XXVII. THE DIFFERENCE BETWEEN THE TAKIN (*BUDORCAS*) FROM THE MISHMI HILLS AND THAT FROM TIBET, WITH NOTES ON VARIATION DISPLAYED BY THE FORMER.

By T. BENTHAM, *Indian Museum.*

(Plate xxiii.)

In the collection of the Indian Museum there are twelve skulls and frontlets of *Budorcas taxicolor*, nine of which are known to come from the Mishmi Hills and one from E. Tibet, two having no known history. In the Mishmi series, two sets of skulls can be so arranged that they show a marked difference in rise from the young to the adult stage. This rise is marked by the gradual approximation of the horns. The youngest of the series, which are all males, has the horns at their bases quite two inches apart, and this distance gradually becomes less and less until we eventually arrive at a specimen in which the horns are coincident and very large. The only Tibetan species, which is a young adult, seems to possess horns which are almost identical in size and distance apart with No. 2 of the Mishmi series. This almost serves to point out that Mishmi and Tibetan animals cannot with certainty be distinguished by the size, shape, or distance apart of their horns. The only thing that can be said on this point is that the horns are very variable and that this variability seems to be consequent on the age of the animal. (For description of horns *cf.* Chalmers Mitchell, *Proc. Zool. Soc.*, 1907, p. 467; Lydekker, *Game Animals of India*, etc., p. 162; Hodgson, *Journ. Asiat. Soc. Bengal*, vol. xix, p. 65; Milne Edwards, *Réch. des Mam.*, 1868-74, p. 367.)

A more important point lies in the shortness and broadness of the nasal bones of the *Budorcas* from Tibet, as compared proportionately with all the Mishmi specimens. This feature carries with it a larger space to the opening of the nasal chamber, which is deeper and higher than in the animal from Assam. In referring to the nasal chamber it must also be noted that in the Tibetan skull the ridges starting from the edge of the maxilla at the junction of this bone with the premaxilla and lying on the floor of the nasal chamber are far less marked than in the Mishmi skull (see pl. xxiii, A and B, figs. 2 and 3). This last statement also applies to the pits underlying the vomer, which are larger and deeper in the Mishmi animal. The difference in these ridges undoubtedly shows that as a consequence of their development the maxillo-turbinals are far more developed in the Assam form than in that from Tibet, a fact

which is not altogether surprising, since the Mishmi Takin lives in jungle, where its sense of smell would be more indispensable than if its habitat were on the bare plateaux of Tibet.

The premaxilla is longer in the Tibetan skull, proportionately, and more slender than in the other specimens. This is also quite evident in Milne Edward's drawing of the nose-cavity in a specimen from Moupin.[1]

In the skeleton the only difference between the Assam and Tibetan forms seems to lie, as far as can be judged from the same author's plates, in the humerus. This difference probably is not important, perhaps being due to age. The outer tuberosity of the Mishmi humerus is larger and has a greater curve inwards than that in the Moupin humerus figured. The bicipital groove is therefore deeper. The deltoid ridge also is more strongly marked. The anterior cannon-bone is shorter and broader in proportion in the Tibetan *Budorcas*, while with regard to the posterior cannon-bone the reverse is the case.

Comparison of Mishmi skins *inter se* exhibits great variation. The colour in males varies from russet-brown to light straw-grey. In no individuals are the dark parts pure black. In fact the younger the animal is, the darker the colour of the skin. The following is a list of the observations taken from skins ranging in age from young to fully adult:—

Budorcas taxicolor, ♂ *Skins from Assam: Age Series.*

Serial No.	Length of horn.	Length of anterior hoof, front face.	Colour.
1	None	1·25 in.	Uniform dark russet-brown; legs and a small patch on the nose inclining to black; dorsal streak very faint and more marked on hind quarters; interior of ears, a patch on the loins, a small patch over eye light brown.
2	·75 in.	2·25 in.	Hair becoming lighter and more golden in colour at the tips along the edge of the dorsal streak, which is now better marked and is beginning to show signs of appearing between shoulders. Rest of the skin as in No. 1.
3	2·5 in.	2·5 in. ..	Dorsal streak quite well marked and dark brown, the hairs having black tips. More yellowish colour on the back which, mingling with the reddish brown hairs it is replacing, gives the back in parts a greenish appearance. A light patch beginning to be evident on the forehead.

