The Effects of Altitude and Vegetation Type on Galago Distribution at Moka, Bioko Island, Equatorial Guinea

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Abstract

A galago census was conducted on eight non-consecutive nights from September 25 until October 11, 2006. The team censused, measured and marked trails around Moka, Bioko Island, Equatorial Guinea, for an average of 4.5 h/night. A total of 40 galagos were seen. Three of the four types of galagos found on Bioko were frequently encountered. These galagos were studied in order to see the relationship of elevation and vegetation type on each species of galago. *Galagoides demidoff poensis* was the most common, followed by *Galago alleni alleni* and *Euoticus pallidus*. The presence of *Galagoides thomasi* was never confirmed, although two galagos were suspected to be *G. thomasi*. *G. demidoff* was more abundant a lower elevations than *G. alleni* or *E. pallidus*. Galagos were rarely seen in *Cyathea manniana* (tree fern) and only one was seen in a non-woody plant. Each galago had different a preference as to how high it was located in the tree, as well as a different branch size preference.

Introduction

Bioko Island is home to some of the most unique wildlife on the planet with a high proportion of endemic subspecies of primates. After 10,000 years of separation from the mainland, the species of Bioko Island have evolved into unique subspecies. The populations of some of the rare primates on the island are very low, and in some cases, extremely threatened due to the hunting for bush meat by local inhabitants. Fortunately, the populations of galagos have remained relatively undisturbed. However, little research had been done on these nocturnal prosimians on Bioko Island. This report provides new information regarding the vegetation type and altitude preferences of the four types of galagos on Bioko: *Galago alleni alleni* (Allen's galago), *Euoticus pallidus* (pallid needle-clawed galago), *Galagoides thomasi* (Thomas's dwarf galago), and *Galagoides demidoff poensis* (Demidoff's dwarf galago). Each species has distinguishable features. This project was designed to show how each galago species plays a different role in the tropical environment on Bioko. Due to the wide variety of plant species, accessible trails, and a wide elevation range, the Moka area is ideal for assessing how elevation and vegetation relate to the abundance of galagos.

Only a few researchers have studied galagos on the island of Bioko. In 1986, Butynski and Koster (1994) studied the distribution and conservation status of all primates on Bioko Island. The study mainly focused on the diurnal species, so only a modest amount of information was found on the status of the galagos on the Island. Only 3 hours of data were collected after sundown. With extensive night research, the present is study paints a better picture of galago abundance and habitat preferences.

Other galago studies on Bioko have focused on the loud and warning calls of the galago (Ambrose 2003). Only a small amount of information on the habitat and elevation of Allen's galago is available. Ambrose (2003) shows a difference between the maximum elevations of the galago from Butynski and Koster (1994). Butynski and Koster reported *G. alleni* had a maximum elevation of 2000 m (Butynski and Koster 1994.

This study shows the distribution of each type of galago at Moka and how this relates to altitude and vegetation. Biodiversity conservation will benefit from this study because more information is now available on the habitat requirements of these species

and a baseline set of data for long-term monitoring of population trends has now been established.

Objective

The objective of this study is to provide preliminary data on the relationship between vegetation, altitude, and abundance for the four species of galagos found on Bioko Island, Equatorial Guinea.

Hypothesis

The four species of galagos on Bioko Island will not exceed 2000 m in elevation and primarily live in sub-montane forest with an elevation of 900-1400 meters. Each species will have a unique set of habitat preferences.

Methods

The survey was conducted over eight non-consecutive nights from September 25 - October 11, 2006. Team members carried field notebooks, pens, binoculars, first-aid kits, compasses, whistles, flashlights, headlamps, extra batteries, rain gear, and photographic equipment. Six census started at, on average, 19:21 h (range = 19:00 – 19:57) and ended, on average, until 00:49 (range 23:20 – 1:33) for seven nights. One night the galagos were studied from 1:10 to 4:45 h. At the start of each census, the following information was collected: time, date, path taken, weather, phase of the moon. Each group had one local guide with census experience, knowledge of the trails, and plant and animal species. A total of 37 km were walked in 30 h and 11 min, resulting in an average of 1.22 km/h.

