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Surveys on *Propithecus verreauxi deckeni*, a melanistic variant, and *P. v. coronatus* in north-west Madagascar

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Propithecus verreauxi *is currently divided into three or four subspecies. Decken's sifaka,* P. v. deckeni, *and the crowned sifaka,* P. v. coronatus, *are believed to be synonymous by some authors, while others regard them as separate subspecies. The results of a survey on an isolated melanistic population of Decken's sifaka, known from museum specimens collected in Ambararatabe, as well as the results of additional surveys carried out within the ranges of* P. v. deckeni *and* P. v. coronatus *are presented. A detailed description and photographs of the melanistic variant are provided. The data are employed to argue the case for recognition of the subspecific status of the endangered* P. v. coronatus. *The consistency of sightings of* P. v. coronatus *to the east of the river Mahavavy and to the west of the river Betsiboka, and sightings of* P. v. deckeni *to the west of the Mahavavy indicate clear separation of the two subspecies in the lower reaches of the two rivers. Clarification of the status of the enigmatic museum specimens from Ambararatabe, representing a melanistic form rather than hybridization of* P. v. deckeni *and* P. v. coronatus, *lends further support to this argument.*

Introduction

Propithecus verreauxi is one of three species of *Propithecus*, Family Indridae, found in Madagascar. Its geographical range extends from the north-west to the south-west of the country, and three or four subspecies are generally recognized (Tattersall, 1982; Figure 1). A substantial body of information is available on the northern subspecies *P. v. coquereli* as well as on the southern subspecies *P. v. verreauxi* (e.g. Richard, 1978; Richard *et al.*, 1991). However, little work has been carried out on the other two subspecies, *P. v. deckeni* and *P. v. coronatus*, and some authors question the subspecific status of the latter (Tattersall, 1982, 1986, 1988), which has led to it occasionally being grouped with *P. v. deckeni* (e.g. Harcourt and Thornback, 1990).

Chromatic variation is well documented in *P. v. verreauxi* and is also known to occur in *P. v. deckeni* (Petter and Peyrieras, 1972; Tattersall, 1986). Observations of melanistic individuals in Decken's sifaka were made in the Bongolava, and museum specimens of a melanistic variant were collected by the 1929–1931 Archbold Expedition at Ambararatabe (Figure 1; Petter and Peyrieras, 1972; Tattersall, 1986; Thalmann and Rakotoarison, 1994).

During brief surveys carried out in the region of Lac Kinkony in 1995 a melanistic variant of *P. v. deckeni* was found at Analabe in the riverine forests to the west of the Mahavavy and to the east of Lac Kinkony. It appears to be geographically isolated and is probably the same population that the Archbold Expedition collected specimens from between 1929–1931 (Tattersall, 1986). A detailed description of this variant is provided here as well as the results of the survey carried out at Analabe. In addition, results are presented of all brief surveys carried out in 1994 and 1995 between the

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rivers Betsiboka and Mahavavy on *P. v. coronatus* and west of the Mahavavy on *P. v. deckeni* (Figure 1).

Methods

P. v. coronatus and pure white *P. v. deckeni* are clearly distinguishable to the eye. The pelage of the crowned sifaka is described as follows. The face is black, naked, or with some short whitish hairs on the muzzle. The fur of the crown, forehead, cheeks and throat is dark chocolate brown or black (Figure 2e), and there is sometimes slight white tufting around the ears. The shoulders and back are variably tinted, ranging from yellow-gold to silver-brown. The tail and hindlimbs are white. The chest is dark and lightens towards and across the abdomen. The pelage of Decken's sifaka differs in a number of ways. The face is black, the ears naked but largely hidden. The fur of many individuals is completely white (Figure 2d), while in others the back, limbs and,