[1] *Réchèrches des Mammifères* (Paris), 1868-74, pl. lxxvi.

Serial No.	Length of horn.	Length of anterior hoof, front face.	Colour.
4	21 in.	3 in. ..	Whole of back yellow, varying from straw colour nearer the dorsal streak to chestnut on the sides. Crescentic patch on forehead and the lining to ears straw colour. Rest of head, as also flanks, very dark brown. Under parts dark brown, the hairs of legs tipped black.
5	22 in.	3·25 in.	Altogether duller; the dorsal streak beginning to disappear. General colour of the upper parts drab straw colour with a slight greenish tinge. Under parts almost black. Nearest to the Tibetan specimen in colour, and also to Hodgson's original description of the type, although it is not the same specimen.

The two females in the collection also show a decided difference *inter se*, no doubt due to age. In both the dark dorsal stripe present in the males is faint and nearly absent; the younger animal exhibits the browner tendencies shown in the younger males, while the older one is greyer in appearance. Both skins are larger than any male skin in the Museum's possession. This indicates that the female may be larger than the male, if the evidence of the dry skins is anything to go upon.

The Tibetan skin shows the following coloration, approaching the oldest Mishmi example in appearance:—

> General colour above yellowish fawn inclining to grey, the hairs at their bases being straw colour; hair of back lighter straw colour along the edges of the dorsal streak, the hair of which is dark brown with black tips. Dorsal streak extending from root of tail, which is black, to the middle of the shoulders, where it gives way to a straw coloured stripe extending across the occiput to the forehead[1] behind the ears and between the eyes. A small light patch at the anterior corner of the eye, and the interior of the ears straw coloured; hair of the muzzle and sides of head black, some of the hairs being different shades of brown and straw colour at their bases; long hairs at sides of body light dull grey with long black tips; a small russet-brown patch above each hoof.

The following is an abstract of Mr. Lydekker's description of *Budorcas taxicolor whitei* in the *Field* of November 16th, 1907, this sub-species having been formed on four specimens from Bhutan.

[1] Hodgson had a model of the Mishmi Takin sent him. This was made by a Mishmi chief, and had a light yellow half-moon mark on the forehead; *vide Journ. Asiat. Soc. Bengal*, vol. xix, p. 69.

The first two specimens were both adult (a male and a female), and the horns of the bull were shorter than those of the cow. The second two were those of an immature male and adult female. From this evidence Mr. Lydekker states that the horns of an adult Bhutia bull would have been 14 to 15 inches in length as compared with 20 to 24 in the Mishmi Takin. But, from the statistics quoted, the same thing might be said with regard to the Tibetan Takin as compared with the Mishmi form. It appears, also, that the yellow colour of the hair in the animal from Bhutan is intermediate in area between that of Mishmi and that of Tibetan examples. The yellow colour of the hair is seemingly also intermediate between the two extremes in some representatives of the same Mishmi race. Indeed, one example of this race in the Museum is almost identical in appearance with the Tibetan animal.

A grey Takin is mentioned by Mr. Lydekker [1] as coming from Sze-chuen, and he proposes to form a new sub-species for its reception. The animal is a female and is light grey on the upper parts.

The gentleman who sent the specimen to Mr. Rowland Ward says that there are two kinds of Takin in Sze-chuen, one a small red animal and the other a large grey one. It is not improbable that the female *Budorcas* is larger than the male, and I have shown that the young are dark russet-brown, and the adults light in appearance. It is probable that the small "race" mentioned consists simply of young examples of the large grey form, and, as is quite common among ungulates, that the young separate into flocks, while the adult males or females, as the case may be, go about singly or in pairs. An observant person could, with the greatest ease, make at least three sub-species from the Mishmi skins in the Indian Museum, if they had chanced to be from different localities simply on the evidence of coloration and variation of horns. I may also mention that we have two stuffed specimens from the Mishmi Hills in addition to those already noticed. These are presumably adult, and though they are somewhat faded, it can easily be seen that the female is larger and greyer in appearance, standing 3 feet 5 inches at the shoulder, while the male is reddish, and is only 2 feet 8 inches in height. These animals, looked at from a great distance, would be thought to be distinct species.

On the evidence of the facts stated above, I am perfectly willing to admit that the Mishmi and Tibetan animals are distinct, not so much on the evidence of coloration, but on that of the characteristics of the skull, on which the Tibetan animal perhaps deserves specific rank.

