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RESEARCH ARTICLE

A New Species of Snub-Nosed Monkey, Genus *Rhinopithecus* Milne-Edwards, 1872 (Primates, Colobinae), From Northern Kachin State, Northeastern Myanmar

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We describe a snub-nosed monkey that is new to science from the high altitudes of northeastern Kachin state, northeastern Myanmar, the Burmese snub-nosed monkey, *Rhinopithecus strykeri* sp. nov. Descriptions are based on a skin and skulls of four specimens obtained from local hunters. The new species is geographically isolated from other snub-nosed monkeys and separated from them by two major barriers—the Mekong and the Salween (Thanlwin) rivers. The species is chiefly diagnosed by its almost entirely blackish fur coloration with white fur only on ear tufts, chin beard, and perineal area, and its relatively long tail (140% of head and body length in the adult male). Preliminary surveys and interviews with hunters indicate that the new species is limited in distribution to the Maw River area, a small region of the Salween-N'mai Hka divide in northeastern Kachin state, northeastern Myanmar. The distribution area appears to cover about 270 km^2, and the species may consist of only three groups with a total population of approximately 260–330 individuals. Our data on hunting pressure suggest that the species is Critically Endangered. Am. J. Primatol. 73:96–107, 2011.

Key words: Burmese snub-nosed monkey; *Rhinopithecus strykeri* sp. nov.; *Rhinopithecus bieti*; Kachin state; Myanmar; New species

INTRODUCTION

During gibbon surveys in Myanmar [e.g. Geissmann et al., 2008, 2009, in preparation; Lwin et al., 2010], hunters reported the presence of a monkey species with prominent lips and a nose that faced upwards. This monkey was reported from the eastern Himalayas of northeastern Myanmar, from the area east of the upper N'mai Hka River (a tributary to the Irrawaddy = Ayeyarwaddy River) in northeastern Kachin state. The description was clearly suggestive of a snub-nosed monkey (genus *Rhinopithecus*).

Snub-nosed monkeys are threatened primates known only from restricted parts of China and Vietnam north of approximately 22°N latitude (Table I). No snub-nosed monkey has been reported in Myanmar to date: all previously known populations are located to the east of that country. Two major species boundaries—the Mekong and the Salween (Thanlwin) rivers—separate Myanmar from the habitat of the Yunnan snub-nosed monkey (*R. bieti*), which is the geographically closest snub-nosed species, suggesting that any population in Myanmar could be a new taxon.

To follow up on the interview findings, we conducted a field survey in the area indicated by the hunters and discovered an apparently small population of a new species of snub-nosed monkey that exhibits external characteristics unlike any other snub-nosed monkeys described previously. We propose the scientific name *Rhinopithecus strykeri* sp. nov. for the species and provide an account of its morphology together with some observations on its behavioral ecology and conservation status.

METHODS

The location of the survey area is shown in Figure 1. Our first field and interview survey in this area was conducted from February 10 to March 16,

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TABLE I. Species of the Snub-Nosed Monkeys (Genus *Rhinopithecus*), Their Distribution [Groves, 2001 and Geissmann et al., this study], and Conservation Status [IUCN, 2010]

Species		Distribution	Status
Golden snub-nosed monkey	*Rhinopithecus roxellana*	Mountains of central and western China: Sichuan, Ganssu, Hubei, and Shaanxi	Endangered
Grey snub-nosed monkey	*Rhinopithecus brelichi*	Restricted to Fanjinshan, south of the Yangtze in Huizhou, China	Endangered
Tonkin snub-nosed monkey	*Rhinopithecus avunculus*	Restricted to few areas of northeastern Vietnam	Critically endangered
Yunnan (or black) snub-nosed monkey	*Rhinopithecus bieti*	Ridge of the Mekong-Salween divide, Yunnan and Tibet	Endangered
Burmese snub-nosed monkey	*Rhinopithecus strykeri* sp. nov.	Known from a small area of the Salween–N'mai Hka divide, northeastern Myanmar	Not listed yet, but qualifies as Critically Endangered (this paper)

