XXIV.—On some external characters of Ruminant Artiodactyla—Part III. The Bubalinæ and Originæ

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To cite this article: R.I. Pocock F.R.S. (1918) XXIV.—On some external characters of Ruminant Artiodactyla—Part III. The Bubalinæ and Originæ, *Annals and Magazine of Natural History*, 2:9, 214-225, DOI: [10.1080/00222931808562369](https://doi.org/10.1080/00222931808562369)

To link to this article: <http://dx.doi.org/10.1080/00222931808562369>

Published online: 04 Sep 2009.

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other (whereas in *N. amphibius* the dorsal hair is rather stout, stiff, rod-like, and not divided). Hairs on abdomen very similar to those of *N. amphibius*, being short and branched in the same way, but they are finer. The sac-like structure placed immediately behind the eye is almost circular (instead of being rather elongate-oval).

Length (slightly pressed by accident) 240 μ .

Material. A single specimen collected by the author on the summit of the Mendip Hills, near Axbridge, Somerset, July 1918.

XXIV.—*On some External Characters of Ruminant Artiodactyla.*—Part III. *The Bubalinæ and Oryginæ.* By R. I. Pocock, F.R.S.

PARTS I. and II. of this series, supplementing my paper published in the Proc. Zool. Soc. for 1910, appeared in the Ann. & Mag. Nat. Hist. for June and August of this year. As in those papers, the reference numbers inserted after the genera and species in the following pages apply to the treatise issued in 1910.

Subfamily *BUBALINÆ*.

Genus *DAMALISCUS*, Sci. & Thos.

In 1910 I described the preorbital and pedal glands of this genus from dried skins of *D. korrigum*. I am now able to supplement that account from fresh material of two South African species, *D. albifrons* and *D. pygargus*.

Damaliscus albifrons, Burch.

The muzzle (fig. 1, A, B, C) is long, broad, and depressed, with mobile upper lip and fleshy, valvular, narrow, and elongate nostrils, lined for some distance inside, both above and below, with hair. The *rhinarium* is much reduced, but is broad between the narrowed inner ends of the nostrils; beneath the septum it is continued down the upper lip as a short mesially grooved philtrum, which rapidly narrows from its wide base to its pointed lower end which reaches the inferior edge of the upper lip. Dorsally it extends as a moist band along the upper lid of the nostril, but falls short of the posterior angle of the nostril by some distance; on the lower lid of the nostril there is no rhinarial extension

of moist skin. From the dorsal aspect the rhinarium appears as a crescentic band, thicker mesially in front than posteriorly at the sides, the hairs on the upper side of the muzzle spreading far forwards between the nostrils, forming a well-defined field with an evenly convex antero-lateral edge. The surface of the rhinarium is covered with a reticulation of grooves defining low rounded eminences.

The *preorbital gland* is marked externally by a slightly

Fig. 1.

- A. Muzzle and rhinarium of *Damaliscus allifrons* from the front. $\times \frac{1}{3}$.
 B. The same from above.
 C. The same from the side.
 D. Extremity of the penis of *D. pygargus* from below.
 E. The same from the right side.

raised circular naked area, with a central orifice leading into a short cylindrical tube penetrating about halfway into the substance of the thick gland.

Inguinal glands are absent, and there is a single pair of mammary.

The *pedal glands*, like those of other Bubalines I have already described, are well developed only on the fore feet where they consist of a deep and long interdigital pouch overlapped to a great extent above by the folded integument

of the pastern, but with a comparatively long slit-like orifice. On the hind foot the gland is represented merely by a shallow naked depression.

Damaliscus pygargus, Pall.

Differs in none of the particulars described above from *D. albifrons*, except that the philtrum fails to reach the edge of the upper lip.

In the male the *penis* (fig. 1, D, E) ends in a well-defined cordate thickening, broad at the base, narrowed at the apex. The urethral canal is not produced beyond the extremity of the glans, but terminates in a groove in the middle of its under side.

