

THE GIBBONS OF THE SUBGENUS *NOMASCUS* (PRIMATES, MAMMALIA)

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INTRODUCTION

A traditional classification of the gibbons recognised a single genus, *Hylobates*, with four subgenus (Groves, 1972; Frouty *et al.*, 1983). The Concolor or Crested Gibbons were placed in the subgenus *Nomascus*, and assigned to one species, *H. (N.) concolor*. To this species was assigned six subspecies, as follows, *H. c. concolor* (North Vietnam and Laos, between the Red and Black Rivers), *hainanus* (Hainan Island, China), *lu* (a small area in far western Laos), *leucogenys* (Other parts of northern Vietnam and Laos), *siki* (Central Vietnam, southern Laos), *gabriellae* (South Vietnam). The adult males (and juveniles of both sexes) are completely black in the first three, but have light (white to pale reddish) cheek patches in the other three; the adult female are buffy coloured (with a blackish streak from crown to nape) in all, but in *concolor* and *lu* the ventral region is blackish.

Dao (1983) surveyed the gibbons of North Vietnam, finding that both *H. c. concolor* and *leucogenys* occurred at Muong Lay, Lai Chau province. He proposed that, the two being sympatric with no indication of interbreeding, they be classified as separate species, *H. concolor* and *H. leucogenys*. He also recorded *H. c. hainanus* from several localities in the coastal region of Vietnam; Tan (1985) and Fooden *et al.*, (1987) reported that *H. c. hainanus* exterminated less than 40 years ago in southwestern Guangxi, China (Kept no specimens in this place in all museum).

Ma and Wang (1986), working in Yunnan, China, likewise recorded sympatry between true *concolor* and *leucogenys*, on Mt. Huanglian, Luchun Co. In addition, they revised the morphological characters of both forms, extending the range of differences between them; most significantly, they found a consistent difference in the baculum between them. They were thus able definitively to confirm that two separate species, not just one, can be distinguished. Finally, they described two new subspecies of *H. concolor*, *H. c. jingdongensis* from Jingdong Co., and *H. c. fuvogaster* from Cangyuan, Gengma and Yongde Co. west of the Mekong River (all other taxa in the subgenus being found only east of the river). they disagree with Dao's (1983) identification of *H. c. hainanus* on the mainland, and feel that gibbons on both banks of the Red River belong to *H. c. concolor*.

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MATERIAL AND METHODS

We have studied specimens of this subgenus in the following collections, Kunming Institute of Zoology, Academia Sinica, (KIZ); Institute of Zoology, Academia Sinica, Beijing, (BIZ); Guangdong Institute of Entomology, Guangzhou, (GIE); British Museum (Natural History), London, (BM); Museum National d'Histoire Naturelle, Paris, (MNP); American Museum of Natural History, New York, (AMNH); Smithsonian Institution, Washington, (USNM); Field Museum of Natural History, Chicago, (FMNH); Museum of comparative Zoology, Harvard, (MCZ); National Zoological Reference Collection, Singapore, (ZRC). We took several measurements on skulls and postcranial skeletons (see Groves 1972; measurements are also taken from Dao (1985), and the following measurements on skins, length of hair (1) on withers, (2) on side of crown, (3) in centre of crown, (4) over ear; in adult female skins, (1) length and (2) width of dark streak or patch on crown and nape. We extracted the baculum from many of the male skins, and the baubellum from a few of the female skins. Localities are listed in Groves (1972), Dao (1985) and Ma & Wang (1986).

RESULTS

(1) Comparison between *H. concolor* and *H. leucogenys*

We confirm the existence of considerable morphological differences between these two distinct species. In the black phase (i. e. adult males, and juveniles of both sexes) the hair is fine, almost silky, and jet black in *H. concolor*, but longer and coarser, and with silvery hairs inconspicuously intermixed in *H. leucogenys*; in the latter there are white patches on the cheeks, from below the level of the mouth corners to above the level of the tops of the ears, their anterior margins being straight, so that the mouth corners are not involved. The adult females are less readily distinguished, but tend to be more richly coloured (orange-creamy) in *H. leucogenys* than in *H. concolor* in which the colour is more yellow to fawn-grey; in most subspecies of the latter there is a black zone on the ventral surface of the body, but never in *H. leucogenys*. The dark crown patch is blackish in tone, long-oval or triangular, in *H. concolor*; dark brown, often with a maroon tinge, and more trapezoidal (ending bluntly on the nape, not in a point), in *H. leucogenys*.

