

HL261 Howler monkey behaviour, habitat use, feeding ecology and vocalization in Honduras

By Dr Kathy Slater, Operation Wallacea

Introduction and Project Rationale

Diet and Activity

Howler monkeys are folivorous-frugivorous primates that have been studied extensively in Central America. Howler monkey social organisation may be uni-male or multi-male, although the latter is generally more common in mantled howlers due to larger average group size in comparison to other howler monkey species (Crockett & Eisenberg 1987). Although diurnal, howler monkeys exhibit little activity during the day, and spend up to 80% of their day resting (Estrada et al 1999; Pavelka & Knopff 2004). Howler monkey inactivity is likely due to the high percentage of toxin-loaded mature leaves in their diet and fermentative digestion, which are energetically demanding (Milton 1980; Milton & McBee 1983). However, howler monkeys are reported to preferentially feed on ripe fruit when available, which can account for up to 80% of the diet during certain months of the year (Estrada et al. 1999; Pinto & Setz 2004; Pavelka & Knopff 2004). Despite, variation in dietary preferences, activity budgets appear to remain constant throughout the year, which calls into question the assumption that inactivity is due to their folivorous diet (Pavelka & Knopff 2004).

Due their adaptable diet, howler monkeys are one of the few primate species that survive in disturbed forest fragments, often at very high densities. Although forest fragment size is not a good predictor of howler monkey responses to habitat disturbance (Bicca-Marques 2003; Cristobel-Azkarate & Arroyo-Rodriguez 2007), increased population density associated with habitat fragmentation appears directly linked to changes in howler monkey diet, ranging and behaviour (Cristobel-Azkarate & Arroyo-Rodriguez 2007). When living in high densities, howler monkeys are reported to adapt their home ranges, diet and activity budgets by consuming all the food sources available in their restricted home ranges and minimizing energy expenditure (Silva & Marsh 2003; Cristobel-Azkarate & Arroyo-Rodriguez 2007). This often involves smaller home ranges (Estrada & Coates-Estrada 1996) and an increase in the degree of folivory in the diet (Lopez et al. 2005; Asensio et al 2007), although increased folivory does not necessarily refer to an increase in toxin loaded mature leaves.

This current study aims to investigate the effects of forest fragment size and population density on the dietary preferences, activity budgets, social behaviour, and home range size in eight groups of mantled howler monkeys living in two adjacent, disturbed lowland forest fragments in Honduras. As with previous studies, population density was expected to be the best predictor of howler monkeys responses to habitat fragmentation and groups with the smallest home ranges were predicted to show a higher degree of folivory in their diet and spend more time resting than groups with larger home ranges and greater food availability. Data relating to dietary preferences, activity budgets, home range size and habitat quality within each home range will be used to investigate two competing hypotheses of inactivity in howler monkeys: that howler monkeys are inactive due to the high concentration of toxin-loaded mature leaves in the diet, or that howler monkeys are general energy conservers that rest more when food availability is low.

Vocalizations

Primates exhibit a vast array of vocal behaviours within specific social contexts, providing evidence for a cognitive component to vocal behaviour. Loud calls (also known as long-distance calls) are widespread throughout primates (Whitehead 1987) and occur in various forms that allow for effective communication at long distances. These calls are often stereotyped and discrete and contain repeated features which reduce the receiver(s)'s uncertainty about the acoustic characteristics of the signal" (Wiley 1983). Loud calls are also often contagious, as a call from one male often stimulates other males to counter call (Whitehead 1987). Several functions have been proposed for primate loud calls, which can be divided into intra-group and extra-group functions. Intra-group functions include alarm signals, calls alerting other group members to the presence of food, and contact calls as a means of group coordination (Delgado 2006). Extra-group functions generally relate to competition for resources and territorial behaviour between males (Delgado 2006).

Howler monkey loud calls are reported to function as a territorial behaviour between groups, which provide honest signals of group location and the number of males making the calls (Delgado 2006; Sekulic 1982). Data from black howler monkeys (*Alouatta pigra*) has also indicated that males vary their calls or stop calling completely depending on the number of males from neighbouring groups that respond to their calls (Kitchen 2004). Female behaviour may also be influenced by the presence and outcome of male calling, particularly when females have young infants (Kitchen 2006). The vocalisation project at Manacal therefore aimed to investigate environmental and social factors affecting call rates and loud call characteristics and their corresponding effects on female behaviour.

Methods

Subjects and Study Site

The study will be conducted at Rancho Manacal, which is a privately owned sugar cane plantation with adjacent forest patches and cattle ranch located outside Cofradia, off the main highway to San Pedro Sula. The ranch is managed by Continental Ltd, which enforce a strict policy to ensure the protection of the primates within the property. There are five different troops of howler monkeys within the forest fragment at Rancho Manacal, of varied sizes and compositions (Figure 1). Outside Rancho Manacal on the opposite side of the road is a small water purification plant run by a cooperative of local villagers called Gracias a Dios. The water purification plant is located within a long thin strip of forest that also houses a large number of howler monkeys in three separate groups (Figure 1).