The figure of the penis of *D. albifrons*, published by Garrod (P. Z. S. 1877, p. 11, fig. 22), and apparently copied by Gerhardt, represents this organ as apically attenuated and provided with a short tubular urethral process lying along the left side of the end of the glans and free from it to a very limited extent, but not projecting beyond it.

It seems to me to be very unlikely that two species so closely allied as *D. albifrons* and *D. pygargus* differ in reality in the structure of the penis to the extent indicated by Garrod's observations and my own; and since Garrod's figure shows close agreement between the penis of *D. albifrons* and that of *Connochætes*, I am disposed to think it likely that the penis of *D. pygargus* I examined must have been abnormal or, perhaps, mutilated with respect to the end of the urethra.

There the matter must rest until the opportunity of examining this organ in other examples of *D. pygargus* occurs. Considering the rarity of the species we may have to wait long for such a chance to verify or disprove the point at issue.

Genus CONNOCHÆTES, Licht.

Connochætes gnou, Zimm. (p. 904).

I have very little to add to my original account of this species except some facts regarding the rhinarium and penis which were not described in 1910*.

The muzzle (fig. 2, A, B, C) is a gross exaggeration of the type seen in *Damaliscus*, being wider and having the valvular lids of the nostrils more protuberant and fleshy.

* In one specimen the surface of the preorbital gland showed a central saucer-like depression. Hence this surface is not always flat, as described in 1910.

A further important and very interesting difference is the presence of a well-developed pouch, lined with short hair, penetrating the internarial septum on each side and opening by a circular orifice within the anterior angle of the nostril, nearly midway between the latter and the anterior end of entrance to the narial passages. The orifice of this pouch,

Fig. 2.

- A. Muzzle and rhinarium of *Connoclaetes gnou* from the front. $\times \frac{1}{3}$.
(The vibrissae shorter than in nature.)
- B. The same from the side.
- C. The same with the upper lid of the nostril raised to show the orifice of the sack penetrating the septum.
- D. Extremity of penis of the same from below.
- E. The same of *Gorgon taurinus* from the left side.

like the entrance to the chamber itself, is revealed when the upper lid of the nostril is raised and concealed when it is in its normal depressed position (fig. 2, B, C).

Owing to the scanty clothing of hair on the dorsal side of the muzzle, the *rhinarium* is not so well defined above and behind as in *Damaliscus*; it extends less than halfway

round the upper lid of the nostril. Viewed from the front it is exceedingly wide and laterally attenuated, with a concavo-convex, sinuous upper edge. The philtrum, which is broad, angular, and ungrooved, is inferiorly abbreviated, ending in a point a little above the middle of the upper lip, the lower portion of which is continuously hairy across the middle line. The surface of the rhinarium is transversely striated, not roughened and tessellated.

In his paper on the anatomy of the Gnu, Lönnerberg (K. Vet.-Akad. Handl. xxxv. no. 3, p. 48, 1901) paid no special attention to the rhinarium, contenting himself with a reference to the descriptions published by others, notably by Selater and Thomas in the 'Book of Antelopes,' vol. i. This brief description, however, contains no mention of the pouches in the internarial septum, because they are completely concealed in dried skins. No doubt this fact accounts for their having hitherto apparently escaped detection. At all events I have not come across any record of their occurrence.

I am unable to suggest any explanation of the function of these pouches, unless they act as traps for the maggots of parasitic dipterous insects (*Æstrus*) whose usual habit it is to pass up the true nostril into the narial passages, where they frequently set up serious disorders in Ruminants. At all events, these parasites would be innocuous in the pouches.

The *penis* (fig. 2, D) differs from that of *Damaliscus pygargus* in being apically attenuated, without trace of the cordate thickening at the end, and in the termination of the urethral canal in a short process on the left side of the apex, beyond which it projects for a very short distance.

Genus GORGON, Gray.

Gorgon taurinus, Burch. (p. 906).

