

KUNGL. SVENSKA VETENSKAPSAKADEMIENS HANDLINGAR. Band 49. N:o 7.

ANATOMICAL NOTES ON MAMMALS

OBTAINED IN BRITISH EAST AFRICA

BY

THE SWEDISH ZOOLOGICAL EXPEDITION

1911

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BY

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(WITH TWO PLATES AND THREE TEXTFIGURES)

UPPSALA & STOCKHOLM
ALMQVIST & WIKSELLS BOKTRYCKERI-A.-B.
1912

series of closely set small papillæ forming an edge along the anterior side of each fold, but separated from the same. There are also scattered papillæ elsewhere in the palate. Eleven folds in all can be discerned. The first in front of the canines is least developed. The following five are arcuate but with the forward directed convexity gradually lessened. These five folds run respectively between the canines and the premolars (p^1 to p^4). The next three folds have a tendency to be interrupted in the median line and thus form pairs of arcuate folds. The tenth fold consists of two short transverse folds opposite to m^2 . The eleventh fold is continuous but also straight and transverse and situated opposite the interspace between m^2 and m^3 . Behind the last fold there are numerous small papillæ scattered on the palatal surface. Such papillæ are thus very numerous in this species which perhaps stands in connection with its to great extent insectivorous diet.

The male organ of *Rhinoceros bicornis*.

Among the *Artiodactyla* the very variable shape of the male organ can be traced back to a common type from which all the numerous modifications¹ can be derived by reduction of different portions, or some other alterations. It appears a little more difficult to decide whether a common type may be found from which the male organ of all the recent *Perissodactyla* may be derived. When reviewing our present knowledge about this organ among the vertebrates, especially the *Amniota* GERHARDT² points out as common characteristics to the male organs of all *Perissodactyla*: »Bedeutende Länge und Dicke des ganzen Organs, starke Entwicklung der Glans und Fehlen eines Septums samt Penisknochen.» The last two characteristics are negative and shared by others as well.

Of the three families of *Perissodactyla* which have survived to the present time it is in the first rank *Rhinocerotidæ* which will be considered at this opportunity. The genus *Rhinoceros* of the present time has been divided in three subgenera viz. *Dicerorhinus*, *Diceros* and *Rhinoceros* s. str. The male organ of a member of the first and last of these subgenera has been described and figured before. That of *Diceros bicornis* is to be described below, and its appearance is shown on Pl. II, Fig. 3 (dorsal view) and Fig. 4 (lateral view). OWEN described the male organ of *Rhinoceros unicornis* already 1852.³ He drew attention to the peculiar fact that »the apex is not simple, but resembles a mushroom on a thick peduncle projecting from an excavation at the end of the glans with a thin wall or border, like a second prepuce» — — —; and further that »on each side of the base of the glans, and rather towards its under⁴ part, there is a longitudinal ridge or lobe three inches and a half in length and eight lines in basal thickness» — — —.

¹ The *Tylopoda* might, however, form an exception, but I do not know their male organ from my own experience.

² Ergebnisse u. Fortschr. d. Zoologie. Bd. 1. Hft. 2. Jena 1908.

³ Trans. Zool. Soc. London. Vol. IV. Part 2. Pl. 9. This description is also repeated with more details in OWEN's »Anatomy of Vertebrates» III, p. 663 & 664.

⁴ ought to be »upper»!

In the year 1881 FORBES described¹ the same organ of *Dicerorhinus sumatrensis*. With regard to the peculiar 'mushroom- or trumpet-shaped expansion' at the apex of the penis this species agrees with *Rh. unicornis*. But the lateral lobes are very different in shape in the two animals. FORBES describes those of *D. sumatrensis* as 'two large oblong-oval lobes, of the same colour and substance as the rest of the glans, which are free for the greater part of their length, and only attached to the rest of the glans at their bases. The lobes lie on the side of the dorsum of the penis, and are closely approximated at their bases' — — —.

The male organ of *Diceros bicornis* (conf. Pl. II, Figs. 3 & 4) is of the same general type as the same of the two other species mentioned above, and it is proved by this that all three subgenera of *Rhinoceros* are rather alike in this respect, although as a comparison shows there are specific differences to be found.