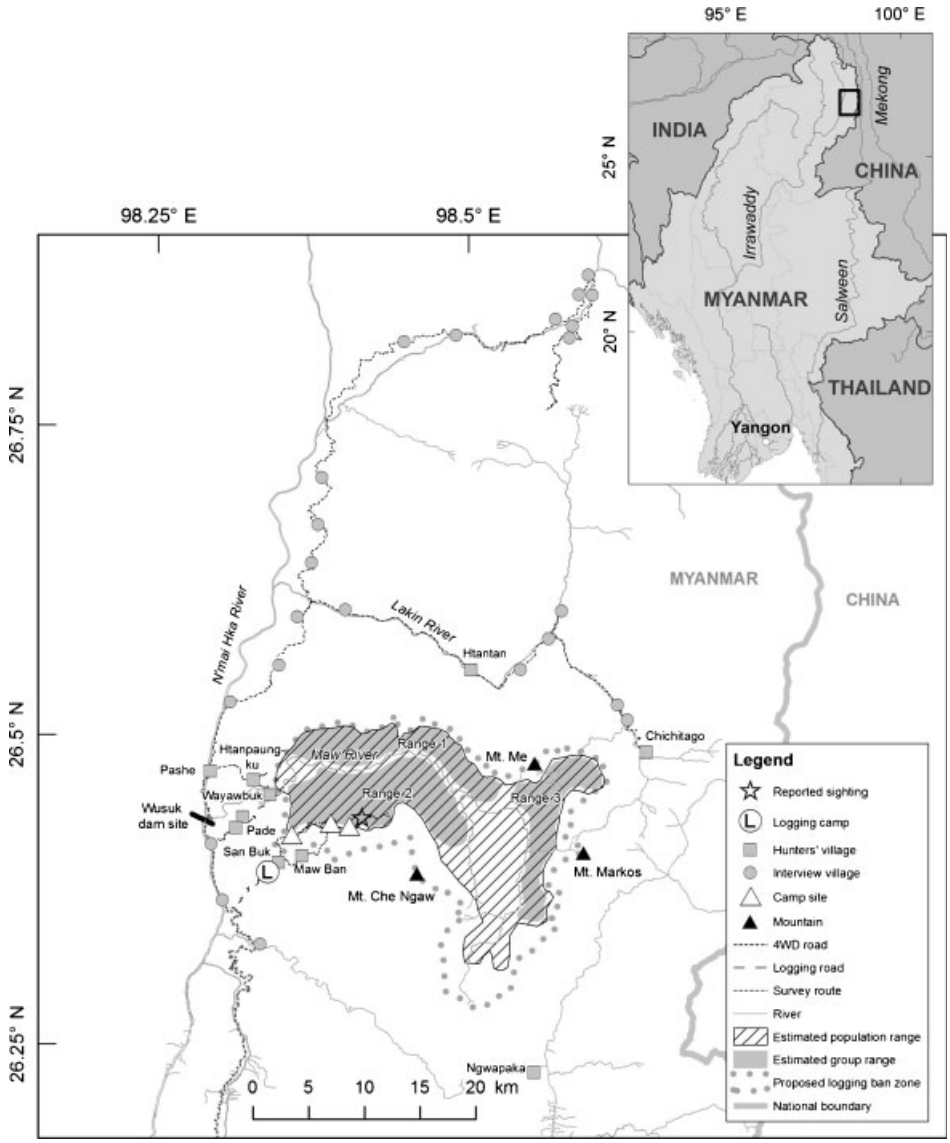

Fig. 1. Map of study area showing villages visited during this study and estimated ranges of snub-nosed monkeys in Kachin. Inset: Map of Myanmar showing location of the study area (square). The reported sighting was made during a survey on May 1, 2010.

2010 as part of the nationwide Hoolock Gibbon Status Review, the second one from April 24 to May 8, 2010 to target snub-nosed monkeys in particular. Both surveys occurred during the dry season.

During the two surveys, the survey team conducted interviews with 65 respondents from 33 villages located along the N'mai Hka, Maw, Lakin and Me rivers in northeast Kachin State, northeastern Myanmar. Interviews were conducted with hunters in all villages within the survey area shown in Figure 1. The area covered by the interview survey ranges from 26.22705°N (Ngwapaka) to 26.87102°N (Hkindammay) and from 98.29161°E (Pashe) to 98.64373°E (Chichitago). Elevations of villages ranged from 385 m (Phamawzup) to 1,880 m (Chichitago) above sea level (a.s.l.). Information on snub-nosed monkeys was obtained from 25 of 33 villages, whereas interviewees from eight villages did not appear to know the species. Specimens were obtained at Pade and Htantan villages.

Comparative data from other *Rhinopithecus* species were obtained by inspecting and photographing captive individuals in China (Beijing Zoo, Beijing Breeding Centre for Endangered Animals, Guangzhou Zoo, Kunming Institute of Zoology, Kunming Zoo, Shanghai Zoo) and Japan (Higashiyama Zoo in Nagoya) between 1990 and 2010, and by studying skins and skulls in the collection of the Kunming Institute of Zoology in May 2010. Additional comparative photographs of all species of snub-nosed monkeys were obtained from Cyril C. Grueter and from the Internet.

The research adhered to the legal requirements of Myanmar, and the research adhered to the American Society of Primatologists (ASP) Principles for the Ethical Treatment of Non Human Primates (see www.asp.org/society/resolutions/EthicalTreatmentofNonHumanPrimates.html).

THE BURMESE SNUB-NOSED MONKEY

Order Primates Linnaeus, 1758
Superfamily Cercopithecoidea Gray, 1821
Family Cercopithecidae Gray, 1821
Subfamily Colobinae Jerdon, 1867
Genus *Rhinopithecus* Milne-Edwards, 1872
Rhinopithecus strykeri species novum

Holotype

Skull (with mandible), skin, and photographs of gutted carcass of adult male. Collected by Ngwe Lwin, Saw Soe Aung, Thet Naing Aung, and Zin Myo Aung on March 7, 2010 from two hunters from Pade village (26.42486°N, 98.31237°E, 1,012 m a.s.l.), who had caught the monkey one or two days before, south of the Maw River. The skull and skin (AIMZ 15504.a and 15504.b respectively) have been deposited in the Anthropological Institute and Museum of the University of Zürich (AIMZ), Zürich, Switzerland.