An example of *G. taurinus albojubatus*, four and a half months old, had the muzzle constructed as in *Connochætes gnou*, except that the peculiarities were less exaggerated; it was less depressed and narrower and the rhinarium seen from the front was deeper from above downwards and the shortened philtrum showed a narrow groove.

The *preorbital gland* was scantily clothed with long hair and its surface was mesially depressed and saucer-like.

The *penis* (fig. 2, E) of an adult male of the typical race was less attenuated apically than in that of *Connochætes gnou* and the urethral canal was not prolonged beyond the end of the glans.

From evidence supplied mainly by the digestive tract,

Lönnberg (K. Vet.-Akad. Handl. xxxv. no. 3 (1901) ; Arkiv. Zool. v. no. 10, p. 21 (1909)) was of opinion that the Gnus are phylogenetically related to the Bovinæ, the latter being the descendants of antelopes closely akin to *Connochætes* and *Gorgon*. It appears to me, however, to be certain that the Gnus must be regarded as highly specialised forms of *Bubalis*; but I cannot admit that the latter are in any way nearly affiliated to any form of Bubalinæ. The evidence, on the other hand, that the Bovinæ are specialised Tragelaphinæ is, in my opinion, complete.

The usually recorded differences between the Gnus and Hartebeests in cranial and cornual characters are well known. Using the muzzle as a basis the two groups may be distinguished as follows :—

- a. Muzzle comparatively narrow; rhinarium cleaving the upper lip approximately to its inferior edge, its depth about half its width, its surface roughened and reticulated; no pouches in the internarial septum within the nostril *Bubalis, Damaliscus.*
- a'. Muzzle comparatively very broad; rhinarium not extending to inferior edge of upper lip, its depth less than half its width, its surface transversely striated; a pair of pouches penetrating the internarial septum within the nostrils *Connochætes, Gorgon,*

The Bubalinæ constitute a compact group of Bovidæ showing comparatively slight range of variation so far as the external features dealt with in this paper are concerned. The muzzle is expanded, the rhinarium is reduced, the nostrils are valvular and lined within the orifice with longish hair for the exclusion of foreign bodies. The preorbital gland is large and is either provided with a narrow duct-like invagination (*Damaliscus, Bubalis*) or has a flat, slightly convex or slightly concave surface (*Connochætes, Gorgon*). Inguinal glands are absent, and there is normally, at all events, a single pair of mammæ. Pedal glands are well developed only on the fore feet, where they consist of a long deep interdigital pouch with a long orifice, but not so long as in the Antilopinæ, on the front of the pastern. In the hind feet this gland is aborted and represented merely by a shallow depression. The penis at most has a short tubular urethral prolongation.

Subfamily ORYGINÆ.

Genus ORYX, Blainville.

My account of the cutaneous glands of this genus published in 1910 was based upon an examination of dried skins

and living animals only. Since that date I have had the opportunity of seeing fresh carcasses of two very distinct species, namely *O. gazella*, the type of the genus, and *O. leucoryx*, which should rank, I think, as a distinct genus

Oryx gazella, Linn.

The muzzle (fig. 3, A, B, and 4, F) is broad and depressed,

Fig. 3.

A. Muzzle of rhinarium of *Oryx gazella* from the front. $\times \frac{1}{3}$.
B. The same from above.

with the nostrils narrow, elongated, valvular, and hairy right up to their lower rim. The smooth rhinarium is reduced in size, moderately broad between the nostrils, and extending laterally as a comparatively narrow strip all along the upper rim of the nostrils. From the dorsal aspect it is crescentic, the hairs of the dorsal side of the face extending

far forwards between the nostrils, more than halfway along their length, forming a field with an evenly convex antero-lateral border. From the front the upper edge has a sinuous curvature, and the depth of the rhinarium down the middle line is about equal to the width of the internarial septum; the inferior edge is slightly angled, but is not continued as a philtrum down the upper lip, which is continuously hairy across the middle line*.