In order to reduce bias, the research group attempted to census the same number of ascending and descending trails in order to sample all elevations more or less equally. The group also tried to leave and return at roughly the same time each night. The team made an effort to go out only when the skies were clear, except for one night when the team was caught in a rainstorm. The researchers also attempted to cover the same distance each time they looked for galagos. The transect route was changed every night in order to sample different elevations and vegetation types.

While on census, the group made as little noise as possible so as to not alert or scare the galagos. The census team comprised 3-4 people, including the guide, and stayed roughly 4 m apart in order to minimize the noise. Flashlights and spotlamps were used in order spot galagos by the reflection from their eyes.

Other methods of spotting galagos included listening for their calls and foliage noise. Although loud calls and warning calls were not frequent, they were used to locate a few galagos near the trails. At times, the researchers left the trail (up to 25 m) in order to see what was making the noise. Once a galago was encountered, the species was identified by closely examining body size and color. Also, the height in the tree or vegetation type gave good clues to what species each galago was. For each galago observed, the following were recorded: species, elevation, plant species, location, galago's activity, diameter of the branches used, and height above the ground.

Results

A total of 40 galagos were encountered during this study (See appendix 1 for detailed data). *G. demidoff* was the most abundant galago, making up 40% of the galagos encounted in the vicinity of Moka. *G. allenii* was the second most common, accounting for 35% of the galagos. *E. pallidus* was the third most common, accounting for 25% of the galagos. Although *G. thomasi* is found on Bioko Island (Ambrose & Perkin 2000) this taxon was not encountered for certain during the eight nights of research. On two occasions, galagos were seen that were probably *G. thomasi*; each was >25 m above the ground and well within tall forest. These two galagos were not included in the database. If they were indeed *G. thomasi*, they would comprise slightly less than 5% of the galagos at Moka.

Each galago reached its peak abundance at different elevations (Fig. 1). *G. demidoff* showed a slight preference for lower altitudes; average elevation 1410 m (range = 1112 - 1601 m, n = 16). *G. allenii* had the highest average elevation (mean = 1527 m, range = 1381 -1813 m, n = 14) and was the only galago found above 1601 m. Average elevation for *E. pallidus* was 1464 m (range = 1120 - 1593 m, n = 10). *E. pallidus* and *G. demidoff* were never observed or heard above 1601 m, while five *G. allenii* were found above this elevation. When data for all encounters were combined, the galagos were concentrated between 1300 m and 1625 m, with 88 percent of the galagos were seen in this range.

According to Ambrose and Perkin (2000), *E. pallidus* is rare on Bioko. However, one fourth of the galagos seen during this study were *E. pallidus*. *E. pallidus* was found in dense foliage and light foliage, contradictory to Ambrose and Perkin (2000). It was found at a rate of 0.33 animals/h. *G. demidoff* was seen at a higher rate (0.53 animals/h) during this study than during the study of Ambrose and Perkin (2000) (0.36 animals/h). *G. alleni* were encountered much less often during this study (0.46 animals/h) as compared to the study by Ambrose & Perkin (2000) (1.8 animals/h).