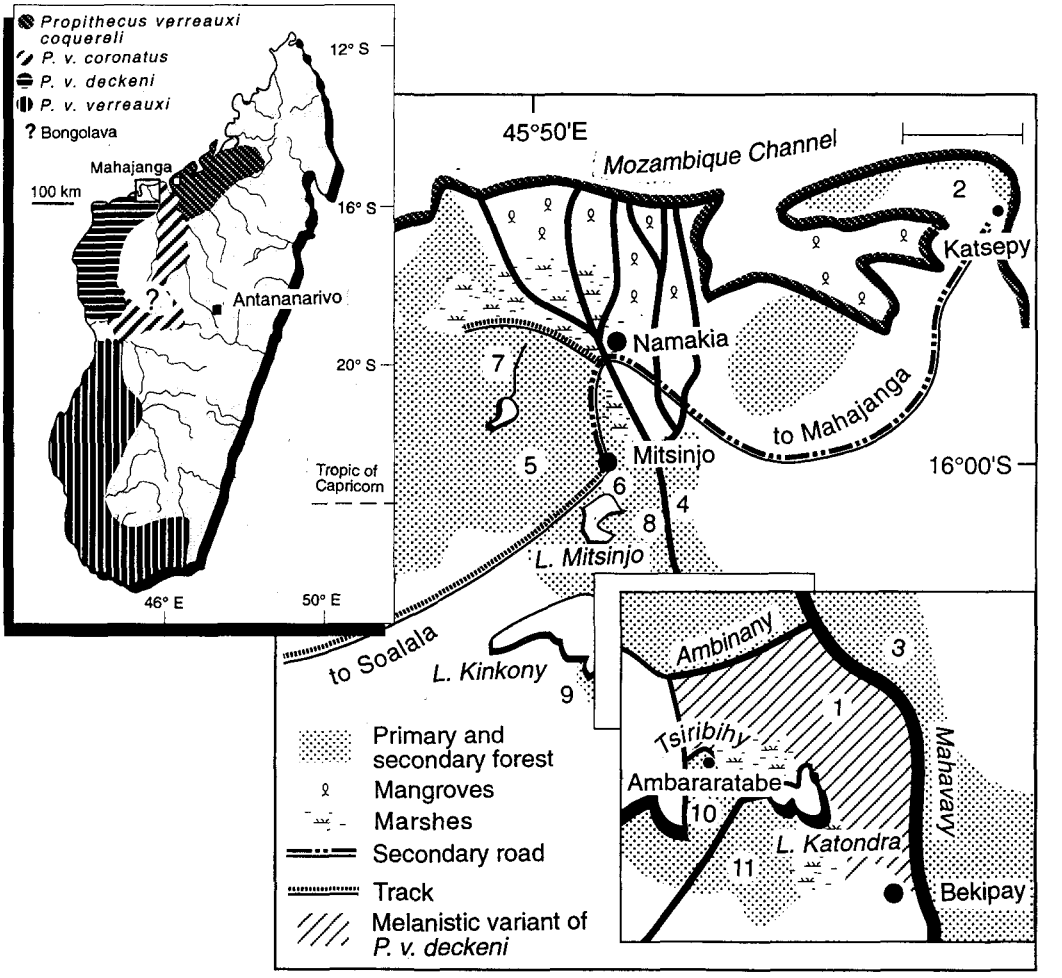

Figure 1. Distribution of *Propithecus verreauxi* (map) and location of areas surveyed including the proposed isolate where the melanistic population of *P. v. deckeni* is to be found (insets). Areas surveyed: 1, Analabe; 2, Katsepy; 3, Anaborengy; 4, Anjamena; 5, Tsiombikibo South; 6, Mitsinjo; 7, Tsiombikibo North; 8, Anadabomandry; 9, Antseza; 10, Ihopy West; 11, Ihopy East. Adapted from: Tattersall (1982); Carte de Madagasikara 1:500 000 (Anon., 1986); Nicoll and Landgrand (1989); Thalmann and Rakotoarison (1994).

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particularly, the shoulders are touched with pale yellow-gold or silver-grey tints. The fur is short and sparse ventrally, revealing black skin (Tattersall, 1982). Based on these differences, the two subspecies were easily identified in the field.

The area surveyed at Analabe on 26 July 1995 from 08.05 to 16.10 h covered approximately 6 sq km. The census was carried out on foot. A standard 10 minutes were spent counting individuals in each group as well as attempting to classify the individuals according to their age and sex (Eisenberg, 1981). However, if a group was resting it was sometimes possible to accomplish this in less than 10 minutes before moving on. A further 4 km between Analabe and the river Ambinany were surveyed from the river on 25 and 29 July and on 10 August 1995 (Figure 1; Table 1).

A number of other localities within the ranges of *P. v. coronatus* and *P. v. deckeni* were surveyed between 1994 and 1995, covering approximate areas of 1 sq km (Ihopy W), 3 sq km (Katsepy, Anaborengy, Antseza, Ihopy E) and 6 sq km (Anadabomandry) (Figure 1; Table 2).

Density estimates (number of individuals/sq km) were calculated for each locality by dividing the number of animals sighted by the area surveyed. These values should be treated with caution because they are based on counts made on one day only and it was sometimes difficult to adequately assess the size of the area surveyed.