Paratypes

Two adult skulls, one male and one female, collected by Ngwe Lwin and Saw Soe Aung on February 23, 2010 from a hunter from Htantan village (26.55563°N, 98.49789°E, 1,533 m a.s.l.). The hunter collected these monkeys c. 2007 from north of the Maw River. On the same day, another hunter from Htantan gave us [Ngwe Lwin and Saw Soe Aung] a bag he had made out of the skin of a juvenile snub-nosed monkey. The monkey was caught in January 2010, also north of the Maw River. The female skull (AIMZ 15505) has been deposited in the primatological collection of the Anthropological Institute and Museum of the University of Zürich (AIMZ), Zürich, Switzerland. The male skull (BANCA 2010.6) and the bag (BANCA 2010.4) have been deposited in the zoological collection of Hlawga Wildlife Park, Yangon Division, Myanmar.

Type Locality

The trapping locality of the holotype was determined as 26.43101°N, 98.38894°E (elevation 2,815 m) in the Maw River area, northeastern Kachin state, and northeastern Myanmar.

Diagnosis

A species of the genus *Rhinopithecus* [sensu Groves, 2001] as defined according to broad distributional and physical characteristics. The most conspicuous of these are the wide upturned nostrils: the openings face forwards and the flaps of skin lateral to the nostrils are directed upwards.

This new species is distinguished from other species by its black or blackish ventral parts, all black or blackish limbs, and a white chin beard.

Comparisons

A comparative list of 50 external characteristics (mostly fur and skin coloration) of all species of snub-nosed monkeys is presented in Table II. It is based on the data compiled by Chaplin and Jablonski [1998], revised and supplemented by the first author (T. G.).

Rhinopithecus strykeri sp. nov. lacks the white underparts and white thigh backs of *R. bieti*, the white underparts and white circum-facial hair of *R. brelichi*, the yellowish-orange body fur and the skin flaps on the lateral upper lip of males of *R. roxellana*, and the bright gingery red fur coloration on underside and inner side of limbs of *R. brelichi*. The new species shows similarities with *R. bieti* in the presence of a distinct, forward-swept occipital crest in adult males, and white ear tufts that sharply contrast with the black surrounding fur.

TABLE II. Comparison of External Characteristics of All Species of the Snub-Nosed Monkeys (Genus *Rhinopithecus*)

	Species				
Characteristic	*Rhinopithecus roxellanae*	*Rhinopithecus brelichi*	*Rhinopithecus avunculus*	*Rhinopithecus bieti*	*Rhinopithecus strykeri* sp. nov.
Head					
Color of crown hair	Brown	Brown	Black	Gray	Black
Color of temple hair	Orange	Brown	White or bleached	Buff	Black
Color of forehead hair	Orange	Brown	White or bleached	Buff	Dark gray brown
Color of ear tuft	White or bleached	White or bleached	White or bleached	White or bleached	White or bleached
Color of whiskers	White or bleached	White or bleached	White or bleached	Black	White or bleached
Color of hair on cheeks	Yellow	White or bleached	White or bleached	Brown	Dark gray brown
Body ventral					
Color of throat hair	Yellow	Orange	Orange	Orange	Buff brown
Color of collar hair	Yellow	Orange-buff	White or bleached	Gray	Buff brown
Color of inner arm hair	White or bleached	Yellow	Cream	White or bleached	Upper arm: buff brown to brown, lower arm: black
Color of inner thigh hair	Yellow	Yellow	Gray	Cream	Dark gray brown
Color of ventral coat	Yellow	Dark-brown	Buff	Cream	Dark gray brown
Body dorsal					
Color of hair on nape of neck	Brown	Brown	Black	Black	Black
Color of hair over deltoid region	Red or chestnut	Blackish brown	Black	Black	Black
Color of hair on lateral aspect of arm	Brown	Black	Black	Black	Black
Color of hair over triceps region	White or bleached	White or bleached	White or bleached	White or bleached	Black
Color of hair on lateral aspect of forearm	Brown	Black	Black	Black	Black
Color of hair on back of hand	Brown	Dark	Black	Black	Black
Color of cape on upper back	Brown	Black-brown	Brown	Black	Black
Color of lower back hair	Red or chestnut	Red[-brown] or chestnut	Black	Brown	Black
Color of sacral hair	Yellow	Brown	Black	Brown	Black
Color of hair over iliac region	White or bleached	Cream	White or bleached	Gray	Blackish brown
Color of hair around perineum	White or bleached	Gray-cream	White or bleached	Cream	White or bleached
Color of hair on back of thigh	White or bleached	Yellow	Black	White or bleached	Black
Color of hair on lateral aspect of thigh	Brown	Blackish-brown	Black	Black	Black
Color of hair on leg	Brown	Black	Black	Black	Black
Color of hair on foot	Cream	–	Black	Black	Black
Color of hair on tail	Red or chestnut	Black	Buff	Black	Black
Color of tail tip	White or bleached	Black	Cream	Black	Black
Skin					
Color of skin around eyes	Blue	Blue	Blue	Blue	Pale pink
Color of skin on philtrum	White	White	Grayish blue	White	Pale pink