The mushroom-, or trumpet-shaped organ at the apex has an oval disc with a vertical diameter of about 20, and a horizontal of 13 1/2 mm. in the present specimen. The upper lobe is larger than the lower so that the distance from the lower edge to the orifice of the urethra is only 7 mm. The peduncle of the disc is oval in section with a vertical diameter of 13 and a horizontal of 9 mm. close behind the expansion, but it increases gradually in thickness proximally. The terminal excavation or fossa from the centre of which the just described mushroom-shaped appendix projects, is deep and has high, rather thin-edged borders which form a kind of collar. Laterally the height of this collar is about 17 mm. Ventrally it is somewhat broader still, and curved down as a lip. All the way from the distal margin of this lip to its base, and then up on the peduncle to the mushroom-like appendix runs in the median line a small but distinct raphe. Dorsally in the median line the peduncle is connected with the collar by means of a thick frenum which, however, unlike the ventral raphe, does not extend on the peduncle itself beyond the direct connection. On the dorsal surface of the penis above this frenum, thus on the dorsal surface of the collar, there is a broad ridge which terminates just behind the edge of the collar with a rounded knob which appears to have a thickened epiderm. Probably this knob represents the end of *corpus cavernosum penis*.

The two lateral lobes are very different in shape from those of the other two species. They are nearly triangular in outline with straight vertical anterior contour, somewhat curved upper contour and they sit on a long base (conf. Pl. II, Figs. 3 & 4). Their anterior border is about 75 mm. behind the edge of the collar in the present specimen. And the length of their base is about 58 mm. When the organ is at rest the lobes are laid around the dorsal surface so that their borders meet mesially and dorsally. They are a little thinner at their anterior border, but the average is about 6—7 mm. in this stage.

Basally on the ventral side of the penis-end between the same and the prepuce there is a short but strong frenum and from this extends in the median line on the ventral side a raphe which is continued to the lower lip of the collar and corresponds

¹ Trans. Zool. Soc. London. Vol. XI. Part 4, p. 107. Pl. XX.

to the raphe on the inner side of this lip and on the peduncle of the mushroom-like appendage as described above.

The presence of the frenum is of importance because OWEN (l. c. p. 50) has stated that there is no frenum between the prepuce and the penis in the Indian Rhinoceros.

Since it now has been shown that the members of *Rhinocerotidæ* probably all of them have a penis with a similar structure it remains to find out whether the same organ of the two other families of *Perissodactyla* can be derived from such a type, or at least from an ancestral type which can be assumed as common to all three.

OWEN states that in the Sumatran Tapir the base of the glans has an upper lobe as well as one on each side, beyond which it is continued forward contracting, but terminates in a truncate surface on the middle of which the urethra opens.¹ The lateral of these lobes can no doubt be homologised with those of the Rhinoceroses, and this must be regarded as an important correspondence. The truncate shape of the anterior end is also a likeness, although the Tapir has no mushroom-like appendage in front. This may have become reduced in the ancestors of the Tapir, or independently developed in the Rhinoceroses.

The homologisation of the different parts of this organ of the Rhinoceroses, and of the Indian Tapir is still more facilitated by POELMAN's description² and figure of the conditions found in the latter species. The author quoted says: 'Le gland — — — son extrémité libre est plutôt aplatie, et à la partie inférieure de celle-ci, au fond d'une fossette, se trouve l'orifice de l'urètre.' This 'fossette' is no doubt to be regarded as homologous with the apical groove of the glans of the Rhinoceroses, although the appendage is missing. POELMAN's figure (l. c. Pl. II) presents 'trois espèces de crêtes ou de bourrelets aplatis — — —'. These are evidently the same as those mentioned by OWEN, as quoted above. An examination of POELMAN's figure (l. c. Pl. II) convinces one that the two lateral of these lobes evidently must be quite homologous with those in a corresponding situation on the male organ of the Rhinoceroses.³

In the Horse there are no lobes on the male organ, but such lobes may have been present and become reduced already among the ancestors of the Horse. But the *corpus penis* of the Horse ends, according to ELLENBERGER and BAUM,⁴ with three apices in front. The middle one of these is long and pointed, and it serves to support the glans. The lateral ones are termed 'kurz und stumpf'. The hypothesis is near at hand that these lateral apices may have formerly stood in connection with lateral lobes of the penis of such a kind as those found in the Rhinoceroses.