Results

Description of the melanistic variant

In the melanistic variant the entire head including the dorsal surface of the neck is dark brown or black. The dorsal coloration of the upper arms, shoulders and cranial half of the back is light brown or silvery grey. This coloration gets progressively lighter on the caudal half of the back and tail, and the caudal half of the tail is entirely white. The ventral surface of the arms and the chest are dark brown, the legs light brown or silvery grey ventrally. The dorsal surface of the forearms and legs is white (Figures 2a and b). The coloration of a lighter melanistic variant seen only infrequently is white, with the exception of the chest, which is dark brown. The fur on the head varies from off-white to silvery grey (Figure 2c).

Surveys and density estimates

Groups of pure white *P. v. deckeni*, mixed groups containing the melanistic variant and pure white individuals, and one group consisting of melanistic individuals only (including a melanistic infant) were seen at Analabe. The variant accounted for 25 per cent and pure white *P. v. deckeni* for 75 per cent of all individuals sighted (Table 1). There was no indication of sex- or age-class dependence in coloration in this population.

All other localities to the west of the Mahavavy revealed only pure white *P. v. deckeni*. Surveys to the east of the river and further north at Katsepy were equally consistent in that only *P. v. coronatus* was found (Table 2). This indicates a clear separation of the two subspecies in the lower reaches of the Mahavavy.

Density estimates for *P. v. deckeni* range between 3 and 23 animals per sq km and are as follows: Analabe 23 animals per sq km; Anadabomandry 3 per sq km; Antseza 5 per sq km; Ihopy West 5 per sq km; Ihopy East 10 per sq km. Estimates for *P. v. coronatus* were 5 per sq km at Katsepy and 32 per sq km between Anaborengy and Anjamena.

Discussion

Melanization in P. verreauxi

Melanization in *P. v. verreauxi* is well documented and groups consisting entirely of melanistic individuals, as well as mixed groups have been observed (Tattersall, 1982, 1986). The situation is less clear in the case of *P. v. deckeni* and *P. v. coronatus*. Field sightings of *P. v. deckeni* in the Bongolava report on groups containing only pure white individuals and mixed groups of white as well

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Figures 2a and 2b. *P. v. deckeni,* melanistic form (*D. J. Curtis*).

Figure 2c. *P. v. deckeni,* lighter melanistic form (*D. J. Curtis).*

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Figure 2d (above). *P. v. deckeni*, pure white form (*D. J. Curtis*).
Figure 2e (right). *P. v. coronatus*. (*P. Müller*).

as melanistic variants. Museum specimens from Ambararatabe are much darker than normal (Petter and Peyrieras, 1972; Tattersall, 1986). Chromatic variation has also been reported for *P. v. coronatus* in the Bongolava (Petter and Peyrieras, 1972), and to the south of the river Manambolo near Bekopaka, as well as at Katsepy on the Bay of Bombetoka, a pure white individual was sighted in a group of *P. v. coronatus* (Tattersall, 1982, 1988; Thalmann and Rakotoarison, 1994). No variation in coloration has been noted in the northernmost subspecies *P. v. coquereli*.

Individuals that fit the description of the chromatic variant described here were collected by the Archbold Expedition in 1929–1931 at Ambararatabe, just south of Analabe, and provisionally assigned to *P. v. coronatus* (Buettner-Janusch and Tattersall, 1985; Tattersall, 1986). Petter and Peyrieras (1972) described a specimen of this variant from the collection of the British Museum, also collected at Ambararatabe, but assigned it to *P. v. deckeni*. However, this variant exhibits pelage characteristics found neither in *P. v. deckeni* nor in *P. v. coronatus* and, as has been noted by Tattersall (1986), bears no resemblance to hybrids of the two subspecies (Petter, 1969). The few intermediates sighted during this study, combined pelage features of the melanistic form and the pure white form. Groups of pure white individuals, mixed groups containing the melanistic variant and pure white individuals, and one group consisting of melanistic individuals only were sighted. This pattern resembles that reported by Petter and Peyrieras

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Table 1. Results of surveys carried out on a melanistic variant of *P. v. deckeni*

Locality	Total no. groups	Total no. individuals	No. white	No. melanistic	Mean group size
Analabe	28	138	104	34	5
Ambinany–Analabe	6	18	16	2	3

Analabe (16°06'S; 45°56'E) was surveyed on 26 July 1995; Ambinany–Analabe was surveyed on 25–29 July 1995 and 10 August 1995. The numbers given are total sightings on the same stretch of river.