TABLE II. Continued

Characteristic	Species				
	Rhinopithecus roxellanae	*Rhinopithecus brelichi*	*Rhinopithecus avunculus*	*Rhinopithecus bieti*	*Rhinopithecus strykeri* sp. nov.
Color of supralabial skin	White	White	Pink	White	Pale pink
Color of actual lips	White	White	Pink	Pink	Pale pink
Color of skin on ear	Flesh	Flesh	Flesh	Flesh	Flesh
Color of skin on palm of hand	Pink	Black	Black	Black	Black
Color of skin on foot	Brown	Black	Flesh	Black	Black
Color of nipples	White	Flesh	Flesh	Black	Flesh
Color of ischial callosities	Light brown	Flesh	Flesh	Light brown	Dark gray
Color of perineal and surrounding skin	Blue	–	Flesh	Pink	Pale brown
Color of penis	Blue	Flesh	Flesh	Black	Black
Color of scrotum	White	Red	Flesh	White	White
Hypertrichy					
Length of hairs on withers	Normal	Normal	Normal	Elongated	Medium
Length of hairs over sacrum	Long	Medium	Medium	Medium	Medium
Crest at vertex	Present	Present	Absent	Present	Present
Distinctive whorls or crown swirl on head	Absent	Absent	Absent	Present	Present
Ear tuft	Present	Present	Absent	Present	Present
Whiskers	Absent	Absent	Absent	Absent	Present
Swept back whiskers	Absent	Absent	Present	Absent	Absent
Tail length to body	Short (100–130%)	Long (nearly 150%)	Long (nearly 150%)	Short (100–130%)	Long (ca. 140%)
Tail tuft	Present	Present	Present	Absent	Absent
Hypertrichy at base of tail	Absent	Absent	Absent	Present	Absent

Description of Holotype

Fur coloration mostly black. Crown with thin, high, forward-curved crest of long, black hairs. Protruding ear tufts white. Face mostly naked, skin pale pink. Upper lips laterally with whitish hairs (''moustache''). Distinct white chin beard. Circumfacial hair (lower front, cheeks) blackish brown, protruding into facial area below eyes. Upper chest (clavicular area) also blackish brown, intermingled with few whitish hairs. Lower chest black with a faint sepia tinge. Perineal area white, clearly defined. Limbs black, inner sides of upper arms and upper legs blackish brown. Tail black and long, about 140% of head plus body length. Body measurements are presented below.

Measurements

For skull measurements, see Table III. Body measurements taken on the freshly dead holotype male on March 7, 2010 are: head-body length 55.5 cm and tail length 78.0 cm.

Etymology

The species is named in honor of Jon Stryker, President, and Founder of the Arcus Foundation. His generous support for primate conservation globally funded the field survey in Myanmar that led to the discovery of this new species.

Vernacular Name and Name-Related Lore

The ethnic groups in the Maw River area are Law Waw and Lisu. In Law Waw language, the Burmese snub-nosed monkey is called *myuk na tok te*. In Lisu language, the monkey's name is *mey nwoah*. Both names mean ''monkey with an upturned nose.''

Many people assured us that this species was particularly easy to find when it was raining. The monkeys reportedly tend to get rainwater in their upturned noses, to which they respond with audible sneezes. To avoid getting rainwater in their noses, the monkeys allegedly spend rainy days sitting with their heads tucked face-down between their knees.

Further Details of Specimens Collected

Holotype

Our survey team visited Pade village and inquired about the snub-nosed monkeys in the afternoon of March 6, 2010, because we were informed previously that a hunter in Pade had a

TABLE III. Cranial and Dental Measurements (mm) of Three Specimens of *Rhinopithecus strykeri*