The hair in the centre of the crown rises in a prominent tuft in the male of *H. leucogenys*, but this is almost entirely absent in the female. In *H. concolor* the female has a tuft very like that of the male. On the other hand the hair over the ears is considerably elongated in the female *H. concolor* (much more than in the male), but there is much less differential lengthening in *H. leucogenys*.

Sexual size difference is also much more marked in *H. leucogenys*. The mean skull length for three males is 114.3 mm; for seven females, 107.3, i. e. 7 mm difference. In *H. concolor* the size difference is only half of this (see next section).

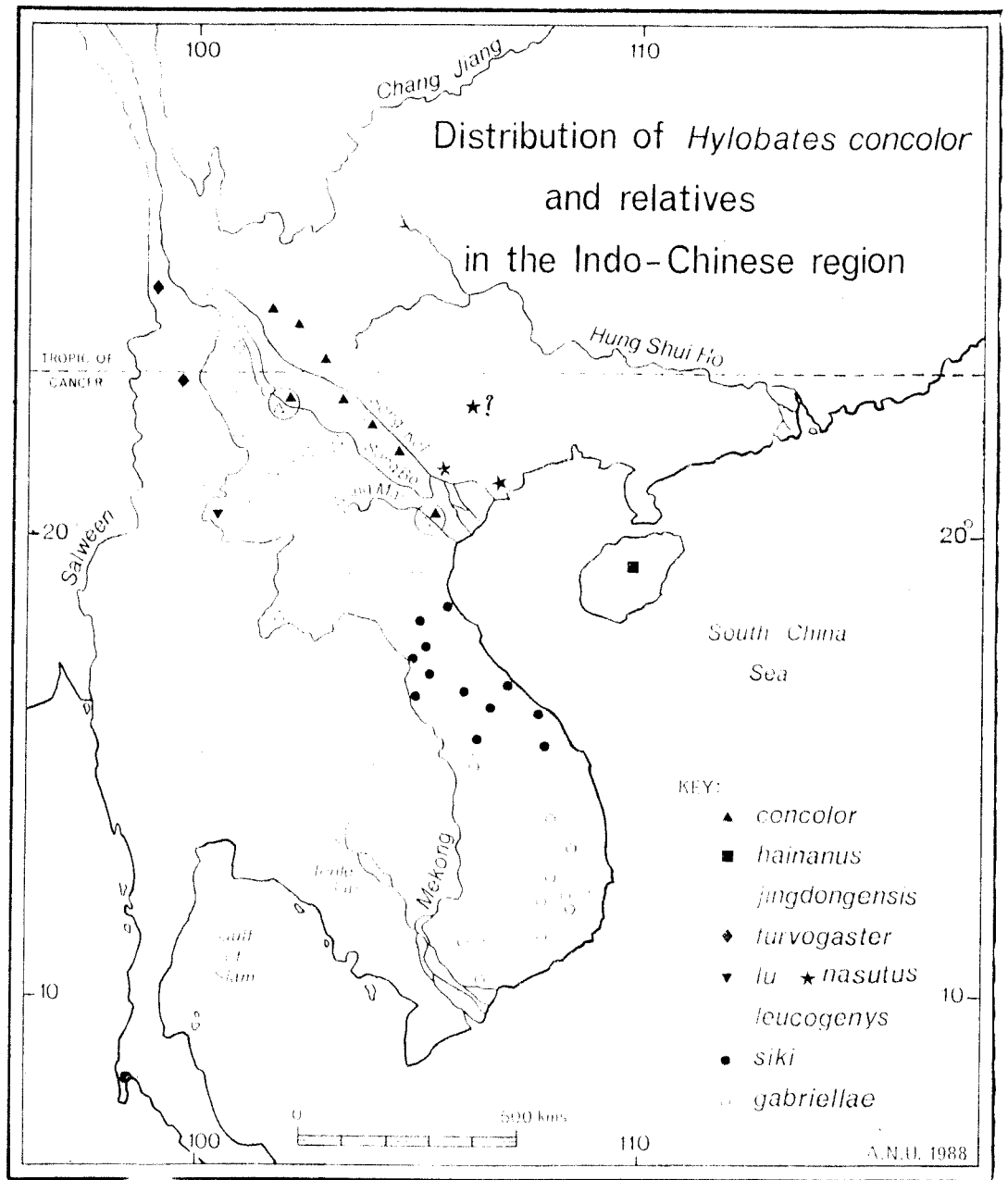
In *H. leucogenys* M^3 is generally noticeably smaller than M^1 ; in *H. concolor*, the two are about equivalent in size. The canines are more slender, with the longitudinal groove less marked, in *H. leucogenys*.