Preorbital and *inguinal glands* are absent, as Owen and Ogilby correctly recorded.

The *pedal glands* on all four feet consist of dilated hair-lined pouches, opening by a narrow passage and a small orifice on the front of the pastern just above the summit of the folded interungual web. They resemble those of *O. beisa* described in 1910, except that the orifice is small and sub-circular (cf. *infra*).

Oryx beisa, Rupp. (p. 907).

I am indebted to the late Mr. F. C. Selous for the fore and hind foot of an adult example of this species from British East Africa. In these the glands were moderately large and saccular, with a narrow cylindrical exit passage and circular orifice. In 1910 I described the orifice of the gland observed on the dried feet of an immature specimen as consisting of an elongated slit. The shape assumed by the orifice in this case was probably due to shrinkage of the skin when drying. At all events, the glands of the specimen brought for me by Mr. Selous resembled those of the fresh specimen of *O. gazella* described above.

Genus *ÆGORYX*, nov.

Differs from *Oryx* in possessing a preorbital gland, a more reduced rhinarium, and curved horns.

Type, *Ægoryx algazel*, Oken.

Ægoryx algazel, Oken (p. 909).

In 1910 my notes on this species were restricted to the statement that an example living in the Gardens showed the presence of preorbital glands by patches of secretion on the face about one inch in front of the eye, thus disproving the assertions of Owen and Ogilby that the preorbital gland is absent.

* In the figures illustrating the muzzle of the antelopes described in this paper, no attempt has been made to indicate by shading the transverse and vertical convexity of the rhinaria, which thus appear to be too flat.

In an example of the typical race of this species from Northern Nigeria, the gland (fig. 4, B) consists of a thickened area of skin concealed and overgrown by hair basally adherent with secretion. The gland is about 30 mm. long and 6 mm. thick and slightly elevated, resembling the

Fig. 4.

- A. Muzzle and rhinarium of *Egorix algazel* from the front. $\times \frac{1}{3}$.
 B. Preorbital gland of the same in longitudinal section.
 C. Extremity of the penis of the same from the left side.
 D. The same from the right side with urethral process pulled down.
 E. Extremity of penis of *Hippotragus niger* with urethral process straightened.
 F. Muzzle and rhinarium of *Oryx gazella* from the side.

corresponding gland of *Hippotragus*, although shorter as compared with its thickness.

The muzzle (fig. 4, A) in its general features is like that of *Oryx gazella*, but the rhinarium is considerably more reduced. When viewed from the front it is much wider as

compared with its height, the height in the middle line being slightly less than that of the upper lip and much less than the width of the internarial septum.

As in other members of this subfamily the *inguinal glands* are absent, there are two pairs of *mammæ*, and the *pedal glands* are present and constructed as in *Oryx*.

The *penis* (fig. 4, C, D) is remarkable for the thickness and length of the tubular prolongation of the urethral canal, which projects some distance beyond the ovate termination of the glans and is nowhere adherent to it. It rises from the underside of the cylindrical portion of the penis, and, although normally closely applied to the left side of the well-defined terminal portion, is in reality separable from it. It is thick at the base and gradually attenuated apically.

The penis closely resembles that of *Addax* as described and figured by Garrod (P. Z. S. 1877, p. 10, fig. 18); but Gerhardt's figure of the penis in *Addax* has a much shorter urethral prolongation, not overlapping the tip of the glans (Verh. Deutsch. Zool. Ges. xvi. p. 153, 1906).

Genus HIPPOTRAGUS, Sund.

Hippotragus niger, Ham. (p. 909).

Specimens examined since 1910 confirm in every particular the facts stated in that year as to the structure and incidence of the cutaneous glands. The new facts here recorded relate to the rhinarium and the penis.