Variable	Holotype, male AIMZ 15504.a	Paratype 1, male BANCA 2010.6	Paratype 2, female AIMZ 15505
Cranial length nasion—opisthocranion	10.15[a]	–	–
Greatest skull length prosthion—opisthocranion	13.28[a]	–	–
Bizygomatic breadth	10.57	–	–
Cranial breadth across vault (bieuryonic)	7.91	–	–
Cranial breadth across supramastoid crests	8.96	–	–
Postorbital breadth	5.51	5.54	5.33
Cranial height, basion—bregma	5.98	–	5.53
Nasion to basion	–	8.34	7.23
Maximal length of foramen zygomaticum	4.185	4.61	3.73
Palate length, prosthion to staphylion	5.19	5.57	4.75
Palate breadth, across (a) M^3–M^3	4.22	4.27	3.71
Palate breadth, across (b) canines	4.21	4.43	3.10
Maximal length of postcanine toothrow, maxilla	3.61	3.55	3.65
Maximal breadth of postcanine toothrow, maxilla	0.91	1.03	0.93
Canine length (mesiodistal)	1.00	1.00	0.63
Canine breadth (labiolingual)	0.80	0.81	0.54
Length of M^3	0.93	0.85	0.91
Breadth of M^3	0.875	0.925	0.88
Length of M^2	0.81	0.84	0.80
Breadth of M^2	0.90	0.97	0.92
Basal length (basion to prosthion)	9.60	10.34	8.49
Biorbital breadth, inner	7.71	8.08	7.14
Biorbital breadth, outer	9.37	9.70	8.06
Orbit breadth	3.12	3.27	2.76
Orbit height	2.735	2.82	2.87
Face height, prosthion to nasion	5.31	5.78	4.76
Mandible length infradentale (a) to gonion	8.51	–	–
Mandible length infradentale (b) to condyle	10.075	–	–
Bimental breadth	2.833	–	–
Minimal corpus height between M_1 and M_2	2.855	–	–
Mandibular width, bicondylar	8.433	–	–
Ascending ramus height, perpendicular from tip of coronoid	5.878	–	–
Maximal ascending ramus height, gonion to centre of condyle surface	4.73	–	–
Breadth incisura mandibulae	2.37	–	–
Coronoid to gonion	5.50	–	–

[a]Not reliable because the occipital bone is missing and with it possibly some contribution to the cranial length.

skin and skull of the species. Unfortunately, when we arrived, the specimen had reportedly already been sold to a Chinese man, so we moved on to Pashe village. In the late afternoon, two locals came to our house and said they had caught a monkey with an upturned nose in an iron trap south of the Maw River (within the area tentatively ascribed to ''Range 2'', Fig. 1). We inspected and photographed the carcass on March 7, 2010 (Fig. 2). By that time, it had already been gutted. The carcass was readily identified as an adult male. This was confirmed by the dentition. We obtained the skull and the complete skin of this specimen.

Paratypes

Two unsexed adult skulls (Fig. 3), one male, one female, were obtained from a hunter from Htantan village on February 23, 2010. The hunter collected these monkeys about 3–4 years ago from north of the Maw River (within ''Range 1'' on Fig. 1). He remembered that the smaller (female) specimen had ''more white fur'' than the bigger one.

A bag made out of the skin of a juvenile snub-nosed monkey (Fig. 4) was obtained from a hunter from Htantan on February 23, 2010. The monkey was caught in January 2010 in the northern part of Group Range 1 (north of the Maw River). The piece of fur used for the bag is completely black in the dorsal area and blackish brown in the ventral area.

Other Specimens Seen and Specimens Described by Hunters

On May 1, 2010, Le Me A Si and Dai Laum, two of our local survey team members from San Buk village, encountered a group of snub-nosed monkeys

Fig. 2. *Rhinopithecus strykeri*, new species. Views of the freshly dead male holotype (Skull and Skin: AIMZ 15504) in Pade village on March 7, 2010. Photos: Ngwe Lwin.

counting at least seven individuals (including one infant) within the Range 2 area on Figure 1 (specific location: 26.43300°N, 98.41393°E, elevation 2,503 m) [Momberg et al., 2010]. They described the monkeys as ''black with long black tails.'' The infant was all black, but only the dorsal aspect was visible as the infant was clinging to the belly of its mother. The location of this sighting is indicated in Figure 1.

In Maw Ban village, we saw an additional skull of an adult female snub-nosed monkey in the headman's house (Fig. 5).

Additional Descriptions From Hunters

The various hunters we interviewed described the snub-nosed monkeys they observed or hunted before as follows: adults all black, except for white chin, ears, and perineal area, and somewhat paler color on the inner sides of upper arms and on the chest. These reports are consistent with the diagnosis above.

Two hunters commented on young individuals being paler or having more white fur than the adult, especially around chest or throat. In snub-nosed monkeys, neonatal coats tend to be paler than the adult fur coloration. This is particularly pronounced in the Yunnan snub-nosed monkey (*R. bieti*), in which infants are uniformly white to grayish white, except for a small dark cap when first born [Chaplin & Jablonski, 1998, p 92; T. G., own observations].

Geographic Distribution

Preliminary surveys and notes on habitat associations indicate that the range of the new species encompasses the mountain forests in the watershed area of the Maw River, a tributary to the N'mai Hka River, and forests across the range to the east above the village of Chichitago. The species therefore appears to be limited in distribution to a small area of the Salween–N'mai Hka divide in northeastern Kachin state and northeastern Myanmar (see Fig. 1). The coordinates of the distribution area are 26.31°–26.51°N and 98.34°–98.61°E.