The difference found by Ma & Wang (1986) in the baculum can be confirmed on further specimens. In *H. concolor* it is rod-like, somewhat thickened at the base, 9.0—9.2 mm long in fully mature males; in *H. leucogenys* it is 9.1—12.1 mm long, and has a characteristic bony projection in front. These differences can be seen in specimens figured by Groves, 1972 (fig. 11).

(2) Subspecies in *H. concolor*

The three subspecies found in Yunnan, China are *H. c. concolor*, *yingdongensis*, and *furvogaster*. They can be distinguished broadly as follows:

H. c. concolor: From the Red River valley in southern Yunnan, China and northern Vietnam. Male with a prominent tuft, 30—35 mm long, on crown. Adult female dull buffy, with a black, diamond-



shaped patch on crown, about 80–125mm long by 30–75mm wide; with a narrow rim of white fur around lower part of face, from eyes to chin, replaced by black hairs on cheeks and brows; ventral surface extensively black, extending into armpits; in a female in Tierpark Berlin, there is even a dark triangle on the back. Body hair soft, 43–52mm long; hair short over ears. Ears small, 28–35mm. Skull length of males averaging 112mm ($n=4$), of females 108.5 ($n=6$); zygomata relatively wide, as much as 84mm.

H.c. jingdongensis: From Jingdong County, Yunnan, China. Male's crown tuft longer, generally

over 35mm long. Female more gingery buff, with less black suffusion on ventral surface, this tone not usually extending to armpits; crown patch black-brown, tadpole-shaped, about 85—130×70—90mm; a broader, more nearly complete grey-white face-ring. Ears larger, 30—37; skull length 116mm in a single male, 115.3 in 4 females; zygomata less flaring, 72—75mm.

H. c. furogaster: The only Crested Gibbon from west of the Mekong River. Female darker grey-buff, with abundant thick black fur ventrally, extending to axillae and inner surfaces of limbs; crown patch dark brown, long-pointed-oval in shape, very large, 110—180×40—95mm; a narrow grey-white face ring. Body hair more elongated over ears, where 35—43mm long (compared to 25—35 in other subspecies). The ears measure 33mm in a single specimen. Other characters unknown and likely to remain so, as this subspecies is threatened with extinction. The strikingly unusual colour of the adult female was, at the time of the original description, known from only a single specimen; a second female skin, in the Beijing collection (BIZ 17929, from Baoshan), closely resembles the Kunming female.

The fourth Chinese subspecies is *H. c. hainanus*, from Hainan Island. It is distinguished by its very short, brittle body hair, 35—42mm long; the male's crown tuft is short, under 30mm; the adult female is brown-yellow to golden-brown, with no black at all on the ventral surface (quite by contrast to other subspecies); the crown patch is small, 100×30mm, trapezoidal, and black; there is no light face-ring as such, but often an off-white zone on cheeks, sometimes nearly reaching chin. The ears are very large, 32—48mm. Hainan Island specimens are very small, skull length 102—105mm in two specimens (sex uncertain); zygomatic breadth 66—67.

