



A Female Black Gibbon, *Hylobates concolor* Subspecies, from Northeastern Vietnam

Thomas Geissmann¹

Received August 16, 1989; revised December 18, 1989

The Hainan black gibbon, *Hylobates concolor hainanus*, was originally believed to be endemic to Hainan Island. The authors of some recent reports suggest that the species also occurs on the mainland in northeastern Vietnam (Dao Van Tien, 1983), and that it has only recently been exterminated in southwestern Guangxi Province, China (Fooden et al., 1987). Others disagree, and propose that these populations should be identified as *H. c. concolor* (Ma and Wang, 1986; Ma et al., 1988). A female from northeastern Vietnam lived for many years at the Tierpark Berlin. This report provides a preliminary description of this adult female, demonstrating that it cannot be attributed to *H. c. hainanus*. In some characteristics the specimen resembles *H. c. concolor*, but in others it is unique. This female provides first evidence that the distribution area of the proposed mainland population of *H. c. hainanus* in northeastern Vietnam also contains a previously unrecognized population which either belongs to *H. c. concolor* or possibly represents a new subspecies of the black gibbon (*H. concolor*).

KEY WORDS: black gibbon; *Hylobates concolor hainanus*; *H. c. concolor*; Vietnam; Hainan Island.

INTRODUCTION

Little is known about the black gibbons (*Hylobates concolor* spp.) in Vietnam, and their affinities remain unclear. Kunckel d'Herculais (1884) ap-

parently published the first description of a specimen of a black gibbon from Vietnam: *Hylobates nasutus*. His type specimen lived for a short time in captivity in Paris and was reportedly captured in the neighbourhood of Vung Ha Long ("au voisinage de la baie d'Along"), at the coast of northeastern Vietnam.

In 1892, Thomas described a captive male gibbon from Hainan island as a new species (*Hylobates hainanus*). Matschie (1893) placed the specimen in *H. concolor*, a species first described by Harlan (1826) on the basis of a juvenile captive specimen which was then believed to originate from Borneo. Pousargues (1904) placed both *H. concolor* and *H. hainanus* in *H. nasutus* and concluded that Harlan's (1826) type of *H. concolor* probably did not originate in Borneo. Pocock (1925) also united the three forms in one species but recognized priority of the name *concolor* over *nasutus*.

Delacour (1951) considered the Hainan black gibbon to be subspecifically distinct from the black gibbon on the mainland of Tonkin but preferred to use the name *H. c. nasutus* for the latter, and *H. c. concolor* for the Hainan black gibbon. Simonetta (1957) resurrected the names *H. c. concolor* for the Tonkin black gibbon, and *H. c. hainanus* for the Hainan subspecies. This nomenclature has been followed by most subsequent authors (e.g., Chivers, 1977; Groves, 1972; Marshall and Sugardjito, 1986). Meanwhile, the problem of the type locality for *H. c. concolor* has been solved by the designation of a neotype from Chapa, northern Vietnam (Groves, 1972).

Recently, however, Dao Van Tien (1983, 1985) reported that two subspecies of black gibbons were present in Vietnam: *H. c. concolor* in northwestern Vietnam, west of the Red River, and *H. c. hainanus* in northeastern Vietnam, mostly east of the Red River. One male skin from a locality much more to the south, close to the Ma River, was also attributed to *H. c. hainanus* (Dao Van Tien, 1983), but subspecific identification of male skins is problematic in *H. concolor* (see below). Following Dao Van Tien (1983), Fooden *et al.* (1987) suggested that the black gibbon populations, which were exterminated less than 40 years ago in southwestern Guangxi Province (southern China), were presumably also *H. c. hainanus*. However, Ma and Wang (1986) and Ma *et al.* (1988) disagree with Dao Van Tien's (1983) identification of the subspecies, and believe that gibbons on both banks of the Red River belong to *H. c. concolor*. On this uncertain base currently rests our knowledge on the systematic affinities of the Vietnamese black gibbons.

The known geographic range of *H. concolor*, with its currently recognized subspecies (including the disputed *H. c. hainanus* from the mainland), is presented in Fig. 1. The uncertainty regarding the affinities of the black gibbons in northeastern Vietnam may be attributed to the fact that black gibbon specimens from the mainland east of the Red River have rarely been described in much detail (but see Dao Van Tien, 1985, quoted below).

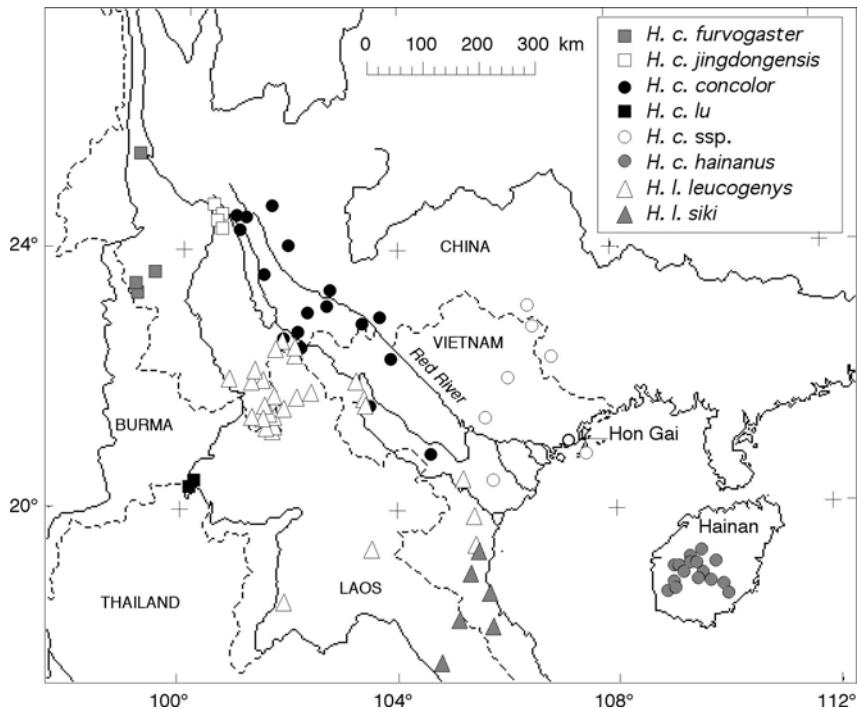


Fig. 1. Known distribution of subspecies of black gibbons, *Hylobates concolor*, and adjacent populations of white-cheeked gibbons, *H. leucogenys*. References: Dao Van Tien, 1983; Fooden, 1987; Fooden *et al.*, 1987; Groves, 1972; Ma and Wang, 1986. The disputed mainland population of *H. c. hainanus* is here referred to as *H. c. ssp.* An adult female (FMNH 39151) from Hoi Xuan (Thanh Hoa, northern Vietnam; 20°22'N, 105°07'E) is here regarded as *H. l. leucogenys*, on the basis of both her geographical origin and her facial markings (a white brow-band). Fooden *et al.* (1987, p. 166) do not exclude a possible identification of this female as *H. c. hainanus*. However, a white brow-band was absent in the female *H. c. hainanus* (BMNH 1907.12.1.1) but was present in all adult females (museum and zoo specimens) of *H. l. leucogenys* examined for this report. Dao Van Tien (1983, p. 370) attributed a female skull from Hoi Xuan to *H. c. concolor*, but he later identified a male and a female specimen (skulls and skins preserved) from the same locality as *H. l. leucogenys* (Dao Van Tien, 1985, p. 197, 210f).