Habitat

The distribution area is mountainous, and slopes are very steep in most places (Fig. 6). The forests of this area and their botanical composition were first studied by Frank Kingdon Ward who traversed the snub-nosed monkey forests at the end of August 1914 [Kingdon Ward, 1921]. The main forest types in the range of the snub-nosed monkeys are *Cool Temperate Rain Forest* (1,830–2,440 m) and *Mixed Temperate Forest* (2,135–2,745 m). *Silver Fir Forest* occurs at elevations of 2,745–3,660 m (conifer zone). Five locations where snub-nosed monkeys were sighted or caught by hunters were visited by us: their altitudes range from 1,720–3,190 m. We have no information how high up the mountains the monkeys go, but the highest mountain in this range is 3,660 m. Groups of *Rhinopihecus bieti* exhibit an altitudinal range of 2,625–4,600 m ($n = 5$ groups) [Grüter, 2009, p 110], which suggests that the Burmese species tends to occur at lower altitudes than the latter.

According to local hunters, snub-nosed monkeys spend the summer (i.e. the snow-free times from May to October) mostly at higher altitudes, in mixed temperate forests and conifer forests. In winter, however, when snowfall probably restricts

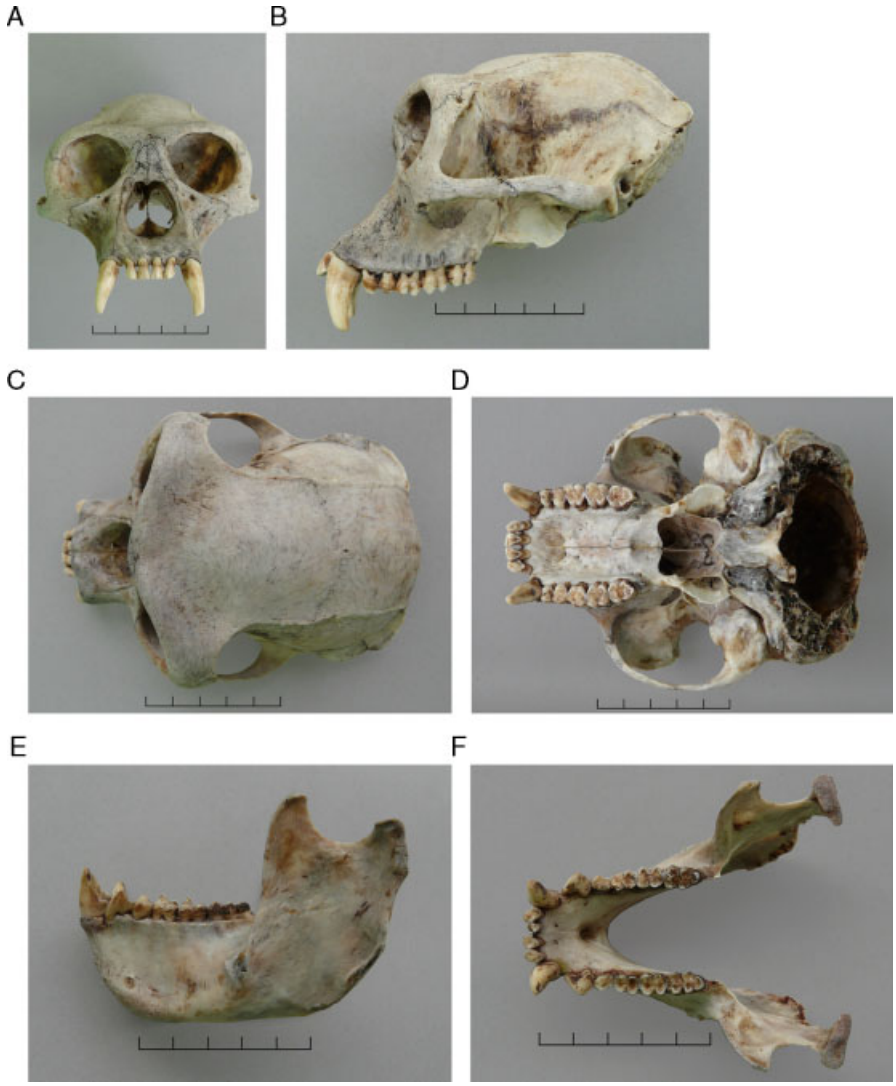

Fig. 3. *Rhinopithecus strykeri*, new species. Skull and mandible of the adult male holotype (AIMZ 15504.a). Photos: Thomas Geissmann.

the availability of food, the monkeys descend to lower elevations and may be found closer to villages. The monkeys reportedly occur near Wayawbuk village in October and November, for instance, and are said to be easy to find at that time.

Other non-human primates occurring in the survey area include Shortridge's langur (*Trachypithecus shortridgei*), stump-tailed macaque (*Macaca arctoides*), Assamese macaque (*M. assamensis*), Rhesus macaque (*M. mulatta*), and northern pig-tailed macaque (*M. leonina*) [Momberg et al., 2010].