The fifth subspecies of *H. concolor* is *H. c. nasutus* from the coastal region of Vietnam, north of the Ma River. Dao (1983) recorded specimens of *H. concolor hainanus* from localities in this region. In a book published later (1985), but evidently prepared much earlier as it is based on collections up to 1975, a specimen from one of these localities, Chi Ne in Hoa Binh province, is ascribed to *leucogenys*, and only one locality (Trung Khanh, Cao Bang Province) is given for *hainanus*. The description, however, leaves no doubt about the correctness of the identification; the male entirely black, the female "brown-gold, with black spot on head and nape. Underside gold; pale tone on cheek" (Dao, 1985; translated by C. P. G.). (The lack of a dark ventral tone is no doubt the reason why the Hoa Binh specimen, a female, was originally ascribed to *leucogenys*). The skull length in a male is given by Dao as 110 mm., bizygomatic breadth 78 mm.; it seems mean that the mainland specimens are larger than that on Hainan. Geissmann (1989) made comparison between the two on the coloration, dark facial area and black crown patch in female, and suggested it seems as a new subspecies. In fact, Kunkel d'Herculais (1844) described as *Hylobates nasutus* from Near along Bay, Tonkin, Indo-China. Specimens, recorded by Dao (1985) and Geissmann (1989) from East of Red River, northeast Vietnam are seemingly ascribed to *nasutus*, and as a subspecies of *H. concolor*.

The last subspecies of *H. concolor* is the poorly-known *H. c. lu*, from the Ban Nam Khueng district, western Laos, separated from conspecifics by the range of *H. leucogenys*. The crown tuft is short, 27mm in one specimen. The female resembles that of *H. c. furogaster*, but with even greater ventral and limb extension of the black tone; there is a broad white face-ring, which extends back to border the crown patch. The crown patch is black, pointed-oval, large, 130×60mm. The body hair is long, 40—47mm; the ears large, 35mm; the skull (in a single male) small, 107mm long, but with flaring zygomata, 76mm broad.

(3) The status of *gabriellae*

The finding that the baculum is consistently different in *H. concolor* and *H. leucogenys* at once focuses attention on the position of *H. "concolor" gabriellae*. A baculum of this form figured by Groves (loc. cit.) resembles that of *concolor*, not that of the geographically intervening *leucogenys*,

No:
Dao's and
Geissmann's are
different

being rod-like, 8.2mm long. Re-study by C. P. G. of London and paris specimens in the light of the findings of Ma and Wang (1986) shows that while the black phase resembles *H. leucogenys* in its intermixture of silvery hairs, in some other characters it tends to approach *H. concolor*. The adult female has a brown tinge on the skin (but not on the hair) of the ventral surface, though the overall tone of the body hair tends to be red-gold, even brighter than in *H. leucogenys*; the crown patch is black or grey, triangular (ending in a point on the nape like *H. concolor*), and short, under 100mm long whereas it is nearly always above 100mm in *H. leucogenys*. The body hair is short (33—45mm, compared to 40—70 in *H. leucogenys*), rather fine. There is very little sexual size difference (skull length male, 107.4 (n=9), female 105.8 (n=8); M³ is about equal in size to M¹. More definitively *leucogenys*-like is the strong sexual difference in elongation of crown hair, the weak (in this case, virtual absence of) elongation of ear hair in the female, and the slender of the canines.

The intermembral index (arm length × 100/leg length) in *gabriellae* is 137—150 (n=4); in *H. leucogenys* it is 121—140 (n=14); but *H. concolor* overlaps both these ranges, 126—149 (n=9).

The chromosomes of *H. leucogenys* and *H. gabriellae* also appear to differ. Couturier *et al.*, (1982) noted that a hybrid *leucogenys* × *gabriellae* had a reciprocal translocation between chromosomes 1 and 22 in one of its sets, the other being identical to the previously established karyotype of *H. leucogenys*. Dr Peter Van Tuinen (in litt. to C. P. G.) states that this translocation is consistent for *gabriellae*, and suggests that it might result in lowered hybrid fertility.

Considering the consistency of differences in the baculum between *H. concolor* and *H. leucogenys*, it seems plausible that the *concolor*-like character of the *gabriellae* baculum will turn out to be constant as well, even though at the moment only a single specimen has been examined. The other characters, as described above, assort sometimes with *H. concolor*, sometimes with *H. leucogenys*. We propose that the red-cheeked gibbon should stand as a third species, *H. gabriellae*.

(4) What is *H. "concolor" siki*?