In addition, no such specimen has been identified so far in western museums. Thus, the identification and relationship of these black gibbons remain unclear.

A female gibbon from the region in question lived for many years at the Tierpark Berlin (Fischer, 1965, 1980, 1981). She was wild-born and originated from the hinterland of Hon Gai (Quang Ninh), northeastern Vietnam. Hon Gai is situated east of the Red River (see Fig. 1); the U.S. Board on Geographic Names (1964) reports its coordinates as 20°57'N, 107°05'E. The

information on the geographic origin of the gibbon has been reported by Fischer (1980, 1981).

Fischer went to Hanoi in order to take charge of the infant gibbon on September 14, 1962, and brought the animal to the Tierpark Berlin (East Germany) in November 1962 (Fischer, 1965). The female, called "Patzi", was estimated to be 1 to 1.25 years of age when acquired (Fischer, 1965). Detailed observations on her physical and behavioral development have been reported by Fischer (1965, 1980, 1981). She has been identified previously as *H. c. concolor* (Fischer, 1980; Groves, 1984; Schilling, 1984). According to the records of the Tierpark Berlin, Patzi died on June 9, 1986. Minimum age at death (= time spent in captivity) is 24 years.

I recently relocated the preserved remains of this female at the Museum für Naturkunde der Humboldt-Universität, East Berlin. Here I describe her characteristics, based on examination of the original skin and skull and color photographs taken of the living animal.

MATERIAL AND METHODS

The specimen at the Museum für Naturkunde der Humboldt-Universität, East Berlin (ZMB), consists of an adult female skin, skull, and complete skeleton (ZMB No. 70036). In addition, various color photographs of the living animal were kindly made available to me during my visit to the Tierpark Berlin. Measurements were taken on the skull of the Berlin female as follows: (1) greatest skull length – prosthiion to opisthocranion; (2) basal length – prosthiion to basion; (3) palate length – prosthiion to staphylion; (4) palate breadth – widest breadth across buccal side of upper third molars; (5) bizygomatic breadth – zygon to zygon. Martin's (1928) definitions of points on the skull were used for recording the measurements.

For comparison with the Berlin female, skins of *H. c. concolor* from Chapa (northern Vietnam, west of the Red River), of *H. c. hainanus* from Hainan, and of light-cheeked gibbons (*H. leucogenys*) from various parts of Vietnam and Laos were studied at: Berlin (Museum für Naturkunde der Humboldt-Universität, ZMB); Chicago (Field Museum of Natural History, FMNH); London (British Museum of Natural History, BMNH); New York (American Museum of Natural History, AMNH); and Paris (Muséum National d'Histoire Naturelle, MNHN). The number of specimens of each subspecies studied are listed in Table I.

In addition, I also visited a pair of captive gibbons at Twycross Zoo, England, which had previously been identified as *H. c. hainanus* (Groves, 1972, p. 41f; Haimoff, 1984). However, the female showed song and colouration characteristics typical of *H. leucogenys*. Additional investigation revealed that it had been imported in 1973 from Laos. *H. leucogenys* is widely

Table I. Museum specimens of crested gibbons examined for this study^a

	<i>Hylobates concolor</i>				<i>Hylobates leucogenys</i>		
	<i>concolor</i>	<i>hainanus</i>	<i>lu</i> ^b	ssp. ^c	<i>leucogenys</i> ^d	<i>siki</i>	<i>gabriellae</i>
Berlin (ZMB)		0,0;0,0(2)		0,1			
Chicago (FMNH)	1,1				3,4		6,7(2)
London (BMNH)	1,2	0,1;3,0	1,1		1,2;1,0	0,0;2,0	2,0
New York (AMNH)			0,0;0,1			1,0	1,1
Paris (MNHN)			1,0		0,2;1,0	1,0	1,1
Total	2,3	0,1;3,0(2)	2,1;0,1	0,1	4,8;2,0	2,0;2,0	10,9(2)

^a The figures in the table indicate, from left to right: number of adult and subadult males, number of adult and subadult females; number of juvenile males, number of juvenile females in black coat, and, in brackets, number of unsexed specimens in black coat. Infants (pale coat) are not included.

^b One animal of *H. c. lu* in the black coat (AMNH 148262) is here identified as a juvenile female, although it has previously been believed to be an adult male (see Appendix).

^c The specimen described in this study probably should be identified to *H. c. concolor* or to a new subspecies of *H. concolor*.

^d An adult female (FMNH 39151) from Hoi Xuan (Thanh Hoa, northern Vietnam) is here regarded as *H. l. leucogenys*, on the basis of both her geographical origin and her facial markings (a white brow-band) (see also legend to Fig. 1).

Table II. Selected Skull Measurements (mm) in Crested Gibbons^a

Taxon	Greatest skull length	Basal length	Palate length
<i>Hylobates concolor</i>			
ssp. ^c	116.0 <i>n</i> = 1 (0, 1)	83.4 <i>n</i> = 1 (0, 1)	44.7 <i>n</i> = 1 (0, 1)
<i>jingdongensis</i>	114.9 ±2.6 111–117 <i>n</i> = 6 (2, 4)		41.7 ±2.4 39–45 <i>n</i> = 7 (3, 4)
<i>concolor</i>	110.0 ±5.5 101–116 <i>n</i> = 13 (5, 5, 3)	78.5 ±4.0 71–86 <i>n</i> = 12 (5, 5, 2)	43.2 ±1.5 41–46 <i>n</i> = 12 (5, 5, 2)
ssp. ^d	110.0 <i>n</i> = 1 (1, 0)	77.8 <i>n</i> = 1 (1, 0)	42.5 <i>n</i> = 1 (1, 0)
<i>lu</i>	107.0 <i>n</i> = 1 (1, 0)	80.0 <i>n</i> = 1 (1, 0)	42.0 <i>n</i> = 1 (1, 0)
<i>hainanus</i>	103.3 ±1.5 102–105 <i>n</i> = 3 (1, 2)		41.1 ±1.0 40–42 <i>n</i> = 3 (1, 2)
<i>H. leucogenys</i>			
<i>leucogenys</i> ^e	111.1 ±5.7 98–122 <i>n</i> = 14 (3, 8, 3)	78.2 ±3.8 73–84 <i>n</i> = 11 (3, 8)	43.9 ±3.1 38–48 <i>n</i> = 14 (3, 8, 3)
<i>siki</i>	110.0 <i>n</i> = 1 (1, 0)	79.0 <i>n</i> = 1 (1, 0)	45.0 <i>n</i> = 1 (1, 0)
<i>gabriellae</i>	106.6 ±3.3 99–116 <i>n</i> = 23 (13, 10)	74.4 ±3.0 69–82 <i>n</i> = 23 (13, 10)	41.3 ±2.4 38–46 <i>n</i> = 17 (9, 8)

^a For each taxon, this table shows means and standard deviations on the first line, minimum and maximum values on the second line, and sample size on the third line (in brackets, from left to right: adult males, adult females, sex not specified). Where sample size is only one specimen, the table shows the individual measurements (first line), and the sex of the individual (second line). For definition of measurements see Material and Methods. Palate length was measured in a slightly different way (from staphylion to orale, not to prosthion) by Ma & Wang (1986, see Ma *et al.*, 1988, p. 279).