In the face, however, of the occurrence of so much variation in Mishmi animals, it is quite reasonable to suppose that a like variation occurs among those beyond the hills.

Appended is a list of measurements of skulls and skeletons of the ♂ specimens in the Indian Museum and of the one described by Milne Edwards.

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[1] In the *Field* of May 9th, 1908.

[NOTE.—Since writing this paper I have been permitted by Mr. I. H. Burkill of the Industrial Section, Indian Museum, to examine a shield from the Daffla Hills made of *Budorcas* hide. This skin is probably that of a young animal and is brownish in appearance, the dorsal stripe being indistinct. This fact is interesting only as regards the distribution of the Takin, if we may assume that the skin is that of an individual killed in the Daffla and not in the Mishmi Hills.]

Measurements of Skulls.

Measurements in millimetres.	Mishmi average.	♂ Mishmi Hills. A. R. Comber.	♂ Mishmi Hills. E. T. Dalton.	♂ Mishmi Hills.	♂ Mishmi Hills.	♂ Tibet. Milne Edwards (juv.).	♂ E. Tibet (juv.).
Basal length of skull	386	395	375	415	360	400	353
Breadth between orbits ..	145	165	144	145	125	93	134
Length nasals ..	136	142	136	150	115	..	98
Breadth nasals ..	77	98	70	88	70	58	80
Depth from highest point of nasals to lowest point of maxilla	167	174	168	171	154	130	143
Length of premaxilla ..	149	155	155	158	130	..	130
Length from tip of nasals to end of premaxilla ..	147	171	147	143	128	..	135
Breadth between premaxillæ at junctions with maxillæ .	91	98	93	98	75		75
Length from between horns to end of nasals ..	251	245	247	268	243	..	215
Length of maxillary tooth-line ..	124	122	131	115	127	..	120
Length from first premolar to end of premaxilla	120	135	115	125	105		99
Length of space between the horns at base ..	14	20	coincident.	15	7		25
Length of horn ..	571	544	571	514	408	480	365
Circumference at base of horn ..	285	290	323	294	235	320	235
Length tip to tip	245	328	265	220	185	330	160
Length from coronoid process to angle	146	..	138	..	155	..	134
Breadth from third molar to angle .. .	94	..	93	..	95		75
Length of mandibular tooth-line . ..	125	..	125	..	125		119

Measurements of Skeletons.

Measurements in millimetres.	♂ *Budorcas taxicolor* (*tibetanus*), Alphonse Milne Edwards.	♂ *Budorcas taxicolor*, Mishmi Hills, Assam.	♂ *Budorcas taxicolor*, Mishmi Hills.	♂ juv. *Budorcas taxicolor*, Mishmi Hills.
Length of the humerus	315	262	310	260
Transverse diameter of the superior extremity of the humerus	101	86	110	70
Thickness of the great tuberosity	33	35	37	25
Minimum diameter of the diaphysis	36	48	70	53
Length of the inferior extremity of the humerus	69	61	65	60
Length of the radius	275	250	265	210
Length of the superior extremity of the radius	61	51	69	58
Breadth of the inferior extremity of the radius	58	48	80	55
Length of the ulna	365	217	356	250
Length of the anterior cannon bone	103	120	130	Anterior cannon-bone missing.
Minimum breadth of the anterior cannon-bone	44	30	50	
Maximum breadth of the anterior cannon-bone	65	50	69	
Minimum thickness of the anterior cannon-bone	20	21	25	
Length of the femur	335	273	Femur missing, also posterior cannon-bone.	288
Transverse diameter of the superior extremity of the femur	95	80		85
Maximum diameter of the diaphysis	31	40		42
Transverse diameter of the inferior extremity	81	74		78
Antero-posterior diameter of the inferior extremity	83	80		85
Length of the posterior cannon-bone	151	114		120
Minimum transverse diameter	33	43		30
Maximum transverse diameter	56	59		50

Broader and shorter in proportion. (♂ *Budorcas taxicolor* (*tibetanus*), Alphonse Milne Edwards.)

Longer and narrower in proportion. (♂ *Budorcas taxicolor*, Mishmi Hills.)

Longer and narrower in proportion. (♂ *Budorcas taxicolor* (*tibetanus*), Alphonse Milne Edwards.)

Shorter and broader in proportion. (♂ *Budorcas taxicolor*, Mishmi Hills, Assam.)