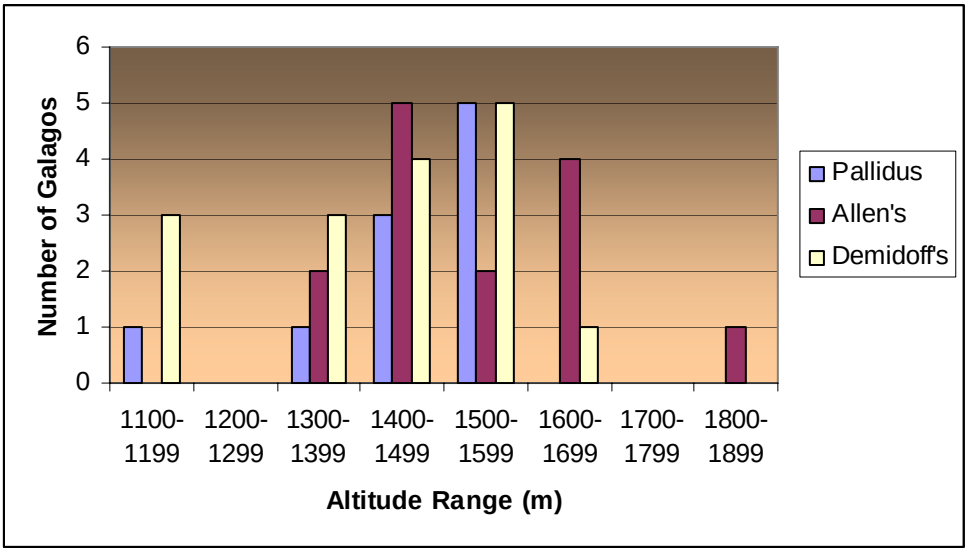

Figure 1. Elevation distribution for the three species of galagos encountered near Moka, Bioko Island (n = 40).

Near Lake Biao (1100 m) there was not any dense forest except for within 200 m of the lake. The rest of the trail consisted mostly of *Pennisetum purpureum* (elephant

grass) and *Pteridium aquilinum* (bracken fern) with a few medium sized trees along the trail. Only one galago, a *G. allenii,* was seen at this high elevation (1819), and it was in the thick forest near the lake.

Vegetation differed slightly with elevation around the Moka area. More tree ferns were found at the lower altitudes. Only two *G. demidoff* were in *C. manniana* (tree ferns) even though *C. manniana* was very abundant in the area. Only one galago, a *G. demidoff,* was observed in elephant grass (*P. purpureum*) (Fig. 2). This was the only instance in which a galago was spotted in non-woody plant. *Trema guineensis* was the most used plant species (25% of all encounters). *Macaranga sp*. was popular among the three types of galagos as well.

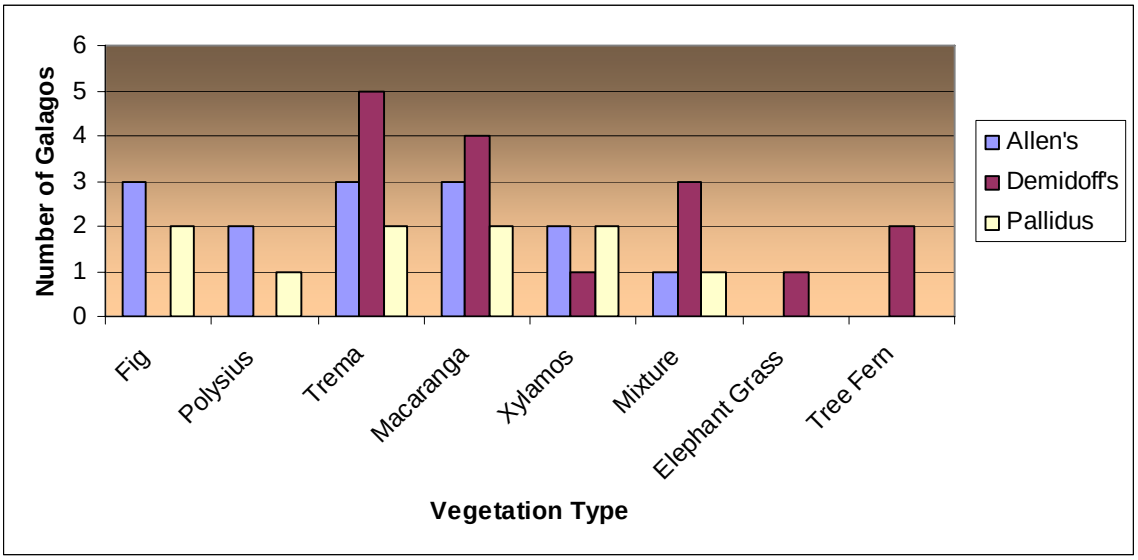

Figure 2. The plant species in which galagos were encountered at Moka, Bioko Island. "Mixture" is a few branches of different plant species closely intertwined.