^b 1=Dao Van Tien (1985); 2=Geissmann, this study; 3=Groves (unpublished data, pers. comm. 1989); 4=Kloss (1929); 5=Ma & Wang (1986); 6=Xu *et al.* (1983).

^c Specimen from Hon Gai (Quang Ninh, northern Vietnam), described in the present article.

^d Specimen from Trung Khanh (Cao Bang, northeastern Vietnam), attributed to *H. c. hainanus* by Dao Van Tien (1985).

^e An adult female (FMNH 39151) from Hoi Xuan (Thanh Hoa, northern Vietnam) is here regarded as *H. l. leucogenys*, on the basis of both her geographical origin and her facial markings (a white brow-band) (see also legend to Fig. 1). Ma & Wang (1986) and Ma *et al.* (1988) have published means, minimum and maximum values of a sample of 5.2 *H. l. leucogenys*. As no individual measurements were published, these values have been included in the present table as if representing three different individuals of unknown sex.

Table II. Continued

Taxon	Palate breadth (M3)	Bizygomatic breadth	References ^b
<i>Hylobates concolor</i>			
ssp. ^c	37.0 <i>n</i> = 1 (0, 1)	78.9 <i>n</i> = 1 (0, 1)	2
<i>jingdongensis</i>	34.9 ±1.7 33–37 <i>n</i> = 7 (3, 4)	73.3 ±1.5 72–75 <i>n</i> = 6 (2, 4)	5
<i>concolor</i>	36.2 ±1.6 34–38 <i>n</i> = 8 (3, 3, 2)	73.1 ±6.5 68–84 <i>n</i> = 6 (2, 3, 1)	1, 3, 5
ssp. ^d		78.0 <i>n</i> =1 (1, 0)	1
<i>lu</i>	36.0 <i>n</i> = 1 (1, 0)	75.5 <i>n</i> = 1 (1, 0)	3
<i>hainanus</i>		66.6 ±0.6 66–67.1 <i>n</i> = 3 (1, 2)	6
<i>H. leucogenys</i>			
<i>leucogenys</i> ^e	35.3 ±1.2 34–38 <i>n</i> =12 (2, 7, 3)	72.1 ±5.9 60–78.5 <i>n</i> = 9 (3, 3, 3)	1, 3, 5
<i>siki</i>	36.0 <i>n</i> = 1 (1, 0)		3
<i>gabriellae</i>	34.0 ±1.6 30–36 <i>n</i> = 17 (9, 8)	71.4 ±2.3 69–76 <i>n</i> = 8 (6, 2)	3, 4

distributed in Laos, but the proposed mainland population of *H. c. hainanus* has not been reported to occur there. The black male obviously was *H. concolor*, but the subspecific identification of males is problematic in this species (see Discussion). As I was able to trace its origin back to an animal dealer in Thailand, its identification as *H. c. concolor* would appear to be more likely than as *H. c. hainanus*, though this is not certain. Five surviving offspring (three males, two females) of this pair were also examined. Four of the five immature animals had a black coat and white cheek patches almost identical to those of *H. l. leucogenys*, thus adding further support to the identification of their mother as *H. l. leucogenys*. The youngest offspring was in transition between a pale infant coloration and the black juvenile coat. Already, the white cheek patches diagnostic of *H. l. leucogenys* were clearly visible.

In this report, black crested gibbons, *H. concolor*, and light-cheeked crested gibbons, *H. leucogenys*, are regarded as two distinct species. This view is based on anatomical differences between *H. concolor* and *H. leucogenys* (Ma and Wang, 1986; Ma *et al.*, 1988). In addition, overlapping distribution of *H. concolor* and *H. leucogenys* has been reported for two localities in northern Vietnam (Dao Van Tien, 1983) and for one in southern Yunnan Province in China (Ma and Wang, 1986; Ma *et al.*, 1988). Dao Van Tien (1983) also stated that no intergrades have been found in the two Vietnamese localities. These findings are strong evidence for species distinction of the black and the light-cheeked forms, but it has been argued that the overlap may consist of just a few individuals having crossed the border of distribution (Marshall and Sugardjito, 1986, p. 141). Moreover, it is not yet clear how the presence of intergrades might be recognized. If all hybrids between *H. concolor* and *H. leucogenys* resemble those produced by the mixed pair at Twycross (see above), then at least males and immature individuals may not be reliably distinguishable from pure *H. leucogenys* on the basis of fur coloration.

It should be mentioned that additional anatomical evidence (Groves, 1988) and differences in the vocalizations between several forms of crested gibbons (Geissmann, unpublished data) appear to indicate that more than one species may also be comprised within the light-cheeked crested gibbons (*H. leucogenys*).

RESULTS

Numerous photographs document the fur characteristics of "Patzi" during her first year at the Tierpark Berlin (e.g. Fischer, 1965). At that time, the crown hairs of the juvenile female were directed upward, forming a very

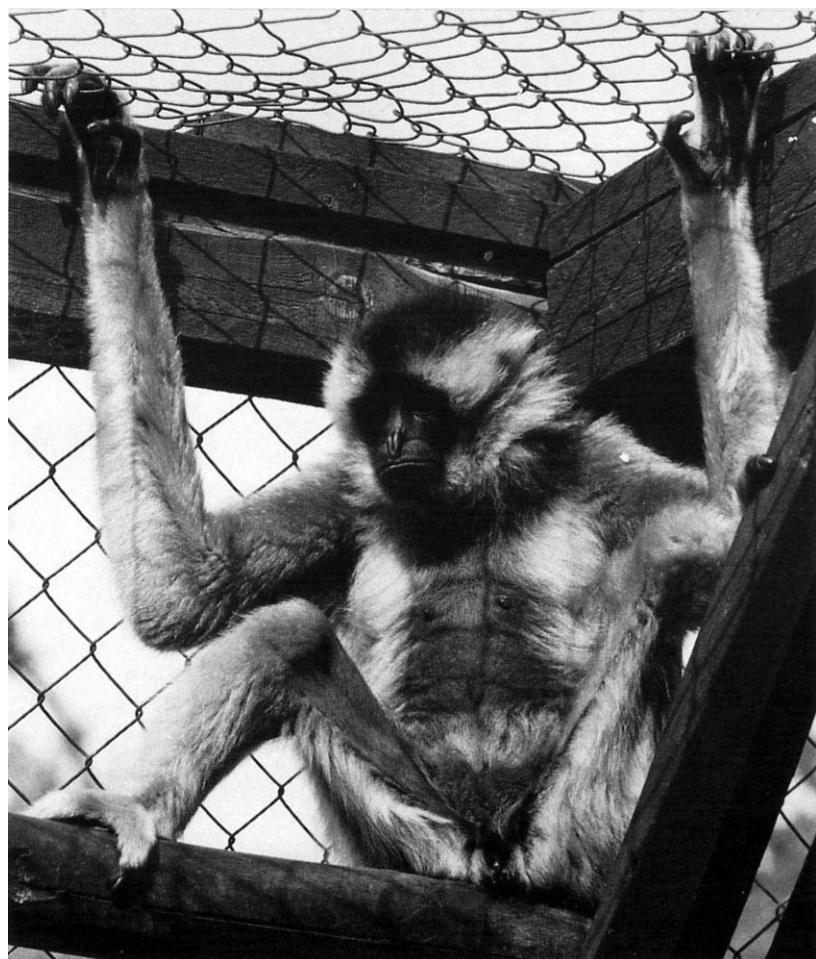


Fig. 2. Adult female *H. concolor* ssp., "Patzi", on 5 August 1985 at the Tierpark Berlin.
Photograph by kind permission of Mr. K. D. Rudloff.

small crest. Also, her fur was completely black, with no trace of white or pale hairs in the cheek or temporal region, or in other body regions.

