Parasites Lost: Canopy lemurs may have less intestinal parasites

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Introduction

Lemur intestinal parasites have been studied in both dry and wet forests in Madagascar, correlating diversity and abundance with seasonality and habitat. However this is the first study of parasite diversity and abundance in lemurs that live primarily in the canopy vs. lemurs that frequently inhabit the understory and are often terrestrial.

Materials and Methods

Study subject and Site

We have collected data at Ranomafana National Park a 43,500 ha continuous rain forest located in southeastern Madagascar (21°16' S latitude and 47° 20' E longitude) (Wright, 1992; Wright and Andriamihaja, 2002)(figure1).

We have studied *Microcebus rufus* (Lesson, 1840) and *Cheirogaleus crossleyi* (A. Grandidier, 1870) in the family of Cheirogaleidae (Mittemeier et al., 1994). They are sympatric and adopt a similar rhythm of activity (nocturnal and may enter periods of seasonal torpor akin to hibernation).

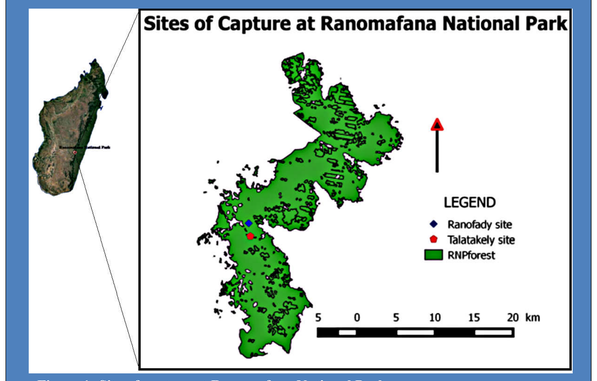

Figure 1: Site of capture at Ranomafana National Park

Trapping Method

40 standard live-traps covering 500m of trail have been used in RNP, such as Sherman live traps for capture of *Microcebus* and tomahawks for *Cheirogaleus*. Trapping methods are based on methods used by Wright and Martin (1995), Atsalis 1999, Blanco, 2010 and Zohdy, 2012). All traps were set 25 meters apart 10 meters back from trails, no more than 3 meters from the ground for the Sherman traps and more than 6 meter for the tomahawks (figure2).

Figure 2: Sherman traps setting in the tree, and installation of Tomahawk trap

Fecal samples and Parasitological analysis

We did a direct analysis without preserved fecal samples, using a method outlined by Gillespie (2006). We performed fecal flotation using Sheather's solution and quantified the parasite eggs or oocyst in McMaster Chamber (Weber Scientific International United Kingdom).

Helminth eggs and protozoan cysts were identified based on their size and morphology. Photographs and measurements were taken using an ocular micrometer fitted to a compound microscope and Image J imaging software (by Wayne Rasband, National institutes of health, USA).

Figure 3: Fecal analysis session

Data analysis

We analyzed parasite prevalence, and species richness as a measurement of the parasite infection.

We used Chi-square tests of independence to compare the prevalence of infection between species, and a nonparametric Mann-Whitney *U* test to compare parasite richness between species.

Results

Comparison of parasitic infections and parasite richness

In feces collected from 72 captured individuals at Ranomafana National park, a total of 6 species of intestinal parasites including a protistan, four nematodes (*Strongyloides* sp., *Ascaris* sp., *Trichuris* sp., *Trichostrongylus* sp.), one cestode (*Hymenolepis* sp.), one protozoan (non identified oocyst Coccidia) were found (figure 4).

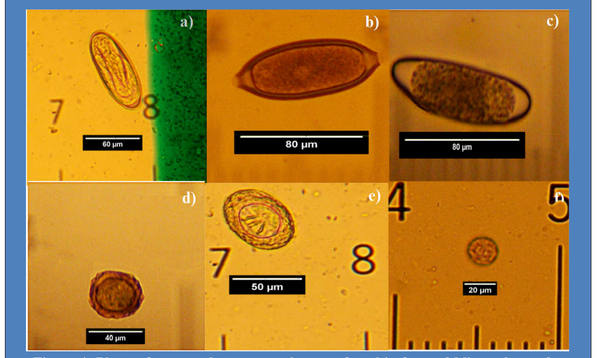

Figure 4: Photo of eggs and oocyst mophotypes found in feces of *Microcebus rufus* and *Cheirogaleus crossleyi*, a) *Strongyloides* sp., b) *Trichuris* sp., c) *Trychostrongylus* sp., d) *Ascaris* sp., e) *Hymenolepis* sp., f) a non identified oocyst of Coccidia

From fecal analysis, we found only two parasites species (*Strongyloides* sp., non identified oocyst Coccidia) from feces of Dwarf lemur. In contrast, mouse lemur harbored all six parasites species found (figure 5). The difference in species richness was significant (U=865,5; P<0, 05).

Analysis of common parasite in both lemur species reveal that the proportion of mouse lemur infected by *Strongyloides* sp., was significantly higher (X^2=18, 31; P<0, 05). However, the prevalence for Coccidia was significantly higher in Dwarf lemur (X^2=7, 65; P<0, 05).

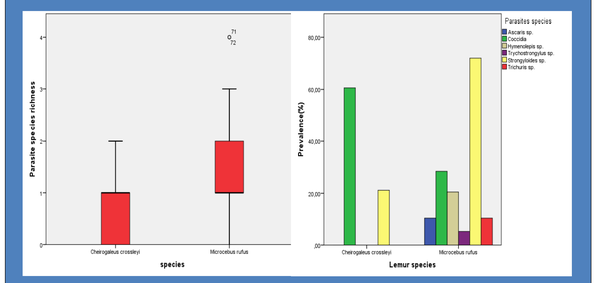

Figure 5: Parasite Species Richness, and the Prevalence of parasitic infection between Dwarf and Mouse lemur in RNP

Discussion

The mouse lemur (in lower strata) exhibited a greater endoparasite richness species than the Dwarf lemur (upper strata). This suggests that the pattern of parasite distribution is different along stratum level.

This could be explained by the fact that most of the parasite found in the study are fecally transmitted, meaning that with fecal matter accumulating as one gets closer to ground, species in lower stratum are in higher contact with those parasites.

Differences in the feeding behavior of each primate may also be responsible for the difference in parasite richness found among the 2 sympatric cheirogaleidae. Mouse lemurs eats fruits, leaves, insects(Atsalis 1998a, 1998b) so there may be higher risk for contact with vector, whereas Dwarf lemur diet is more restricted (see Ganzhorn 1988; Wright & Martin 1995).

This study was done during the rainy season, so it is possible that the rain falling from the canopy to the lower stratum washed the fecally transmitted parasite down and reduced the risk of accumulating the parasite for species in the canopy. Furthermore, the high presence of humidity in the canopy could explain the high prevalence of oocyst coccidia in Dwarf lemurs.

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