One factor that probably plays an important role in selection of the plant species is the preference of *G. demidoff* small branches. Almost all of the *G. demidoff* encountered were on branches ranging from 1 to 5 cm in diameter (n = 14) (Fig. 3). *G. alleni* and *E. pallidus* preferred much larger diameter branches with averages of 11.5 cm (range = 3 cm – 20 cm, n = 14) and 13.3 cm (range = 2 cm – 20 cm, n = 10), respectively. *G. alleni* and *E. pallidus* showed no preference for small, medium or large branches.

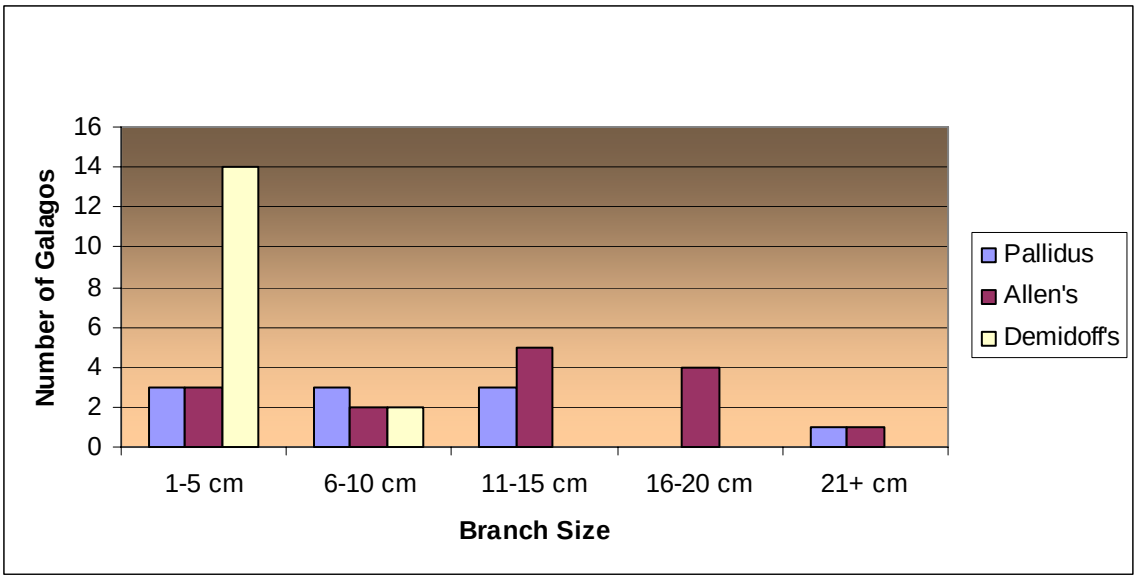

Figure 3. Branch size preference for each galago.

G. demidoff averaged a height of 6.0 m above the ground (range .5 m – 15 m, n = 16). This was considerably lower than for *E. pallidus* (mean = 9.8 m, range 2 m -20 m, n = 10*)* and *G. alleni* (mean = 8.6 m 2 m – 15 m, range,n = 14) (Fig. 4). All species of galago were, however, seen from near ground level to 10 m in height.