The fur of the adult female was generally a buff brown color. The fur on the chest was thin but distinctly darker brown (Figs. 2 and 3). The contrast between the coloration on the chest and that of the lateral thorax was intensified by a very pale gray-beige coloration between these two areas. This pale coloration reached up to the cheeks. The belly was only slightly darker



Fig. 3. Dead female *H. concolor* ssp., "Patzi", on June 9, 1986 at the Tierpark Berlin. Photograph by kind permission of Mr. W. Scherf.

on the ventral side than laterally. The dark patch on the chest did not extend to the axilla, and there was no patch of black hair in the elbow and knee regions.

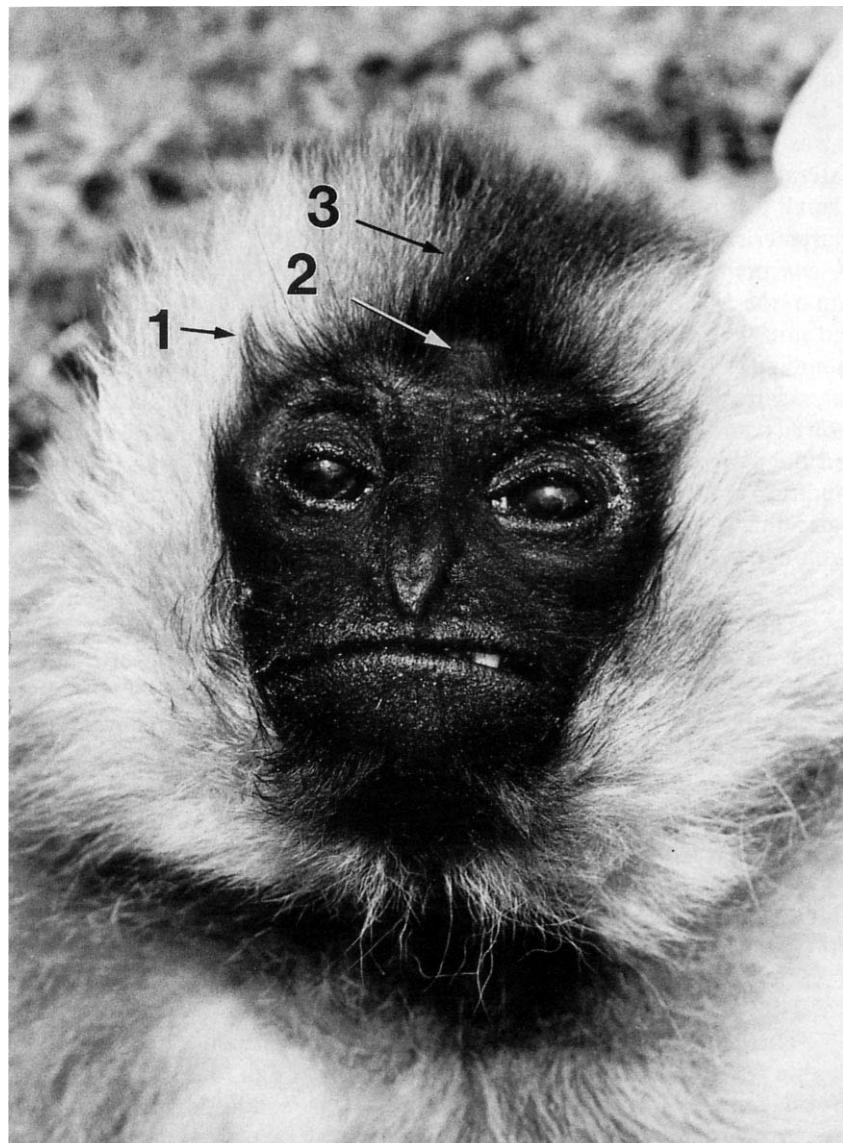


Fig. 4. Facial close-up of dead female *H. concolor* ssp., "Patzi", on June 9, 1986 at the Tierpark Berlin. Notice rhomboid shape of dark facial area, pointed tufts of black fur laterally above eyes (1), naked patch on forehead (2), connection between black fur bordering the facial area and black crown patch (3). Photograph by kind permission of Mr. W. Scherf.

The dark facial area was bordered by a thin but complete ring of black hair (Fig. 4). This ring was absent or reduced to a thin stripe of black hairs

above the eyes in females of *H. leucogenys* (including *H. l. gabriellae*). The ring was interrupted only lateral to the face in two female *H. c. concolor* examined (BMNH 33.4.1.2 and 33.4.1.5) but was complete in a third female of this subspecies (FMNH 39149), and in a female *H. c. lu* (BMNH 52.143). It was absent, however, in a female *H. c. hainanus* (BMNH 1907.12.1.1). Lateral to and above the eyes, the black facial ring of the Berlin female had a small tuft of black hairs which pointed toward the temporal region. This characteristic was, at least to varying degrees, found in all the other female *H. concolor* examined (three *H. c. concolor*, one *H. c. lu*), with the exception of the *H. c. hainanus* specimen. No white hairs invaded the facial region and muzzle in the Berlin female; the dark facial region thus had a rather rhomboid shape. The findings in the other females of *H. concolor* were similar but, again, with the exception of the *hainanus* female. The latter female showed some pale fur invading the dark facial area laterally between the eyes and the upper lip and extensive pale fur on the chin, similar to the typical condition in *H. leucogenys* (including *H. l. gabriellae*). The dark facial region in these females more resembled a trefoil shape (I observed especially pronounced trefoil-shaped facial areas in some captive females of *H. l. leucogenys* and *H. l. siki*).

The cheeks and the region around the dark facial area in the Berlin female were of a pale whitish gray, in contrast to the more brownish hue of the anterior part of the shoulders. This contrasting pale hair around the face was not observed in other female crested gibbons studied here, but a similar observation has been reported for *H. c. jingdongensis* and, to a lesser degree, for *H. c. furvogaster* (Ma & Wang, 1986; Ma *et al.*, 1988).

A conspicuous naked patch occurred on the forehead, directly above the glabella (Fig. 4). This hairless region was already present in the juvenile female and has been documented as early as September 1962 in a photograph made by W. Fischer in Hanoi (Fischer, 1965). A similar naked supraglabellar area was found in two of four specimens (both juvenile males) of *H. c. hainanus* at the British Museum of Natural History (BMNH 11.2.24.4; BMNH 93.9.12.1).

The black crown patch of the Berlin female was broadly connected to the thin black face-ring (Fig. 4), a trait found, though to a lesser extent, in just one female *H. c. concolor* (BMNH 33.4.1.5). In addition, the unusually large crown patch was about 300 mm in length (measured on the flat skin with the hairs spread out in their natural direction), and covered the whole occipital region, the dorsal side of the neck, and the whole breadth of the back at the height of the shoulders. In a broad, lobe-shaped form, it reached almost halfway down the back and ended in a diffuse tip (Fig. 5).

