

lehilahytsara were observed in close proximity. Although *A. trichotis* is now known to have a broad distribution across a good portion of the eastern humid forests, from lowland to montane forests (up to about 1,000 m), it occurs in low densities (Mittermeier *et al.*, 2006). This factor might account for its absence in other forested sites surveyed within the Zahamena-Ankeniheny forest corridor (e.g., Schmid *et al.*, 1999; Randrianabinina and Rasoloharijaona, 2006). However, continued surveying efforts at these sites will probably result in the finding that it occurs across the forest corridor.

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When big lemurs swallow up small ones: Coquerel's dwarf lemur as a predator of grey mouse lemurs and endemic rodents

Susanne Schliehe-Diecks¹, Matthias Markolf², Elise Huchard^{2*}

¹Courant Research Center "Evolution of Social Behavior", Georg-August-University of Göttingen, Kellnerweg 6, 37077 Göttingen, Germany

²Abteilung Verhaltensökologie and Soziobiologie, Deutsches Primatenzentrum, Kellnerweg 4, 37077 Göttingen, Germany

*Corresponding author: ehuchard@gmail.com

Predation has probably played a major role in the evolutionary history of lemurs, and specifically affects small nocturnal lemurs, which are heavily preyed upon by a wide range of vertebrates, including carnivores (e.g., viverrid or domestic carnivores), birds (e.g. raptors, owls) or reptiles (e.g. *Boidae*) (Goodman, 2003). In contrast, lemur predation by other lemur species appears exceptional and highly opportunistic, with one observed case of predation of an infant *Lemur catta* by *Eulemur fulvus* (Pitts, 1995). However, such events might occur more regularly in other lemur species. Two indirect lines of evidence suggest that Coquerel's dwarf lemur (*Mirza coquereli*) predated on closely related smaller mouse lemurs (*Microcebus* sp.) (Kappeler and Rasoloarison, 2003). The first report is based on events where the partially eaten carcass of a gray mouse lemur (*M. murinus*) was found together with a live *M. coquereli* in a trap (Goodman, 2003). The second observation consists of an experimental confrontation of *M. murinus* with *M. coquereli*, both being kept in separate cages that were temporarily placed next to each other. In most experiments, mouse lemurs started alarm-calling at the Coquerel's dwarf lemur and moved around in their cage in an agitated fashion (Fichtel, 2009). Here, we present the first direct evidence of predation by wild *M. coquereli* upon gray mouse lemurs and endemic rodents (western tuft-tailed rats, *Elliurus myoxinus*).

Study animals, study site and methods

Coquerel's dwarf lemurs (300 g; mean home range size: 4 ha) occur in the western lowland forests and gray mouse lemurs (60 g; mean home range size: 1.5 ha) can be found in most remaining forests in southern and western Madagascar (Kappeler and Rasoloarison, 2003; Rasoloarison *et al.*, 2000). Both species share several features. Both are nocturnal and omnivorous solitary foragers. They mainly feed on primary resources (fruits, gum, flowers, young leaves), insect secretions, small invertebrates and occasionally vertebrates (chameleons and lizards). Their diet displays seasonal fluctuation, as well as interspecific variation (Goodman, 1993, 2003), and the Coquerel's dwarf lemur is reported to be slightly more carnivorous than the gray mouse lemur (Petter *et al.*, 1977). In captivity, both species have been observed eating young rodents (Petter *et al.*, 1977) although this has never been reported in the wild. Both species occur sympatrically in central western Madagascar with western tuft-tailed rats, a nocturnal, frugi- and granivorous and partially arboreal rodent (average body mass: 66 g) (Carleton, 2003).

All following observations were made in the Forêt de Kirindy, a 12,500 ha forestry concession of the C.N.F.E.R.E.F. (formerly C.F.P.F.) Morondava. This dry deciduous forest is situated 60 km northeast of Morondava (44°39'E, 20°03'S). The predation of the western tufted-tail rat was witnessed during a focal observation of a Coquerel's dwarf lemur which was equipped with a radio collar (Biotrack TW3). The observed mouse lemurs were similarly equipped with radio collars (Holohil Systems Ltd., BD-2C, 1.8 g), permitting behavioural observations of focal animals.

Results and discussion

The first observation reports the predation of a western tuft-tailed rat by an adult male *M. coquereli* in November 2006 (Fig. 1). The Coquerel's dwarf lemur was found sitting on the ground at 20h17, feeding on a tufted-tail rat, and changed its position only to climb-up the vegetation from 1-3 m height and to recover the carcass when it fell to the ground. It devoured the whole carcass, including (cracked) bones. After finishing eating, the *M. coquereli* groomed its face and hands.