The muzzle (fig. 5, A, B) is less depressed than that of *Oryx*, and the sculptured rhinarium is relatively larger and more normal, with a better defined naked tract below the nostrils, a well-developed philtrum mesially grooved, broad at the base, and narrowed below where it reaches the inferior edge of the upper lip; the nostrils are more expanded with the upper lid more swollen, so that from the anterior aspect the upper edge of the rhinarium appears to be biconvex with an angular median depression and from the dorsal aspect the anterior edge is seen to be transversely truncated. The hairs of the upper side of the nose extend some distance between the nostrils, although not so far as in *Oryx*, so that the posterior border of the rhinarium is strongly concave.

The *penis* (fig. 4, E) resembles that of *Ægoryx*, described above, in the thickness, length, and freedom of the tubular prolongation of the urethral canal, but the termination of the glans is less markedly bulbous.

The *Oryginæ*, apart from *Addax* which requires examination, are a remarkably uniform group with respect to the

structure of the penis, the presence of four mammæ, the absence of inguinal glands, and the presence on all four feet of flask-shaped pedal glands with narrow exit passage and small circular orifice just behind the summit of the interungual web.

Fig. 5.

A. Muzzle and rhinarium of *Hippotragus niger* from the front. $\times \frac{1}{3}$.
B. The same from above.

Setting *Addax* aside, the genera discussed in this paper may be distinguished as follows:—

a. Rhinarium sculptured, with distinct philtrum reaching lower edge of upper lip; upper rim of dilated nostrils swollen; horns rising erect from head ..	<i>Hippotragus.</i>
a'. Rhinarium smooth, without philtrum, upper lip entire; upper rim of narrow nostrils not swollen; horns inclined backwards in the plane of the forehead.	
b. Preorbital gland present as a thickened pad of skin like that of <i>Hippotragus</i> ; rhinarium shallow; horns curved	<i>Ægoryx.</i>
b'. Preorbital gland absent; rhinarium deeper; horns straight	<i>Oryx.</i>

Addax differs from the three above enumerated genera in having broad rounded hoofs, the interdigital web exceedingly thick above, the pedal glands represented by a short narrow cylindrical tube, corresponding to the duct of the gland in *Hippotragus* and *Oryx*, and the horns spirally twisted (Proc. Zool. Soc. 1910, pp. 910-911).

XXV. — *Descriptions from the Joicey Collection of new Species of Syntomidæ, Nymphalidæ, and Hesperidæ, and Two Genera of Syntomidæ.* By W. J. KAYE, F.E.S.

ALL the new species herein described will be figured after the war. The striking new *Chlorippe* from Haiti is so far unique. It is a ♀ and could scarcely be a ♀ ab. of *cherubina*, the species it doubtless comes closest to. In Cuba *Chlorippe laure* occurs, but the present insect is certainly not a ♀ of that species, although it is highly possible that *laure* occurs in Haiti.

The new race of *Anæa xenocrates* from French Guiana, although different in the ♂ from the typical species, has a ♀ (only a single specimen) that is exceedingly like the ♀ at Tring of the type-form from Bolivia. The female of this species appears to be exceedingly rare, and it was rather surprising to get a single pair from quite a new locality.

Syntomidæ.

TIGRIDANIA, gen. nov.

Proboscis well developed. Palpi long, upturned, reaching well above head, and separated widely at base, but meeting above the head. Antennæ bipectinate in both sexes, longer in ♂. Legs fairly long. Hind tibiæ with two pairs of spurs of nearly equal length and strong spines on the tarsal joints. *Fore wing with vein 3 a long way before end of cell and distance between veins 2, 3 less than that between 3 and 4.* Veins 4, 5 from angle of cell; a fold between 5, 6, extending across cell; 11 from cell; 7, 8, 9, 10 stalked. Costa greatly bulged at base. Hind wing with the lower discocellular very short and oblique; veins 2 and 4 on a long stalk, 3 absent, 5 present, 6 and 7 from upper angle.

Type, *quadricincta*, Kaye.

The genus comes nearest to *Sarosa*, from which it differs markedly in the position of veins 2 and 3 of the fore wing.