Additional measurements on the occipital and dorsal patch were taken using another method: directly on the skin, the dimensions of the patch were measured by taking into account only the roots of the black hairs. These

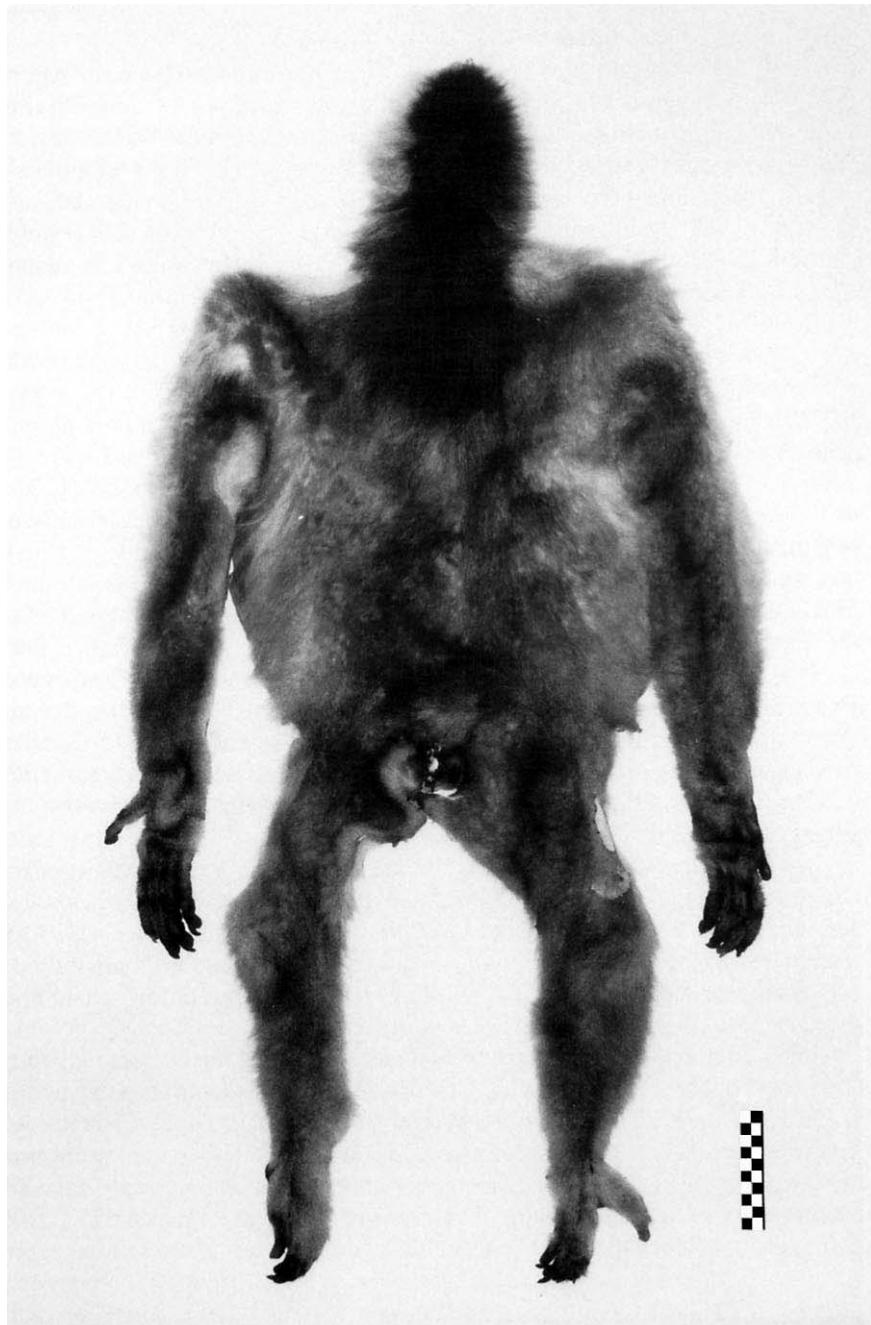


Fig. 5. Skin of adult female *H. concolor* ssp., "Patz", at the Museum für Naturkunde, Humboldt-Universität, East Berlin (ZMB No. 70036), showing considerable dorsal extension of occipital patch. Scale is 10 cm.

measurements thus excluded hair length. The connection between the patch and the facial region had, in its thinnest part, a breadth of 12 mm. On the occipital region, the largest breadth of the patch was 67 mm. On the dorsal side of the neck, breadth was reduced to 29 mm at the thinnest part, and expanded again to as much as 98 mm on the shoulders. The greatest length of the patch, as determined by this method, was 260 mm. As this female had unusually long hair, the patch – as seen on the spread fur – had much larger dimensions, but the measurements taken by the second method (under exclusion of hair length) appear to be more reliable.

The following hair lengths were determined on midsagittal regions: 42 mm on top of the head, 66 mm dorsally on the neck, 68 mm in the interscapular region, 59 mm in the middle part of the back, and 45 mm at about 2 cm above the ischial callosities. Comparative measurements on *H. c. concolor* (2, 1), *H. c. hainanus* (1, 0), *H. c. lu* (1, 1), *H. l. leucogenys* (1, 5), *H. l. siki* (1, 0), and *H. l. gabriellae* (5, 8) all gave lower values, except three specimens which had longer hair above the callosities.

Selected measurements taken on the skull of the Berlin female are presented in Table II. For comparison, measurements for other crested gibbons are also listed. They consist of data collected from the literature, and of previously unpublished data kindly made available by Dr. C. P. Groves. It should be noted that the relatively large skull dimensions of the Berlin female are within the known range of *H. c. concolor* and *H. l. leucogenys* for all measurements listed in Table II (except for a smaller bizygomatic breadth in the sample of *H. l. leucogenys*). Similarities to *H. c. jingdongensis* and *H. l. gabriellae* are less pronounced (except for a similar greatest skull length in the *jingdongensis* sample), and the skulls of *H. c. hainanus* appear to be especially small. In some dimensions, the skull of the Berlin female also resembles the single skulls of *H. l. siki*, *H. c. lu*, and a specimen from Trung Khanh (Cao Bang, northeastern Vietnam) which had been attributed to *H. c. hainanus* by Dao Van Tien (1985). However, interpretation of similarities between single skulls is problematic.

Some measurements taken on the cadaver of the Berlin female soon after death at the Tierpark Berlin are reported here for completeness: body weight, 7.15 kg; head and body length, 600 mm; ear length (distance between the lower margin of the incisura intertragica and the most distant point on the superior border of the helix), 33 mm; length of extremities – upper arm, 260 mm; lower arm, 320 mm; hand, 220 mm; upper leg, 230 mm; lower leg, 210 mm; foot, 190 mm.

DISCUSSION

The photographs documenting the fur characteristics of “Patzi” during her first year at the Tierpark Berlin show a small black crest, as found in

adult males and juveniles of both sexes of the so-called crested gibbons (*H. concolor*, *H. leucogenys*), and in contrast to all other gibbon species. Also as a juvenile, the fur of the female was completely black, with no trace of white or pale hairs in the cheek- or temporal-region. This absence of light hair is a diagnostic characteristic of adult males and juveniles of both sexes in all subspecies of *H. concolor*, except perhaps *H. c. lu* (but see Appendix). These two characteristics of the female in the juvenile coat permit her identification as *H. concolor*.