DISCUSSION

Possible Taxonomic Relationships Between the New Species and Other *Rhinopithecus* spp

Based on a simple numerical comparison of 50 external characteristics (mostly fur and skin coloration) of the species of snub-nosed monkeys in Table II, the new species exhibits the highest number of matches with *R. bieti* (24), closely followed by *R. avunculus* (22) and *R. brelichi* (17), all of which exhibit large areas of black fur. In contrast, there are only eight matches with the predominantly orange or yellow colored *R. roxellana*. It is tempting to assume that this moderately higher similarity between *R. bieti* and the new species indicates a closer affinity between the two, but morphological similarity, especially in color [Geissmann, 2002], does not necessarily correspond to phylogenetic relationship.

The pronounced, forward-swept crest of adult males of *R. bieti* (Fig. 7) and the new species (Fig. 2) may be a shared derived characteristic, which is absent from other odd-nosed monkeys. If this interpretation is correct, it would support a close relationship between *R. bieti* and the new species. The shorter geographical distance between these two species (Fig. 8) also supports this interpretation.

Fig. 4. Bag made out of a *Rhinopithecus* skin by a hunter from Htantan village; Paratype 3 (BANCA 2010.4). Photo: Thomas Geissmann.

Fig. 5. Skull of an adult female snub-nosed monkey in a hunter's house in Maw Ban village, May 2010. Photo: Ngwe Lwin.

Fig. 6. Habitat of the Burmese snub-nosed monkeys in the western part of Range 1. Photo: Ngwe Lwin.

Population Size

Based on interviews with hunters from the villages located near the distribution range of the new species, we estimate that there are approximately three to four groups of snub-nosed monkeys, which occur in three distinct parts of the distribution area. The inferred ranges of three groups are indicated in Figure 1, but require further verification. Two hunters from Lakin and three hunters from Htantan reported that about two groups, each containing approximately 30 individuals, are sometimes encountered north of the Maw River (northern part of Group Range 1, see Fig. 1). Hunters from the villages of Pashe, Wayawbuk, Phamawzup, and Htanpaungku reported that there are two groups near the Maw River: one group lives north of the river and has about 60–80 individuals (Group Range 1); the other group lives south of the river and has about 80–100 individuals (Group Range 2, Fig. 1). Hunters from Chichitago village reported that every year around July, a group of about 150 animals appears at the foothills of the snow-capped mountains above the village (Group Range 3, Fig. 1). Reportedly, the monkeys come to that area to eat bamboo shoots. The location of the remainder of the third group's range is not reliably known. In addition, there is a remote valley located roughly in the middle of the three known group ranges. Whether snub-nosed monkeys also occur in that valley, and whether they belong to one of the three groups described above, is unknown. None of our interviewees were familiar with that valley, because it is far away from all villages. As a tentative summary of all interview information, we estimate that the total population size consists of three groups containing a total of about 260–330 individuals.

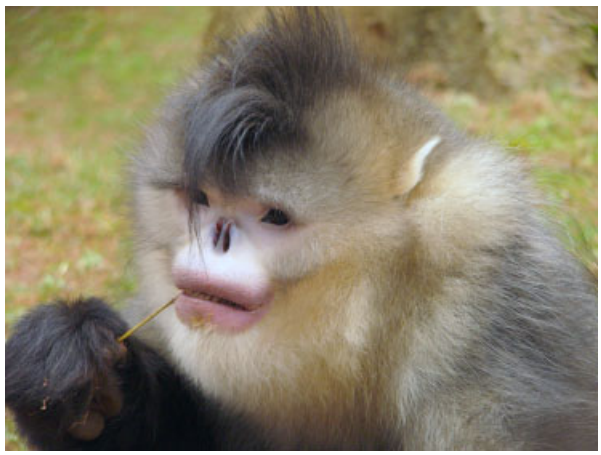

Fig. 7. Yunnan snub-nosed monkey (*Rhinopithecus bieti*), adult male at Kunming Zoo. Photo: Thomas Geissmann.

The ranges shown in Figure 1 are also based on information provided by the interviewed hunters. The sizes of the Group Ranges 1, 2, and 3 are approximately 47, 72, and 41 km^2, respectively. If the unstudied valley in the middle of the three ranges is included in the calculation, the whole distribution area could cover around 273 km^2.

Although we cannot exclude the possibility that additional groups of this species occur in other sites in Kachin, all interviewees who appeared familiar