¹ Mém. de l'Acad. R. Belgique. T. XXVII, p. 17 & Pl. II.

² These lateral lobes of the male organ appear to be developed in comparatively late ontogenetical stages, for PARKER remarks (Proc. Zool. Soc. London 1882, p. 773) that he did not find them in a young Indian Tapir. This is very remarkable as the presence of such lobes must be phylogenetically very old when two families like *Rhinocerotidæ* and *Tapiridæ* are provided with such. I have seen myself the lobes in question strongly developed in a living Tapir.

³ Anatomy of Vertebrates III, p. 664.

⁴ Handbuch d. vergl. Anat. d. Haustiere. 11:te Aufl., p. 553.

It is difficult to prove such a thing, but the possibility does not appear to be excluded. There is, however, another great resemblance between the male organ of the Horses and Rhinoceroses and that is that both are provided with a deep groove (*fossa glandis*) at the truncate end of the glans, and from this groove the *processus urethrae* projects. The latter has in the Rhinoceroses a more complicated shape with its mushroom-like dilatation at the apex and the thickness of its peduncle etc., but there appears to be no doubt about the homology.

Considering all there is such a great agreement in shape and structure between the male organs of the families *Rhinocerotidæ*, *Tapiridæ*, and *Equidæ* that they evidently can be derived from a common type which ought to have been thick and truncate, provided with a terminal fossa or groove from the bottom of which an urethral appendage probably arose, and with a pair of lateral lobes at the base of the glans. There is thus an equal conformity in the Perissodactyline series as that which has been proved before in the Artiodactyline with regard to this organ.

Plate I.