For geographical reasons, two subspecies of *H. concolor* need special attention for identification of the Berlin female under study: *H. c. concolor* and *H. c. hainanus*. The adult males do not appear to differ much between these two subspecies. Dao Van Tien (1983), Delacour (1951), and Groves (1972), reported differences in hair length between the two subspecies, with hair length on the back being at least 43 mm (43-52 mm) in *H. c. concolor*, and less than 43 mm (35-42 mm) in *H. c. hainanus*. Re-examination of all skins of *H. c. hainanus* from Hainan available to these authors (two males and one female in the British Museum, London), as well as of additional specimens (one mounted male in the British Museum, London; two unsexed specimens in the Museum für Naturkunde der Humboldt-Universität Berlin), revealed that these specimens are all immature, with the exception of the female. This may have influenced the finding of a relatively short hair length in *H. c. hainanus*. For the largest of the male specimens (BMNH 11.2.24.4) I measured an interscapular hair length of 35 mm (but neither the canines nor the third molars are fully erupted in this specimen, with the upper deciduous canines still *in situ*). Per contra in two adult males of *H. c. concolor* from Chapa (FMNH 39150, BMNH 1933.4.1.4), I found an interscapular hair length ranging between 32 to 35 mm, which is below the range previously suggested for *H. c. concolor*.

In addition, Fooden et al. (1987) recently reported interscapular hair lengths of four adult or subadult male *H. c. hainanus* from Chinese collections as varying from 45 to 75 mm. These hair lengths are situated well above the upper limits previously recorded for *H. c. hainanus* (Groves, 1972; Dao Van Tien, 1983), and it thus seems doubtful that this characteristic can be used to distinguish between *H. c. concolor* and *H. c. hainanus*. The differences between the hair lengths measured in the present investigation and those published earlier by Groves (1972) for partly the same specimens suggest that hair measurements may not be very reliable, unless two taxa are extremely different from each other. The key used by Dao Van Tien (1983, p. 368) in the identification of gibbons in North Vietnam discriminates between males of these two forms only by differences in hair length. From four out of his five localities for the disputed mainland form of *H. c. hainanus*, only male skins or skulls are available.

Therefore, as our present knowledge does not permit distinction between males of these two subspecies, the distinguishing characteristics es

tablished to date are limited to adult females. Fortunately, the difference between adult females of *H. c. concolor* and *H. c. hainanus* is quite distinct. In *H. c. concolor* (and in the other subspecies of *H. concolor*), the fur on the chest and belly is of conspicuous black or black brown coloration, contrasting with the pale brown, yellow or gray coloration of the back. In contrast to this condition, the ventral surface is pale in *H. c. hainanus* (e.g., Fooden *et al.*, 1987; Ma & Wang, 1986; Ma *et al.*, 1988). In this respect, *H. c. hainanus* resembles *H. leucogenys* (including *H. l. gabriellae*).

Dao Van Tien (1985) described a male, a female and offspring collected at Trung Khanh, Cao Bang (northeastern Vietnam) as follows:

“The male has a fur of dense and coarse appearance. Coloration exclusively black, without lightening by a brown trace, without distinct crest on top of the head. The female has a brown-yellow upper side with a large black spot on top of the head and on the nape. The underside is bright yellow, of somewhat paler color at the cheeks. The offspring is still suckling [and] has entirely black fur.” (Dao Van Tien, 1985, p. 38, my translation).

This description fits only *H. c. hainanus* among the currently recognized forms of crested gibbons, consequently Dao Van Tien (1983, 1985) attributed the Cao Bang-specimens to this subspecies. In contrast, the dark chest decisively distinguishes the Berlin adult female from *H. c. hainanus* and aligns it with *H. c. concolor* and the other subspecies of *H. concolor*. Unlike *H. c. furvogaster* (Ma and Wang, 1986; Ma *et al.*, 1988), the dark patch on the chest of the Berlin adult female does not extend to the axilla, and there is no patch of black hair in the elbow and knee regions (see Figs. 2, 3, and 5).

The dark facial area of the Berlin female is bordered by a thin but complete ring of black hair. Lateral to and above the eyes, the black facial ring shows small tufts of black hairs pointing towards the temporal region. White or pale hairs are completely absent from the facial region and the muzzle. In all these characteristics (see Fig. 4), the Berlin female is more similar to the mainland races of *H. concolor* than to the specimen from Hainan (BMNH 1907.12.1.1), although the latter female may not be a typical specimen of the Hainan black gibbon in every respect (Fooden *et al.*, 1987). The contrastingly pale (whitish-gray) coloration of the cheek region was absent in other adult females of crested gibbons studied by this author but possibly resembles the dense gray-white hair color around the face reported for *H. c. jingdongensis* and, to a lesser degree, for *H. c. furvogaster* (Ma & Wang, 1986; Ma *et al.*, 1988).

A conspicuous naked patch on the forehead of the Berlin female was also found in two (juvenile males) out of four specimens of *H. c. hainanus* at the British Museum of Natural History. This is the only similarity between the Berlin female and the Hainan black gibbon that has not been observed in other subspecies of *H. concolor*.

In other characteristics, the Berlin female appears to be unique among crested gibbons. Her black crown patch is broadly connected to the thin

black face-ring, a trait found in only one female *H. c. concolor*, and even then, to a lesser extent. In addition, the crown patch is extremely large and resembles a cape more than an occipital patch, with a length of about 300 mm. The size and the shape of the occipital and dorsal patch appear to be the most distinctive features of the Berlin female. This cape is much longer than the longest occipital streak reported so far for any specimen in the crested gibbon group: The longest patch found by Groves (1972) measured 130 mm in a *H. c. lu*; Fooden *et al.* (1987) found as much as 140 mm in *H. c. hainanus*, and Geissmann (unpublished data) found 145 mm in a female from Hoi Xuan (FMNH 39151), probably *H. l. leucogenys* [or possibly *H. c. hainanus*; see also Fooden *et al.* (1987, p. 166) on this specimen]. In their sample of black gibbons, Ma & Wang (1986) and Ma *et al.* (1988) reported the longest crown patch for *H. c. furvogaster* (180 mm).

The skull measurements of the Berlin female are somewhat similar to those for *H. c. concolor* and *H. l. leucogenys*, and possibly to those of *H. c. jingdongensis*, instead of those published for *H. c. hainanus* (and those of *H. l. gabriellae*). However, this can be regarded only as a very tentative result in view of the limited sample size of *hainanus* skulls available for comparison, and given the fact that the Berlin female grew up in captivity. Similarities between the skull of the Berlin female and single skulls of other forms of crested gibbons are even less reliable.

The dimensions for three skulls of *H. c. hainanus* appear to be smaller than those of crested gibbons from the mainland, and they are distinctly smaller than those of the Berlin female and those of a male from Trung Khanh (Cao Bang, northeastern Vietnam) which had been attributed to *H. c. hainanus* by Dao Van Tien (1985). This potentially important difference deserves some qualification, because the three individuals that make up the *hainanus* sample may be relatively small specimens: Their body weights were reported to range between 5.75 and 7.5 kg, while a fourth specimen from Hainan, whose skull was not preserved, was reported to weigh as much 10 kg (Xu *et al.*, 1983, p. 315).