The distribution of *siki* falls between those of *H. leucogenys*, and *H. gabriellae*. Like the former, the cheeks in the black phase are whitish, not pale red (although they can be pale yellow in *H. leucogenys*); but whereas the pale patches are linear in *H. leucogenys*, in *H. gabriellae* they extend inward to surround the corners of the mouth, although they do not reach up to be level with the tops of the ears, and are associated with bushy cheek whiskers. The cheek patches of *siki* more closely resemble the *gabriellae* shape, but extend still further round the mouth corners, and tend to reach somewhat under the chin. The body hair is very short; the female's crown patch and hair pattern resemble those of *gabriellae*. A single specimen has an intermembral index of 141.2—in the middle of the range of *gabriellae*, but just above the limits of *leucogenys*.

Groves (1972) mentions a specimen from Saravane, Laos, which appears to be intermediate between *siki* and *gabriellae*.

In view of the strong inference that *siki* is closer to *gabriellae* than to *leucogenys*, the form of the baculum becomes crucial in allocating the enigmatic *siki*. C. P. G. was permitted to extract the baculum from an adult male *siki* skin in the paris Museum, MNP 1971.8, of unknown locality, from the paris Menageris. The baculum is short (7.5mm long), rodlike, thick at the base, and lacking the anterior projection of *H. leucogenys*. It thus resembles those of *H. concolor* (but is considerably smaller) and *H. gabriellae*.

CONCLUSION AND SUMMARY

We confirm the specific difference between *H. concolor* and *H. leucogenys*, and propose to rank *H. gabriellae* as a third species, with *H. g. siki* as a subspecies.

The six subspecies of *H. concolor* are distinguished mainly by the extent and nature of sexual

dimorphism in size, differential hair elongation, and colour. *H. c. hainanus* apparently occurs only on Hainan Island, China. Specimens of East of Red River, northeast Vietnam and southwest Guangxi, China belong to *H. c. nasutus*.

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We thank the curators of the collections in which we have studied specimens of *Nomascus*. C. P. G. would especially like to thank Francis Petter for permission to dissect out the baculum from MNP 1971.8., *H. gabriellae siki*.

Table 1. Baculum measurements in *Hylobates (Nomascus) taxa*(in mm.)

specimens	Length	Proximal	breadth
<i>H. concolor concolor</i>			
BM 33.4.1.4	9.0	2.4	1.6
<i>H. concolor jingdingensis</i>			
KIZ 640289	9.2	2.1	2.1
KIZ 640291	9.0	2.0	2.0
KIZ 044(juv.)	6.8	1.5	1.5
<i>H. leucogenys</i>			
BM 26.10.4.1.	12.1	2.5	2.1
KIZ 61016	10.0	1.8	0.9
KIZ 00018	10.5	2.1	1.5
KIZ 592011	9.1	2.4	1.2
KIZ x-01(subad.)	8.1	1.9	1.5
<i>H. gabriellae siki</i>			
MNP 1971/81	7.5	1.9	—
<i>H. gabriellae gabriellae</i>			
BM 27.12.1.1	8.2	2.2	1.6

Table 2. Measurements of adult male and female of *Hylobates(Nomascus) taxa*(in mm.)

Specimens	Back hair	Crown hair		Crown patch Length	Basic Length	skull	
		Tuft	Over ear			Width	Width
<i>Hylobates concolor concolor</i>							
Male	42—45(2)	30—31(2)	20(2)		112.4(6)	72.8(6)	
Female	47.5(4)	26.8(4)	29.5(4)	100.2(5)	52.0(4)	108.6(8)	69.4(8)
<i>Hylobates concolor hainanus</i>							
Males	35—36(2)	20.29(2)	15(2)		102.0		62.5
Female	42—45(2)	27.3(4)	27.4(4)	106.7(4)	39.5(4)	103.3(3)	66.8(3)
<i>Hylobates concolor nasutus</i>							
Male(No.51, Dao)	—	—	—		110.0		78.0
<i>Hylobates concolor jingdongensis</i>							
Male	41.0(4)	34.3(4)	19.8(4)		112—116(2)		72—75(2)
Female	48.5(4)	29.5(4)	24.5(4)	128.5(4)	80.0(4)	115.3(4)	73.3(4)