Data Collection

Troops of howler monkeys at Manacal are habituated to the presence of human observers and are therefore easily located within minutes of arriving at the field site. Behavioural observations will be conducted on two of the eight groups per day for 6 or 7-hour periods either from 05.00 until 12.00 or from 12.00 until 18.00. An equal number of morning and afternoon observations will be conducted for each group. The GPS location of the group will

be recorded throughout the day in order to assess home and day range. Upon locating a group, the number of individuals and age-sex classification of each will be recorded. Age-sex classification will be based on Carpenter's (1934) criteria with some modifications from Glander (1980).

Activity data will be collected using instantaneous scan samples (Altmann 1974) at 10-minute intervals noting the behaviour (feeding, moving, resting, social and vigilant) of each adult individual in the group. When feeding, the type of food (mature leaves, young leaves, fruit and flowers) and corresponding plant species will be recorded. Where plants can not be identified in the field, photographs and samples will be taken for later identification. Vocalizations, specifically male loud calls, can be recorded *ad libitum*, noting the time of the call, the number of males calling, the origin of the loud call (whether it was made by males from the group being observed, or from a different group), the number of the group that made the call, and the behaviour of individuals upon hearing the call.

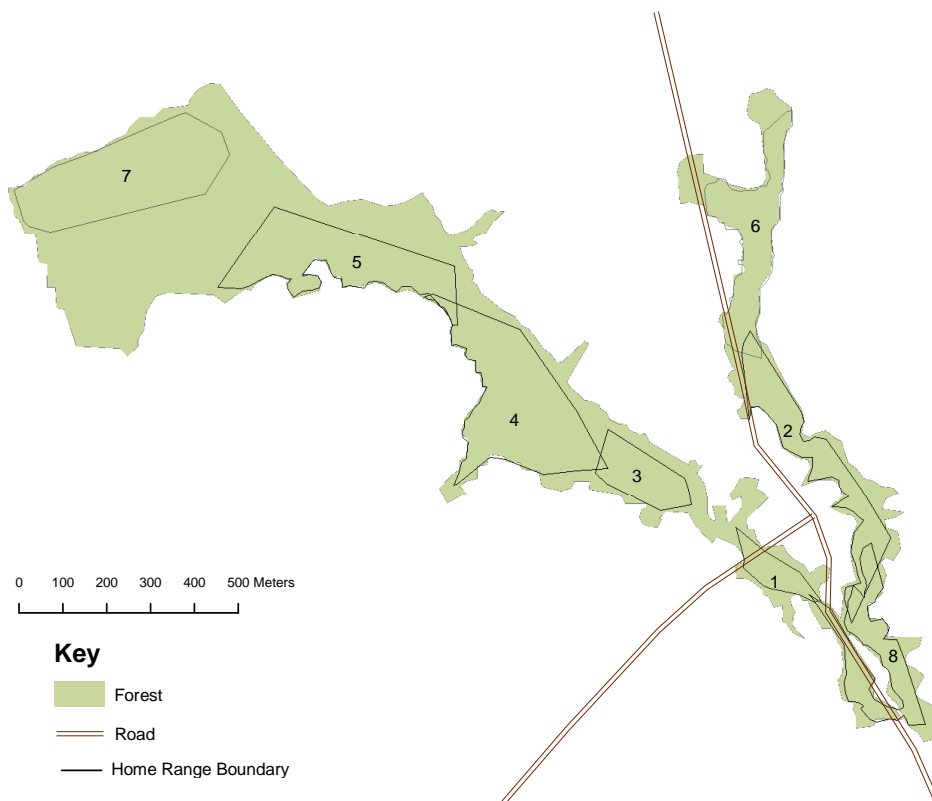


Figure 1: Map of Rancho Manacal showing the home ranges of the 8 groups of howler monkeys that occupy the forest.

Habitat survey data will be collected at 32 randomly located sites (minimum of four samples within each group home range) within Rancho Manacal and Gracias a Dios water station, recording the DBH of all trees with circumference over 30cm, canopy cover using canopy

scopes, the height of the five tallest trees using a clinometer, the number of cut stumps and fallen trees within the plot, the number of small trees <30cm in circumference, and the GPS location of the plot. For each tree over 30cm in circumference, the state of the tree (alive or dead), and the presence or absence of fruit or flowers will be recorded.

Equipment Requirements

- Stopwatch with countdown timer
- Handheld Garmin GPS: model GMAP 60CSx
- Binoculars: 10x40 or 10x50 magnification
- 20m measuring tape
- 5m measuring tape
- Clinometer
- Canopy scope
- Numbered tree tags
- Hammer
- Nails
- Laptop with Microsoft Excel for data management

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