(1972) in groups of *P. v. deckeni* in the Bongolava as well as the pattern found in groups of *P. v. verreauxi* in areas where melanization has been observed, because melanistic and non-melanistic individuals occurred sympatrically (Tattersall, 1982, 1986).

This melanistic variant of *P. v. deckeni* appears to be restricted to a small geographical isolate to the east of Lac Kinkony and the west of the Mahavavy. The northern border is the river Ambinany, the main effluent of Lac Kinkony. The southern border is created by the river Tsiribihy, Lac Katondra and associated marshlands, the hills to the south of Bekipay and Lac Kinkony (Figure 1). The southern border of this isolate is the least clear, because the 1929–1931 Archbold Expedition collected their specimens near Ambararatabe. This locality is situated just to the south of the river Tsiribihy, outside the proposed isolate. However, only pure white *P. v. deckeni* were found during survey work carried out south of Ambararatabe in the Ihopy forest and at Antseza (Figure 1; Table 2). It is possible that the specimens collected by the Archbold Expedition were found just north of the Tsiribihy but this was impossible to verify because very little forest remains in the immediate vicinity of Ambararatabe.

Surveys and density estimates

Estimates provided by this study appear to be fairly low compared with density estimates for *P. v. coronatus* at Anjamena (173 individuals per sq km; Müller, 1997), *P. v. verreauxi*

Table 2. Results of surveys carried out on *P. v. coronatus* and *P. v. deckeni*

Subspecies	Locality	Date	No. groups	No. individuals	Mean group size
P. v. coronatus					
	Katsepy	25 August 1995	4	15	4
	Anaborengy—Anjamena	10 August 1995	17	96	6
P. v. deckeni					
	Tsiombikibo S	22 May 1994	1	2	2
	Mitsinjo	23 May 1994	2	?	?
	Tsiombikibo N	25–26 May 1994	4	?	?
	Anadabomandry	10 September 1994	4	19	5
	Antseza	23–24 July 1995	3	15	5
	Ihopy W	15–16 August 1995	5	20	4
	Ihopy E	16 August 1995	5	30	5

Katsepy (15°46'S; 46°15'E), Anaborengy (16°05'S; 45°56'E), Anjamena (16°03'S; 45°55'E), Tsiombikibo South (16°00'S; 45°50'E), Mitsinjo (16°00'S; 45°52'E), Tsiombikibo North (15°95'S; 45°47'E), Anadabomandry, (16°03'S; 45°54'E), Antseza (16°13'S; 45°53'E), Ihopy West & East (16°15'S; 45°58').

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(ranging from 47 to 500 individuals per sq km) and *P. v. coquereli* (60 individuals per sq km; e.g. Harcourt and Thornback, 1990). No data are available for comparison for *P. v. deckeni*. However, all the values provided here represent very rough estimates because only one day was spent at each locality and hence are most certainly too low. In addition, the very low values (3–10 individuals per sq km) stem from areas that had either been heavily deforested fairly recently or were still being deforested rapidly, and where lemurs were hunted for food.

Based on the sighting of a pure white individual at Katsepy, Tattersall (1982, 1986, 1988) questioned the subspecific status of *P. v. coronatus*. However, the results presented here, as well as a number of other observations at Katsepy (M. Nicoll, pers. comm.; D. Reid, pers. comm.; U. Thalmann, pers. comm.) report only sightings of individuals conforming to the *P. v. coronatus* type. Surveys carried out further inland to the east of the Mahavavy (this study; Müller, 1997), as well as surveys to the west of the river Bestiboka (near Ambato Boéni) also indicate the sole presence of *P. v. coronatus* between the rivers Mahavavy and Betsiboka (R. D. Martin, pers. comm.; Tattersall, 1982; Rabemazava, 1990). The situation in the Bongolava where the ranges of *P. v. coronatus* and *P. v. deckeni* meet remains enigmatic and more surveys are necessary before a better understanding can be reached (Thalmann and Rakotoarison, 1994). In view of the overall consistency of sightings of *P. v. deckeni* to the west of the Mahavavy and *P. v. coronatus* to the east, there does not at present appear to be any justifiable reason for disputing the subspecific status of *P. v. coronatus*. Given the high conservation rating of 7 assigned by Mittermeier *et al.* (1992), the implications for its conservation are dire if it continues to be regarded as belonging to the chromatically variable *P. v. deckeni* (Tattersall, 1988) and is not recognized as a subspecies in its own right: This lemur is highly threatened and is not known to be present in any protected area (Mittermeier *et al.*, 1992; Thalmann and Rakotoarison, 1994).

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