The preliminary description presented above not only adds a new dimension to the ongoing debate on the identity of the gibbons in northeastern Vietnam, but also highlights the vast gaps in our information on black gibbons. The description of the Berlin specimen demonstrates that this adult female from northeastern Vietnam cannot be attributed to the Hainan black gibbon, *H. c. hainanus*. In some characteristics, the specimen resembles *H. c. concolor*, but it is unique in others. This report demonstrates that at least one gibbon population in northeastern Vietnam (east of the Red river), within the distribution area of the proposed mainland population of *H. c. hainanus*, either belongs to *H. c. concolor* or represents a new subspecies of the black gibbon (*H. concolor*). More specimens need to be studied in order to determine, whether the features distinguishing the Berlin female from other

subspecies of *H. concolor* are due to individual variation or represent the typical characteristics of a gibbon population in the region of Hon Gai. In the latter case, such a population would merit subspecific recognition.

In this context, it may be interesting to note that the type specimen of *H. c. nasutus* was reportedly captured in the region of Vung Ha Long (Quang Ninh) on the coast of northeastern Vietnam (Kunckel d'Herculais, 1884, p. 87: "au voisinage de la baie d'Along"). Vung Ha Long (20°55'N, 107°05'E) is very close to Hon Gai (20°57'N, 107°05'E), the locality reported for the Berlin female. Delacour (1951, p. 120) redefined "Chapa, Tonkin" as a new type locality for *H. nasutus*. However, the type locality of a species (or subspecies) is the place where the type specimen was collected (International Commission on Zoological Nomenclature, 1985, p. 147: Art. 72h); in determining the type locality, priority is to be given to information provided by the collector. Therefore, "au voisinage de la baie d'Along" should be taken as the type locality of *H. nasutus*. Delacour (1951) rejected this locality, apparently because he believed that gibbons do not occur there (see his map, p. 119). If they do, as reported by Bourret (1946), Boutan (1906), and Dao Van Tien (1983, his locality no. 5), and as indicated by the evidence concerning the Berlin female, then Delacour's action is invalid. The type locality of *H. nasutus* therefore reverts to "au voisinage de la baie d'Along," and the name would be available for gibbons from that vicinity. I am grateful to Dr. Jack Fooden (Field Museum of Natural History, Chicago) for his advice in this matter (in litt., 4 May 1989).

Appendix: A note on the Laotian black gibbon, *H. concolor lu*

It has been reported that males of *H. c. lu* are characterized by a silvery-black line between eye and ear (Delacour, 1951; Groves, 1972, 1984). For this study, three alleged males of *H. c. lu* have been examined. None of them completely fitted the original description. One specimen (AMNH 148262) had the pale stripe between eye and ear, but in addition, had extended areas of pale yellowish fur among the black hairs on the cheeks, on the back and on the ventral side of the lower legs. This pale fur was especially dense dorsally on the shoulders and distally on the back. X-rays of the skull and the partial skeleton still inside the skin revealed that the canines and the third molars were not completely erupted and that many ephiphyses of the long bones were unfused. Examination of the genital region revealed a second

opening in front of the anal opening (both sewed up). This evidence strongly suggests that the specimen is a juvenile or subadult female at the beginning of color change, not an adult male. The second animal (MNHN C.G. 1952 No. 543) was completely black with no trace of a silvery-black line between eye and ear. The third animal (BMNH 52.142) had the pale stripe above the ears but, in addition, showed a second pale spot below the ear.

The evidence presented above suggests that some males of *H. c. lu* have pale stripes above (and sometimes below) the ears, and some males do not: exactly as in other crested gibbons. I observed a pale stripe above the ears in one adult male *H. l. gabriellae* ("Arthur") living at the La Flèche Zoo (France, May 1988), and in another adult male *H. l. siki* ("Mohrle") at the Tierpark Berlin (East Germany, July 1988). The latter male also had a stripe of pale fur below the ears, going dorsally around the neck like a collar. Fischer (1980), who had studied the same male, did not mention the collar, but reported that the stripe above the ear first appeared in 1967 (when "Mohrle" was about 8 or 9 years old), and became more conspicuous in following years. In photographs of the male in 1972 (Fischer, 1980) and 1975 (Archive of the Tierpark Berlin), the stripe forms an actual corona, somewhat similar to that seen in adult males of *H. pileatus*. The corona was subsequently reduced again, until a stripe was only faintly visible above each ear and the occipital region was completely black (photographs of 1986, 1988, personal observation in July 1988). Fischer (1980) also reported having seen a pale stripe above the ears in *H. l. leucogenys*. Therefore, similar stripes observed in some males of *H. c. lu* may not necessarily represent the typical coloration of the subspecies. Instead, typical males of *H. c. lu* might be completely black, as are the males of other subspecies of *H. concolor*. If this is true, then the only characteristic known so far to distinguish between *H. c. concolor* and *H. c. lu* (apart from the isolated distribution of the latter) would no longer be valid.

It is possible that female fur coloration will eventually offer other distinguishing characteristics. The female of *H. c. lu* examined for this report (BMNH 52.14) had a gray-beige fur due to many black hairs interspersed throughout the pale fur, except laterally on the chest, above the shoulders, around the facial area and laterally to the black occipital streak. This gray-beige coloration was not observed in adult females of *H. c. concolor* which were pale or brown yellow. However, this female of *H. c. lu* may not have completed its final color change; an X-ray of the skull (which is still inside the skin) revealed that root formation of the canine teeth was not terminated and that the female, therefore, was not fully adult.

In his original description of *H. c. lu*, Delacour (1951, p. 121) mentioned that he had collected two "adult females". One of these was said to have the whole fur interspersed with black hairs, possibly representing a

transsition coat ("tout le pelage mélangé de noir, ce qui n'est peut-être qu'une livrée de transition."). This is probably the individual that has been described above (BMNH 52.14). The second adult female mentioned by Delacour (1951) is probably identical to a specimen at the Museum of Comparative Zoology (not seen). Groves (pers. comm. 1989) has described the fur coloration of this second female in his notes as "drab buff; belly dark, chest fairly dark". This supports the view the darker specimen at the British Museum is in a transition coat, whereas the adult coloration of the female may be more like that of *H. c. concolor*.