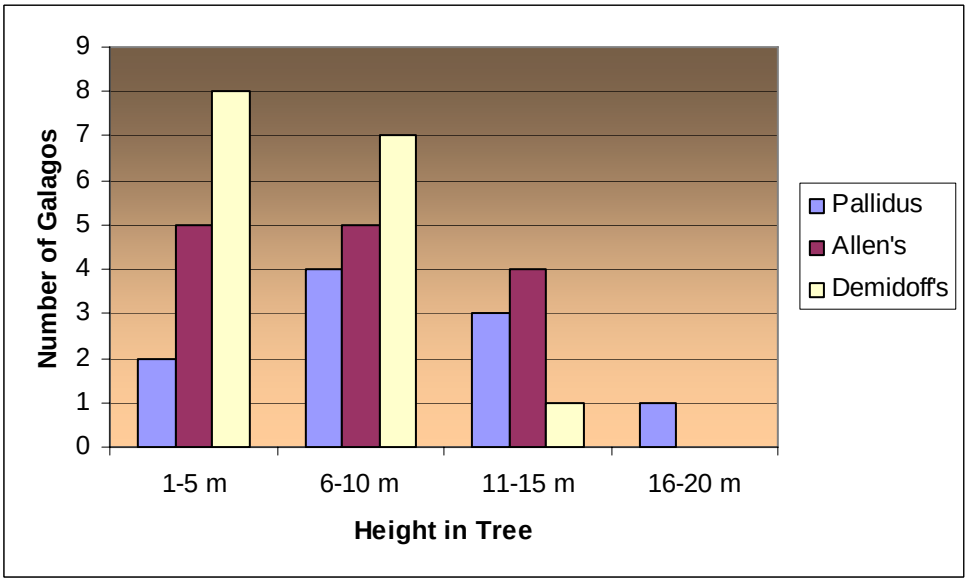

Figure 4. Preference of each galago in respect to the height in each tree.

Discussion

G. demidoff shows the greatest restriction as concerns the height at which it forages, the type of vegetation, and the diameter of the branches used. *G. demidoff* is likely more dependent on small insects close to the ground than the others. *G. demidoff*

was the only galago found in a non-fruiting tree. It was found in moderate to high concentrations everywhere except in the higher altitude areas around Lake Biao.

G. alleni was the only species found in high altitudes. Its calls were heard in lower altitudes near the Cascades (1100 m), but none were seen. More time should be spent at lower altitudes due to the high density of species in the area. The trail to the Cascades was only censused for 1 h in dense forest, and four species were seen in this area.

Surprisingly few galagos (12%) were seen in fig trees. Figs produce vast quantities of fruits and are a large part of the forest ecosystem. Most of the galagos tended to stay in trees with medium sized branches (6-15 cm) and in dense foliage. In many parts of the forest, especially in Balacha South, there is a high density of tree ferns. Only two galagos were seen in tree ferns, likely due to their lack of fruit and sharp spikes along the trunk.

The biggest problem encountered during the study was the unequal amount of census work done at different elevations. Better results could have been obtained if the researches spent the same amount of time at all elevations and if all census routes had been traveled the same number of times. Only two total nights were spent in high altitude and low altitude. The remaining six nights were in altitudes ranging from 1300 m – 1700 m.

This project was important to conservation on Bioko in various ways. It shows that galagos can survive at moderate densities in the area around Moka, even though much of the area is covered by secondary forest and degraded primary forest. In contrast to the galagos, the abundance of monkeys at Moka (and over most of Bioko) has diminished considerably due to the shotgun hunting by the local people. These results suggest that monkeys would too survive in the Moka area in high densities---if they were not hunted with shotguns.

Galagos at Moka are fairly easy to find and to observe. As such, they could be the source both of detailed, long-term, behaviour and ecology studies, as well as a tourism attraction (together with other nocturnal animals such as owls and hyrax).

Recommendations

One interesting question that was brought up that could be researched is why the *G. demidoff* and *E. pallidus* do not occur (apparently) at higher elevations. Their absensce at higher elevations could be due to lack of adequate food, loss of body heat due, etc. The data collected by this project can be used as a baseline for the monitoring of galago populations at Bioko to show changes in relative abundance over time. Future studies might focus on diet and on obtaining more information of the ecological niche at Moka of each of the four galagos

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References Cited

Ambrose, L. 2003. Three acoustic forms of Allen's galagos in the Central Africa region. *Primates*. 1: 25-39.

Ambrose, L. & A. W. Perkin. 2000. A survey of nocturnal prosimians at Moca on Bioko Island, Equatorial Guinea. *African Primates*. 4: 4-10.

Butynski, T. M. & S. H. Koster. 1994. Distribution and conservation status of primates in Bioko Island, Equatorial Guinea. *Biodiversity and Conservation* 3: 893-909.