Detectability of Sociality in Primates: A case study of a primate-like carnivore, the kinkajou *(Potos Flavus)* in Costa Rica

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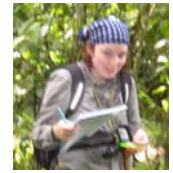

Introduction

Primates are considered amongst the most social of the mammals. Much of past research however has concluded that compared to their diurnal counterparts nocturnal primates do not display high levels gregariousness. But how is gregariousness measured? Although unlike the obvious social interactions between diurnal primates, nocturnal primates *do* display many different types of communication (spatial proximity, calling and scent marking) which also reinforce social bonds and networks.

In order to understand the sociality of primates, a database was composed of the supposedly less social nocturnal primates, along with other mammals of similar body size and nocturnal habits in order to ascertain any ecological or methodological factors that may play an important role in a field worker's perception of animals being gregarious. This was then supplemented by conducted a field study of a primate-like carnivore, the kinkajou (*Potos flavus*; figure 2*)* at La Suerte Biological Research Station, La Primavera, Costa Rica (figure 2).

Figure 2. The kinkajou, *Potos flavus*

Figure 1. A relief map of the field site area

Methods

A literature search was conducted using articles from peer reviewed journals. A database was drawn up which consisted of 29 factors that had to be considered for each species used. Factors covered methods used (equipment, number of observers, time in field), results of the study, and also covered basic knowledge of the species in question (body size, brain mass, gestation and lactation periods).

Field research was conducted in the wet lowland forest at La Suerte Biological Field Station in Costa Rica (figure3). 29 points were chosen at random to cover 3 separate areas of the field site equally at which presence or absence of kinkajous was noted. Points were marked by a stick with both bright flagging tape and reflective tape on so they were found easily both day and night. Vegetation plot data was taken for each of the 29 points. It was ensured that observer numbers were kept low, with an average of 2 observers at any one time. Night walks were done at a very slow pace, and LED headlamps with red filters were used for light. The program Presence was then used to determine the occupancy of kinkajous in this area. Presence is a free online software that estimates patch occupancy rates and related parameters.

Results

Database study

The study consisted of 28 primate, 6 carnivore and 6 marsupial species.

3% of the studies did not report how they obtained their data at all whilst 33% of studies did not involve direct observations. 75% of the studies used radio tracking, but only of one animal at a time, and did not observe their behaviour simultaneously.

Only 45% of studies reported the type of light used; of these only 44% used red lights. Interestingly, most studies only reported 1-2 observers, with only 3 studies having more than this. 5 studies failed to mention observer numbers at all.

The two studies that showed the lowest group sizes (Runcie. MJ 1999, Harper, MJ 2005) showed a mixture of aspects such as short duration, large number of observers, white lights use and in one case radio tracking was the only source of data; the two studies showing the most social behaviour showed more consideration in their methods and employed the use of more nocturnal friendly equipment and had lower observer numbers.

Field Study

Kinkajous were relatively undisturbed by human presence, although occasionally they alarm called, which also aided in detecting them. We initiated the study with line transect walks. On the first three nights, near a fruiting fig tree, 2-6 kinkajous were spotted peacefully foraging together each night.

A total of 29 points were laid out in three different habitat types: highly disturbed, riverine, and secondary rainforest. Each point was visited 4 times, and occupancy of the point was estimated using the program Presence. Points were occupied 35 times; on 11 occasions, a pair of kinkajous occupied a point, generating an average cluster size of 1.5. Detection probability remained stable throughout the study, with 45% of points being occupied. Overall density was 0.75 animals per km^2.

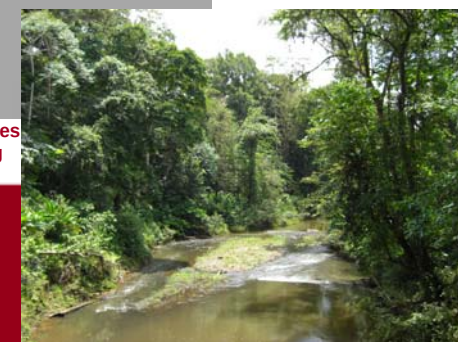

Figure 3. A view of one of the two forest patches where the field study was conducted, showing the Rio La Suerte.