ACKNOWLEDGMENTS

I would like to express my gratitude to the staff of the following museums for permission to study specimens in their care: Dipl. Biol. J. Oppermann and Mrs. I. Thomas, Museum für Naturkunde der Humboldt-Universität, Berlin; Dr. Jack Fooden and Ms. Dianne Jedlicka, Field Museum of Natural History, Chicago; Dr. Paula D. Jenkins, British Museum of Natural History, London; Dr. Guy G. Musser and Mr. Wolfgang Fuchs, American Museum of Natural History, New York; and Drs. Michel Tranier and Francis Petter, Muséum National d'Histoire Naturelle de Paris. I thank Dr. Renate Angermann of the Museum für Naturkunde der Humboldt-Universität, Berlin for kindly giving the gibbon specimen ZMB No. 70036 on loan to the author for further study. X-rays of skulls and a partial skeleton of *H. c. lu* were kindly made available by Dr. Fred Grine (State University New York, Stony Brook) and Dr. Paula D. Jenkins (BMNH, London). For permission to study captive black gibbons (and hybrids with *H. leucogenys*) in their care I would like to thank Miss M. Badham and Miss S.N. Evans, Twycross Zoo; and Mr. Dan Richards, Shrewsbury. Additional information on and photographs of captive black gibbons were kindly provided by Dr. Rosemarie Dathe, Mr. Klaus-Dieter Rudloff, Mr. Wolfgang Scherf, and Mr. Mario Perschke, Tierpark Berlin; Mr. Ian Gibb, Ravensden Zoo Ltd, Rushden; Miss Sue Fowmes, Twycross Zoo; Mrs. S. Landgraf, Zoo Hellabrunn, Munich; and Dr. E. Rühmkorf, Ruhr Zoo, Gelsenkirchen. I am especially thankul to Dr. J. Fooden, Dr. C. P. Groves, Prof. R. D. Martin and Dr. C. Pryce for reading the manuscript and for many constructive and helpful comments. Dr. C. P. Groves generously made many previously unpublished skull measurements available for comparison. The author was supported while working on this project by funds from the A. H. Schultz Foundation.

REFERENCES

- Bourret, R. (1946). *Les mammifères de l'Indochine: Les Gibbons*. Laboratoire des Sciences Naturelles de l'Université Indochinoise (date approximate).
- Boutan, L. (1906). *Mission scientifique permanente d'exploration en Indo-Chine. Décades zoologiques: Mammifères*. Hanoi.
- Chivers, D. J. (1977). The lesser apes. In Prince Rainier III of Monaco, and Bourne, G. H. (eds.), *Primate conservation*, Academic Press, New York, pp. 539-598.
- Dao Van Tien (1983). On the north Indochinese gibbons (*Hylobates concolor*) (Primates: Hylobatidae) in North Vietnam. *J. Hum. Evol.* 12: 367-372.
- Dao Van Tien (1985). *Khao sát thú o miên bac Việt Nam. [Scientific Results of Some Mammals Surveys in North Vietnam (1957-1971)]*. Scientific and Technical Publishing House, Ha Noi (in Vietnamese).
- Delacour, J. (1951). La systématique des Gibbons Indochinois. *Mammalia* 15: 118-123.
- Fischer, W. (1965). *Das Jahr mit den Gibbons*, A. Ziemsen Verlag, Wittenberg Lutherstadt.
- Fischer, W. (1980). Einige Ergänzungen zur Haltung und Entwicklung des Schopfgibbons, *Hylobates (Nomascus) concolor* (Harlan). *Milu, Berlin* 5 (1/2): 167-193.
- Fischer, W. (1981). Forschende Kamera – Farbwechsel beim Schopfgibbon. *Urania, Leipzig* 57 (10): 2-5.
- Fooden, J. (1987). Type locality of *Hylobates concolor leucogenys*. *Am. J. Primatol.* 12: 107-110.
- Fooden, J., Quan, G., and Luo, Y. (1987). Gibbon distribution in China. *Acta Theriol. Sinica* 7: 161-167.
- Groves, C. P. (1972). Systematics and phylogeny of gibbons. In Rumbaugh, D. M. (ed.), *Gibbon and Siamang, vol.1*, Karger, Basel, pp. 1-89.
- Groves, C. P. (1984). A new look at the taxonomy and phylogeny of the gibbons. In Preuschoft, H.; Chivers, D. J.; Brockelman, W. Y. and Creel, N. (eds.), *The Lesser Apes. Evolutionary and Behavioural Biology*, Edinburgh University Press, Edinburgh, pp. 542-561.
- Groves, C. P. (1988). The taxonomy of crested or concolor gibbons. *Austral. Primatol.* 3(1): 33.
- Haimoff, E.H. (1984). The organization of song in the Hainan black gibbon (*Hylobates concolor hainanus*). *Primates* 25: 225-235.
- Harlan, R. (1826). Description of an hermaphrodite orang outang, lately living in Philadelphia. *J. Acad. Nat. Sci. Philad.* 5: 229-236.
- International Commission on Zoological Nomenclature (1985). *International Code of Zoological Nomenclature, Third Edition, Adopted by the XX General Assembly of the International Union of Biological Sciences*, International Trust for Zoological Nomenclature, London.
- Kloss, C. B. (1929). Some remarks on the gibbons, with the description of a new subspecies. *Proc. Zool. Soc., London* 1929: 113-127.
- Kunckel d'Herculais, J. (1884). Le Gibbon du Tonkin. *Science et Nature* 2(33): 86-90.
- Ma, S., and Wang, Y. (1986). The taxonomy and distribution of the gibbons in southern China and its adjacent region - with description of three new subspecies (in Chinese, with English summary). *Zool. Res.* 7(4): 393-410.
- Ma, S., Wang, Y., and Poirier, F. E. (1988). Taxonomy, distribution, and status of gibbons (*Hylobates*) in southern China and adjacent areas. *Primates* 29(2): 277-286.
- Marshall, J., and Sugardjito, J. (1986). Gibbon systematics. In Swindler, D. R. and Erwin, J. (eds.), *Comparative Primate Biology, Vol. I: Systematics, Evolution, and Anatomy*, Alan R. Liss, New York, pp. 137-185.
- Martin, R. (1928). *Lehrbuch der Anthropologie, Vol. 2: Kraniologie, Osteologie*, 2nd ed., Gustav Fischer, Jena.

- Matschie, P. (1893). Die unterscheidenden Merkmale der *Hylobates*-Arten. *Sitzungsber. Ges. naturf. Freunde, Berlin* 1893: 209-212.
- Pocock, R.I. (1925): The gibbons of the genus *Hylobates*. *Proc. Zool. Soc., Lond.* 1927 (2): 719-741.
- Pousargues, E., de (1904): Mammifères de l'Indo-Chine. In Pavie, A. (ed.), *Mission Pavie Indo-Chine 1879-1895. Études diverses, III: Recherches sur l'histoire naturelle de l'Indo-Chine Orientale*, Ernest Leroux, Paris.
- Schilling, D. (1984). Gibbons in European zoos, with notes on the identification of subspecies of concolor gibbon. In Preuschoft, H.; Chivers, D. J.; Brockelman, W. Y. and Creel, N. (eds.), *The Lesser Apes. Evolutionary and Behavioural Biology*, Edinburgh University Press, Edinburgh, pp. 51-60.
- Simonetta, A. (1957). Catalogo e sinonimia annotata degli ominoidi fossili ed attuali (1758-1955). *Atti Soc. Toscana Sci. Nat., Pisa, Ser. B*, 64: 53-113.
- Thomas, O. (1892). Note on the gibbon of the island of Hainan (*Hylobates hainanus*, sp. n.). *Ann. Mag. Hist.* 9 (6): 145-146.
- United States Board on Geographic Names (1964). *Official Standard Names Gazetteer No. 79: Northern Vietnam*. Dept. Interior, Washington, D.C.
- Xu, L., Liu, Z., and Yu, S. (1983). Mammalia. In Xu, L., Liu, Z., and Yi, X. (eds.), *[Birds and Mammals of Hainan Island]*, Scientific Publishing Agency, Beijing, pp. 278-401 (in Chinese).