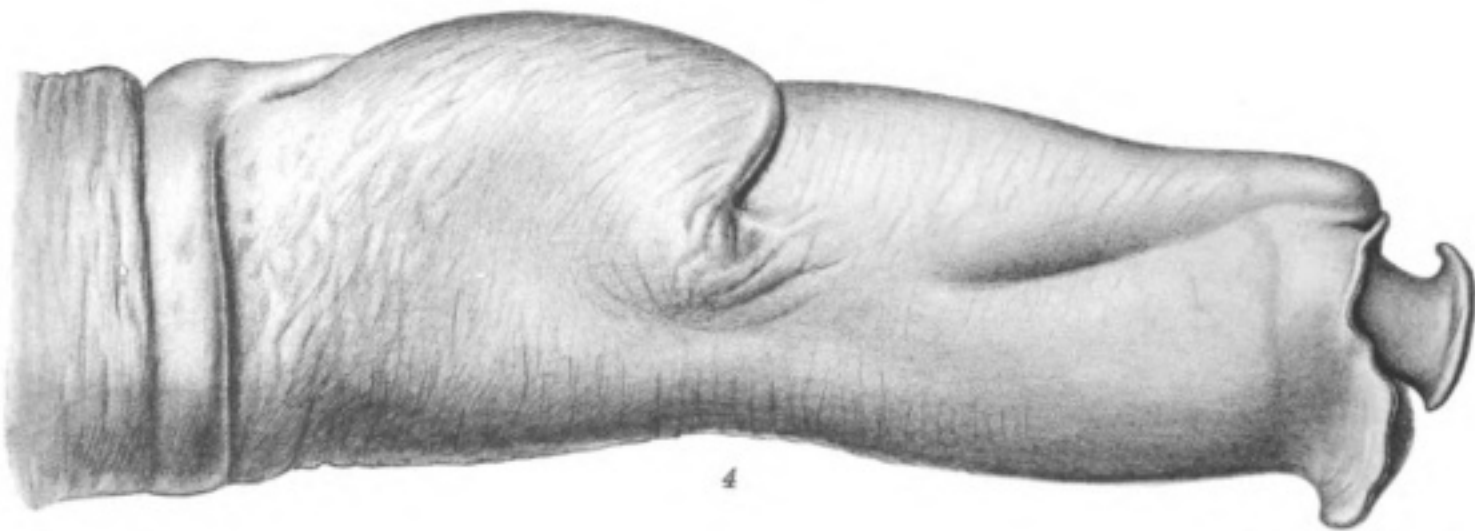
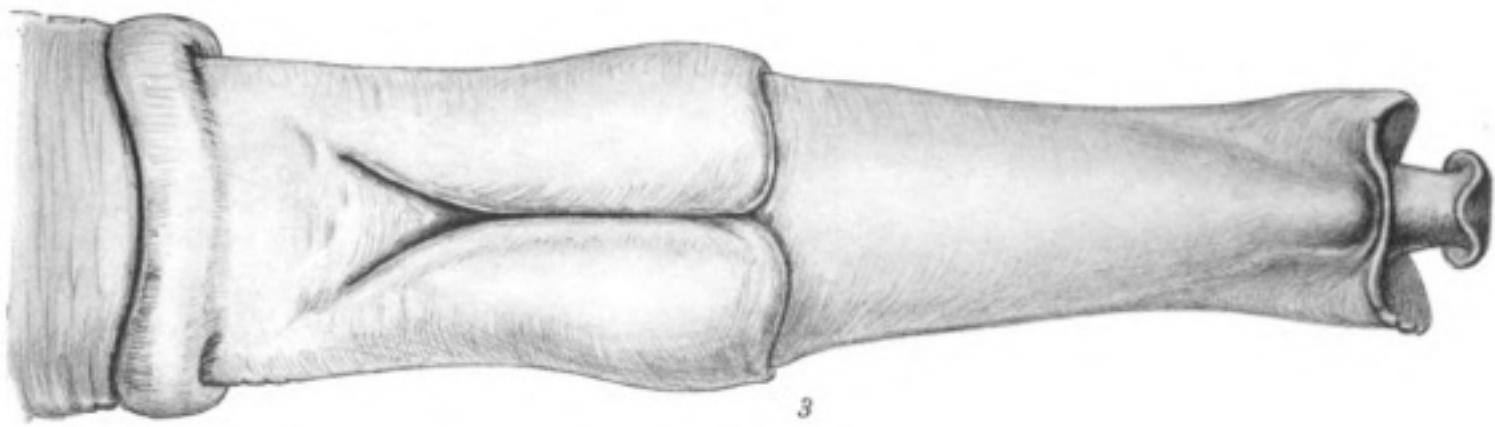
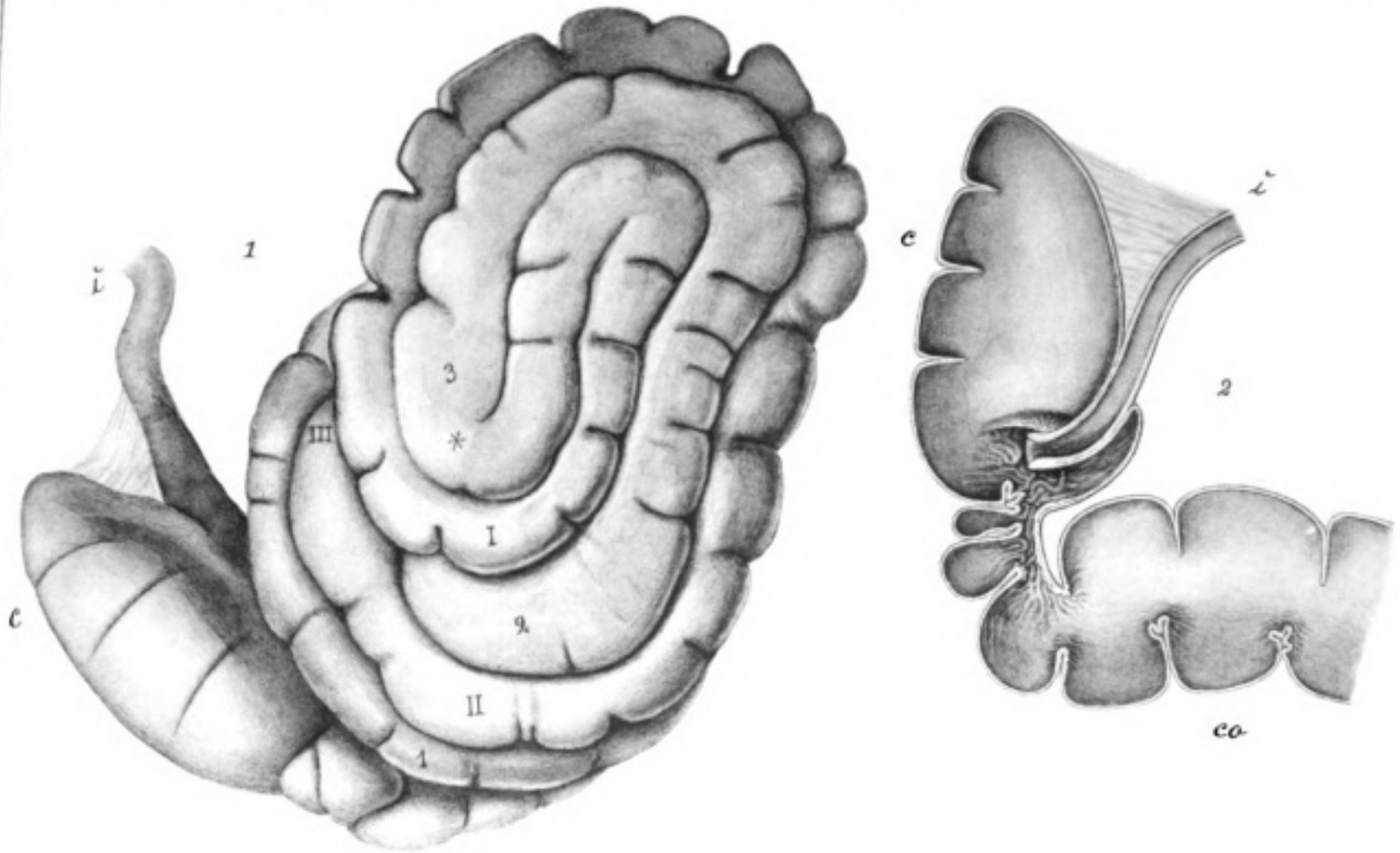
- Fig. 1. Palate of *Buffelus caffer radcliffei* THOMAS, to show the arrangement of the folds. Strongly diminished.
 Fig. 2. Dorsal view of a kidney of *Buffelus caffer radcliffei* THOMAS, to show the lobulation. $\frac{1}{2}$ nat. size.
 Fig. 3. Palate of *Felis leo somaliensis* NOACK. ♂.
 Fig. 4. Palate of *Otocyon megalotis virgatus* MILLER.
 Fig. 5. End of male organ of *Buffelus caffer radcliffei* THOMAS. Nat. size.
 Fig. 6. End of male organ of *Connochates albojubatus* THOMAS. Nat. size.
 Fig. 7. End of male organ of *Æpycceros melampus reudilis* LÖNNBERG. Nat. size.
 Fig. 8. End of male organ of *Lithocranius walleri* BROOKE. Nat. size.
 Fig. 9. End of male organ of *Oryx beisa annectens* HOLLISTER. Nat. size.

Plate II.

- Fig. 1. Colic spiral and cæcum (*c*) of a young *Phacochærus* pig from the Kedong Valley, Brit. East Africa. *i* small intestine. 1 end of first centripetal coil, 2 end of second centripetal coil, 3 near the end of third centripetal coil. * turning point of spiral. I end of first centrifugal coil, II end of second centrifugal coil, III first portion of third centrifugal coil before it disappears under the other coils.
 Fig. 2. Longitudinal section through cæcum (*c*), and adjoining parts of the small intestine (*i*), and the colon (*co*) of a young *Phacochærus* pig from the Kedong Valley, Brit. East Africa.
 Fig. 3. Dorsal view of the male organ of a *Rhinoceros bicornis* from the northern side of Guaso Nyiri, Brit. East Africa.
 Fig. 4. Lateral view of the same.

Tryckt den 3 september 1912.

Uppsala 1912. Almqvist & Wiksells Boktryckeri-A.-B.



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