Fig. 1: An adult Coquerel's dwarf lemur (*Mirza coquereli*) in the Forêt de Kirindy, Madagascar.

The second observation reports an unsuccessful attack on an adult female gray mouse lemur (55 g, approx. age: 1 year and 9 months) by a Coquerel's dwarf lemur in October 2009. At 21h24, the mouse lemur had been foraging high up in the vegetation (between 6 and 15 m) for at least 10 minutes, licking sugary insect secretions off leaves, when a *M. coquereli*, adult size, was spotted at the same height, about 10m from the focal subject, slowly and silently moving towards the mouse lemur. Marking brief and frequent pauses in an apparently easy progression into the canopy, its whole attitude strongly recalled the hunting cat, with a low head and a flexible body, apparently entirely focused on its prey. In less than 30 seconds, the *Mirza* was within 5 m of the mouse lemur, who kept feeding in the same location. While the *Mirza* approached within 2 m, the mouse lemur suddenly disappeared in an eclipse, quickly fleeing among the top and tiniest branches, and jumping from one slim branch to the next. The Coquerel's dwarf lemur did not try to chase it. After 2 minutes out of sight, the mouse lemur was retrieved quietly feeding on tree exudates, 25 m away from its previous localization in its fleeing direction, and 15 m away from a frequently used sleeping site. Less than 10 minutes later, the female was joined by a related female and both entered the tree hole together (21h37).

Finally, an adult Coquerel's dwarf lemur was observed feeding on a young male gray mouse lemur (body mass: 37 g; approx. age: 2-3 months) in June 2010. The predation was recorded at 22h10, about two hours after behavioural data had been collected from the predated mouse lemur, which at the time showed no signs of injuries and displayed normal behaviour. The body of the gray mouse lemur was almost complete when the observer spotted the *M. coquereli* feeding on it, suggesting that the mouse lemur was killed shortly before. The Coquerel's dwarf lemur was sitting with its prey in a tree of about 10m height, which stood 25 m away from the position where the grey mouse lemur was last spotted alive. It took about one hour to finish the entire carcass, interrupted by occasional vigilance scans of the surroundings.

The frequency of such events is probably relatively low, and all reported observations happened during, or at the end of, the dry season in Kirindy. It is thus possible that predation pressure by *M. coquereli* increases at times of food scarcity, when alternative resources like fruits and invertebrates are rare or absent. However, it is also important to note that most observations took place during the dry season, when vegetation density is low in this dry, deciduous forest. This means that the timing of events reported here might simply reflect study methods. Nevertheless, this suit of anecdotal observations represents the first direct and unambiguous evidence for predation by the Coquerel's dwarf lemur upon small nocturnal lemurs, as well as other mammals. Predation among other primate species is relatively rare. So far, only chimpanzees, orangutans, baboons, blue monkeys and capuchins have been observed preying upon other primates (Fichtel, in press). Our report provides evidence for the first

case where a lemur species might commonly predate upon other lemurs.

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Collective mobbing of a boa by a group of red-fronted lemurs (*Eulemur fulvus rufus*)

Lennart Pyritz^{1,2*}, Tianasoa Andrianjanahary¹

¹Behavioral Ecology & Sociobiology Unit, German Primate Center, Kellnerweg 4, 37077 Göttingen, Germany

²CRC "Evolution of Social Behavior", University of Göttingen, Germany

*Corresponding author: LennartPyritz@gmx.net

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Introduction

Collective anti-predator behaviour is one of the principal advantages of group-living (for mammals, e.g., Janzen, 1970; van Schaik, 1983). It can be broadly divided into two strategies and tactics employed before and after predator encounters (Caro, 2005; Rahlfs and Fichtel, 2010; Fichtel, in press). While the former include predator-sensitive foraging and increased vigilance, mobbing occurs in several mammal species after detecting a predator (e.g., Tamura, 1989). Why animals engage in mobbing and who benefits from it in which way remains an unresolved question in animal behaviour (for reviews see Curio *et al.*, 1978; Shields, 1984). Until today, published field observations of group-living lemurs mobbing a predator are rare (summarised in Scheumann *et al.*, 2007). Regarding snakes, only three interactions have been described so far (Colquhoun, 1993; Rakotondravony, 1998; Burney, 2002). Here, we report a prolonged mobbing display against a Madagascar ground boa (*Acrantophis madagascariensis*) by a group of red-fronted lemurs (*Eulemur fulvus rufus*) in Kirindy Forest. Observations like this may help to elucidate fundamental mechanisms of collective anti-predator behaviour by contributing to a pool of data on mobbing by particular pairs of prey and predators.