is a truly exceptional wilderness area. The two major rivers that bound the reserve are the Ucayali and Marañon, and they join to form the Amazon River, right at the point where the reserve

begins. The major habitat type in this forest is the low-lying flooded forests (varzea), which can be further divided into different subcategories based on how close the forest is to the river banks and therefore the extent to which it floods. The extent of flooding has an impact on forest structure, tree species composition and fruit availability.

Data Collection

Line censuses along transect trails will be used to survey primate. Census trails 2 to 5 km in length will be surveyed repeatedly at each of the three sites. Surveys will be completed by small groups of three or four observers walking slowly and quietly (500-1,000 m/hr) between 7am and 3pm. Weather conditions, date, start and finish time of the survey will be recorded. Trails are not placed with any pre-determined knowledge of the distribution of the animals (Peres, 1999), but during low-water season, data collection is focussed on different types of varzea forest and palm swamp. Each time a primate is encountered, the distance along the transect, time, species, number of individuals, perpendicular distance from the primates to the transect line, and forest type (Table 1) will be recorded. Transect data may then be uploaded into DISTANCE (Buckland et al., 2001) software to calculate densities of primate species. These data may be added to the long-term data set to investigate changes to primate abundance over time in relation to water levels. Forest structure and fruit availability data may be collected from a series of habitat plots spaced equidistantly along each transect. Each primate encounter can then be linked to the nearest habitat plot along the transect providing a corresponding set of habitat variables for primate record. From this, habitat preferences of each species may be calculated and the habitat variables effecting primate abundance and diversity at each plot can also be investigated.

Table 1: Definitions of the various forms of varzea forest in Pacaya Samiria

Forest Habitat	Description
Riverine Forest	Forest located immediately next to the river, with a sloping canopy. Dense vegetation changes throughout the year relative to the flood line, through ecological succession.
Liana Flooded Forest	Populated with liana vines, often very dense with a low to intermediate canopy height. No hardwood trees are found in this habitat.
Open Understorey Flooded Forest	Sparse sunlight penetration means there is little ground flora, but large trees and dense, high canopy. Higher concentrations of tannins within the leaves also lead to a darker colour to the vegetation, particularly fallen leaves.
Levees	Falling under two main categories of Restinga, which contain broader and larger trees, and Bajjal, which flood more than Restinga. Levees seasonally flood, but have a greater percentage of ground flora than other habitat types due to the higher ground levels. This also means they have a characteristically lower flood line. Dense understorey vegetation is present. Fruit species such as Taschamango are good indicators of these habitats.
Palm Swamp	Specific species of palms are found here, as well as constant visible flooding due to bad drainage of the soil. These can be in pure (only palm species) swamps or mixed (palm and other tree species) swamps. Palms are a consistent part of the canopy.

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