Acknowledgements: Dr KAI Nekaris, Dr V Nilman, Dr F Heuttmann, URSS

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Runcie. MJ (2005) Movements, dens and feeding behaviour of the tropical scaly-tailed possum (*Wyulda squamicaudata*). *Wildlife research*, 26: 367-373.

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Species	Forest.1	Forest.2	Road	total
bats	53	30	5	88
kinkajou	8	26	12	46
tayra		2		2
jaguarundi	1			1
olingo		1		1
amphibian	4	9		13
owls	2	19	9	30
capuchin		1		1
howler	2	5		7
opossum			2	2
rabbit			2	2
Total				**193**

Figure 1. A table of other species observed during the field study in Costa Rica

Discussion

By following the methods described by Duckworth (1998) and Nekaris et al (2008), a large number of nocturnal animals were observed during this study (Figures 1 and 3). Indeed, we increased the mammal check list for La Suerte by 3, reporting four-eyed opposum, Mexican prehensile tailed porcupine, and olingo for the first time. If we were joined by another researcher who insisted on using a white light, kinkajous in particular showed signs of distress, and rarer animals were not observed. Lights without red filters were used in 56% of the studies that detailed lighting equipment, and this is very likely to have effected presence in study populations.

La Suerte has a relatively healthy population of kinkajous. As also seen by Kays et al (2001), animals were very commonly observed in pairs. When not in pairs, they were commonly heard to call to each other. Varied vocal communications were observed, and they seemed to occur both when near and apart from other individuals. These observations of social activity are not uncommon. The results from the literature search also showed that a broad range of types of communication have been observed in all nocturnal species, including high levels of olfactory communication.

It can clearly be seen through both the field research and database that the information currently available is not based on research undertaken with the most effective methods available. The results show a definite relationship between the methods used and results obtained, that although sounds obvious, is obviously not being considered carefully in many studies. When conducting this research I was struck by something that Kays and Gittleman said in their 2001 paper. ‘‘Solitary’ is often just a default term given to a species that is little studied’. This seems to very much be the case when it comes to these nocturnal species. More research needs to be undertaken, with more consideration for methods used in order that we can fully understand what clearly is the complex social structure of an nocturnal animal.

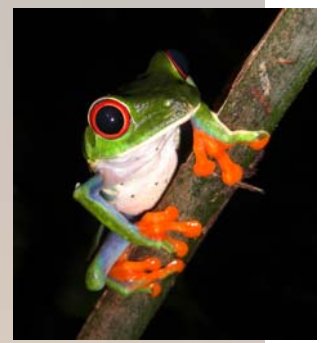

Figure 3. A tree frog observed during one night walk

Figure 3. Costa Rica has a great diversity of birds. Here a fellow field worker holds one of the many different species caught in a mist net.

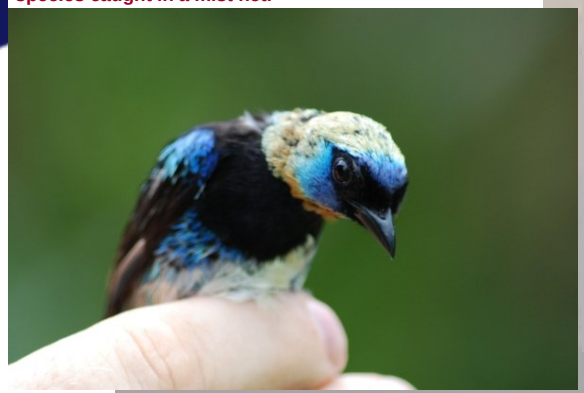

Figure 4. An example of the type of tree used for vegetation data

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Duckworth, JW (1998) The difficulty of estimating population densities of nocturnal forest mammals from transect counts of animals. *Journal of Zoology*, 246(4): 466-468.

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