续表 2

<i>Hylobates concolor fuvogaster</i>							
Male	50.0(3)	36.0(3)	40.0(3)			93—109(2)	60—77(2)
Female	50.0(3)	36.7(3)	40.2(3)	161.7(3)	79.6(3)	106—108(2)	60—68(2)
<i>Hylobates concolor lu</i>							
Male	40—47(2)	27	18			107	75.5
Female	47	23	27	—	—	—	—
<i>Hylobates leucogenys</i>							
Male	55.4(8)	34.3(8)	21.6(8)			114.8(8)	75.2(8)
Female	51.8(13)	24.6(10)	27.2(10)	114.1(14)	61.8(10)	109.3(9)	72.2(8)
<i>Hylobates gabriellae gabriellae</i>							
Male	34.9(8)	27.0(3)	14.3(3)			107.4(9)	68.7(9)
Female	33.7(3)	15—20(2)	17—24(2)	86.5(11)	40.0(3)	105.8(8)	65.3(8)
<i>Hylobates gabriellae siki</i>							
Male	43.7(3)	32.0(3)	20.7(3)			93—110(2)	61.5—65(2)
Female	—	19	17	—	—	—	—

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中文摘要

灵长类 *Nomascus* 亚属的长臂猿

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灵长类中的长臂猿仅有一属 *Hylobates* 4 个亚属, 其中 *Nomascus* 亚属曾被认为仅有一个种即黑冠长臂猿 *Hylobates (Nomascus) concolor*, 且分化有 6 个亚种, *Hylobates concolor concolor*; *H. concolor siki*; *H. concolor lu*; *H. concolor hainanus*; *H. concolor leucogenys*; 和 *H. concolor gabriellae*。

Dao Van Tien (1983) 发现 *concolor* 和 *leucogenys* 在越南北部为同域分布, 认为可能系两个种。马世来和王应祥 (1986) 也发现它们在中国云南南部也有同域分布现象, 且在阴茎骨形态和另外一些形态特征上存在明显差异, 从而正式提出它们确系两个有效种, 并描述了黑冠长臂猿 *H. concolor* 的两个新亚种: *H. c. jingdongensis* (分布于中国云南中部景东无量山区), *H. c. fuvogaster* (分布于中国云南西南部澜沧江以西)。本文进一步查对了欧、亚和北美各主要博物馆中所保存的长臂猿标本。经分析比较, 对 *Nomascus* 亚属的长臂猿进行了重新整理如下:

1. 进一步比较了黑冠长臂猿 *H. concolor* 和白颊长臂猿 *H. leucogenys* 在毛色、头骨、牙齿和阴茎骨等特征上的差异, 证实它们为两个独立的种是正确的。

2. 根据阴茎骨、毛被、牙齿以及杂种核型的形态特征, 认为 *H. gabriellae* 应作为本亚属的第 3 个独立种, *siki* 为它的地理亚种即: *H. gabriellae siki*。

3. 在 *H. concolor* 中, 主要根据量度、毛被的长短和毛色、斑块的差异分为 6 个亚种。其中海南亚种 *H. c. hainanus* 仅分布于中国海南岛。越南东北部 (红河以东) 和中国广西西南部的长臂猿应归属 *H. c. nasutus* 亚种。

综上所述, *Nomascus* 亚属应有 3 个有效种附 8 个亚种, 其名录和分布如下:

(1) 白颊长臂猿 *H. leucogenys*, 为单型种。分布于越南北部, 老挝北部和中国云南南部 (西双版纳和绿春)。

(2) 红颊长臂猿 *H. gabriellae*, 有两个亚种。

A. *H. gabriellae gabriellae*, 分布于越南南部。

B. *H. gabriellae siki*, 分布于越南中部和老挝南部。

(3) 黑冠长臂猿 *H. concolor*, 有 6 个亚种。

A. *H. concolor concolor*, 分布于越南西北部 (红河以西)、老挝北部和中国云南南部。

B. *H. concolor nasutus*, 分布于越南东北部 (红河以东); 中国广西西南部 (?)。

C. *H. concolor hainanus*, 仅分布于中国海南岛。

D. *H. concolor jingdongensis*, 分布于中国云南中部无量山区。

E. *H. concolor fuvogaster*, 分布于中国云南西南部 (澜沧江以西)。

F. *H. concolor lu*, 分布于老挝西部。

关键词: 分类, 长臂猿, *Nomascus* 亚属