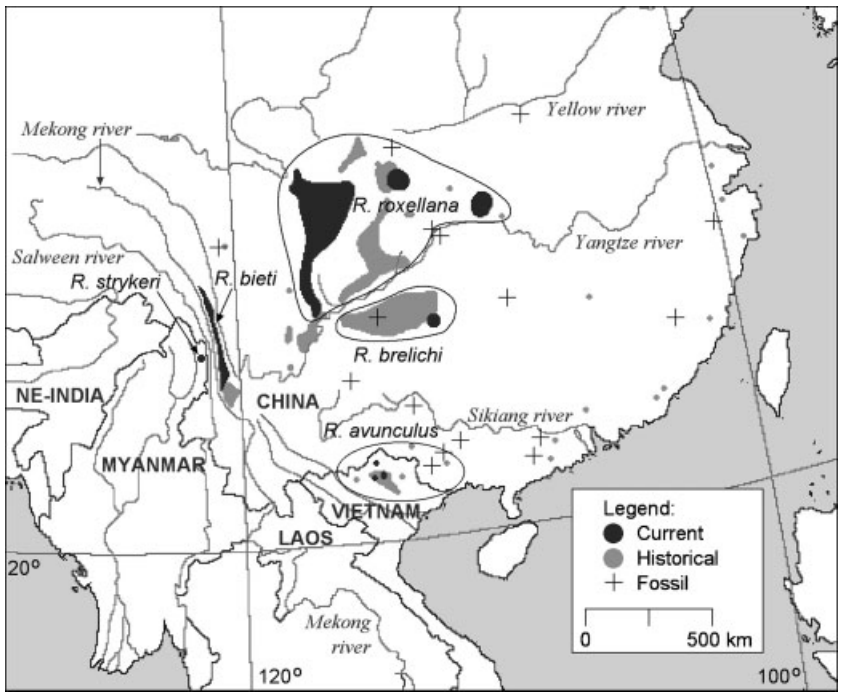

Fig. 8. Distribution map of the snub-nosed monkeys (genus *Rhinopithecus*), after records compiled from Li et al. [2002], Nadler et al. [2003], Wang et al. [1998], and Zhang et al. [1992].

with this species reported that it occurs only around the Maw River.

We have conducted field surveys and hunter interviews along both sides of the N'mai Hka River from Chibwe northwards up to the type locality, paying special attention to primates [i.e. Geissmann et al., in preparation]. That area was previously surveyed during the Vernay-Cutting expedition of 1938–1939 [Anthony, 1941]. We also conducted interview surveys north of the type locality up to the Me River. In 2009/2010, the Biodiversity and Nature Conservation Association (BANCA), Yangon, also conducted environmental biodiversity surveys north of Me River in the Khaunglanghpu region (Aung Soe Than, personal communication to NL and TG). None of these surveys found evidence for snub-nosed monkeys in these regions. The only interviewees who were familiar with snub-nosed monkeys knew them from the species distribution range (as shown on Fig. 1).

During the biodiversity surveys of 2009/2010 conducted by BANCA, however, verbal reports were obtained that monkeys with upturned noses might also occur in the Lwe Nue mountain range (Swe Swe Aung, personal communication, May 2010). This range is located west of the N'mai Hka, just north to the confluence of the N'mai Hka and Mali Hka rivers. This area will need further investigation.

Conservation Status

All previously described snub-nosed monkeys are Endangered or Critically Endangered (Table I), threatened by the fast growing human population, deteriorating environments and accelerated deforestation, and the hunting of monkeys for food and traditional ''medicine'' [Li et al., 2002].

This new species also qualifies as globally threatened, based on the available data. The Burmese snub-nosed monkey is currently known to exist at only a single location. The overall known range of the species (a minimum polygon including the three Group Ranges and the areas in-between them) covers a maximum area of about 273 km^2.

Using the criteria defined by IUCN [2001], the Burmese snub-nosed monkey qualifies as Critically Endangered, CR A4c,d. As explained below, the available data meet the requirement of an inferred ''population size reduction of $\geq$80% during a three-generation period… and where the reduction or its causes have not ceased.'' In our assessment, ''c'' refers to a decline in area of occupancy, extent of occurrence and/or quality of habitat, ''d'' refers to actual or potential levels of exploitation, both of which are supported by information in this article.

We estimate the ''three-generation period'' for this species to be 18 years. Generation length is defined as ''the average age of parents of the current cohort (i.e. newborn individuals in the population)… Generation length is greater than the age at first breeding and less than the age of the oldest breeding individual'' [IUCN, 2001]. Because the generation length of snub-nosed monkeys is unknown, we use the age at first reproduction as a minimum estimate of generation length. In other species of snub-nosed

monkeys, the average age at first reproduction is 4–6 years in females and 6.5–7 years in males [Li et al., 2003, p 274; Liang et al., 2000; Quan & Xie, 2002, cited in Liu et al., 2009, p 3835; Zou, 2002, cited in Cui et al., 2008]. This gives an average of about 6 years for the age at first reproduction. Three-generation spans would thus amount to approximately 18 years.

The total population size (see above) was tentatively estimated between 260 and 330 individuals. In accordance with the precautionary approach recommended by IUCN [2001, p 28], we have used the lower estimate, 260 individuals, in this analysis. Based on the interviews with hunters [Momberg et al., 2010], at least 13 Burmese snub-nosed monkeys were hunted during 2009. If this figure is extrapolated to three-generation spans (at least 18 years), the rate of loss would be 234 monkeys, or 90% of the conservatively estimated current total population of 260 individuals. Furthermore, the hunting pressure is likely to increase considerably in the next few years as new dam construction and logging roads invade the distribution area of this newly discovered snub-nosed monkey.

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