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XLIV.—On some external characters of Galidia, Galidictis, and related genera

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partially separated). *pl.*, pollical lobe; *c.*, external lobe of carpal pad.

Fig. 4. Right hind foot of the same. *hl.*, hallucal lobe.

Fig. 5. Rhinarium of the same.

Fig. 6. Base of ear of the same. *s.*, supratragus; *b.*, bursa; *pe.*, postero-external ridge; *e.*, crest on outside of latter; *r.*, supplementary ridge; *o.*, inferior orifice of meatus; *ae.* and *ai.*, antero-external and antero-internal ridges.

Fig. 7. Ano-genital area of the same. *a.*, anus; *v.*, vulva.

PLATE XIII.

Fig. 1. Anal and genital area of female *Eupleres goudoti* (after Carlsson). *v.*, vulva; *a.*, anus.

Fig. 2. Right hind foot of the same. *1* and *5*, first and fifth digits; *hl.*, hallucal lobe attached to plantar pad.

Fig. 3. Right fore foot of the same. *1* and *5*, first and fifth digits; *c.*, double carpal pad, with spot of naked integument between the larger or outer lobe and the plantar pad; *pl.*, pollical lobe of pad.

Fig. 4. Anal and genital area of male *Fossa fossa* (dried skin). *a.*, anus; *sc.*, scrotum; *p.*, prepuce.

Fig. 5. Left fore foot of *Fossa majori* (dried skin). Lettering as in fig. 3.

Fig. 6. Left hind foot of the same. Lettering as in fig. 2, with addition of *mt.*, metatarsal pad.

XLIV.—*On some External Characters of* Galidia, Galidictis, *and related Genera.* By R. I. POCOCK, F.R.S., Superintendent of the Zoological Society's Gardens.

[Plates XIV. & XV.]

THE indigenous Mascarene carnivores *Cryptoprocta*, *Fossa*, *Galidia*, *Salanoia* (*Hemigalidia*), *Galidictis*, and *Eupleres* were referred by Mivart to the Viverridæ under the sub-families Cryptoproctinæ (*Cryptoprocta*), Viverrinæ (*Fossa*), Galidictinæ (*Galidia*, *Galidictis*, and *Salanoia*), and Euplerinæ (*Eupleres*). Although his definitions were not altogether convincing, the groups themselves will no doubt be admitted by modern systematists, possibly with elevation to the higher rank of families. With *Cryptoprocta* I am not now concerned; *Fossa* and *Eupleres* I suggest (see the preceding paper) may be regarded respectively as divergent types of a primitive group of Viverrids, antedating the ancestor of the groups now characterised by the possession of the scent-gland. With *Fossa* I associate *Linsang*, for the reason that it also is without that organ; and *Poiana* inferentially, and therefore provisionally, goes with *Linsang*, pending the examination of fresh material to establish, or disprove, its possession of the gland.

The confidence I place in this gland, as an important criterion of affinity and as a basis for the classification of the Viverridæ, is admittedly founded on two assumptions: first, that a specialised organ of that description when once acquired and elaborated is not likely to be eliminated, without some radical change in mode of life depriving it of its usefulness; and, second, that there is nothing to justify the view that it has been acquired twice, or more times, within the limits of this group of Æluroid carnivores.

I therefore attach to it a systematic value higher than that accorded to the feet or teeth which, there is evidence to show, are organs of a high degree of plasticity along certain lines, the teeth altering in size, shape, and position apparently in accordance with diet, and the feet becoming modified in the direction of digitigradism and other particulars according to the mode of progression required by the nature of the soil, the change from terrestrial to scansorial habits, or *vice versa*.

The Scent-gland.—Adopting the scent-gland as a criterion, the systematic position of the three remaining Mascarene genera, *Galidia*, *Salanoia*, and *Galidictis*, and the recently established *Mungotictis* (Ann. & Mag. Nat. Hist. (8) xvi. p. 120, 1915), remains to be settled. In some characters they resemble the mongooses, in some the civets and genets, in some they differ from both those sections. They are not definitely classifiable with either. But I think it is a mistake to consider them as intermediate between the two, or as inclining rather to the mongooses than to the civets, as Mivart held. Since Mivart's time fresh or spirit-preserved examples of *Galidictis* and *Galidia* have been examined, and the scent-pouch has been found in both.

A female example of *Galidictis eximius* (=*striata*) was examined by Beddard, and his figure of the gland (Pl. XIV. fig. 4) shows that in position and, apparently, in structure it resembles the homologous organ in *Genetta*, that is to say, it is wholly perineal and consists of two closely applied lobes meeting to form a narrow branching rima (P. Z. S. 1907, p. 805).

As regards *Galidia elegans*, the only known species of the genus, Beddard stated that the male has no scent-gland (P. Z. S. 1909, p. 477); but a year later Miss Carlsson detected the organ in a female of that species (Zool. Jahrb. Syst. xxviii. p. 559, 1910). This discrepancy is difficult to explain. Two explanations suggest themselves:—first, that Beddard overlooked the organ, which is improbable, unless possibly it was as little developed as it is in the young male

of *Cynogale bennettii* I have recently described (Ann. & Mag. Nat. Hist. (8) xv. p. 358, pl. xiv. fig. 8, 1915) ; and, second, that the organ is present only in the female. This must be admitted as quite possible, despite the better development of the gland in the males than in the females of the Viverrinæ and Paradoxurinæ. If this prove to be so the fact will be one of very great interest, for, taken in conjunction with certain archaic characters of *Galidia* and *Galidictis*, it suggests that this organ may originally have been a sexual character acquired first by the female to help the male find her and, subsequently, by the male for the opposite purpose. However that may be, the present state of our knowledge only justifies the statement that the gland is present in the females of the two genera under discussion.

It may be added that Miss Carlsson's figure of the gland in the female *Galidia elegans* (Pl. XIV. fig. 3) shows that it is a perineal pocket, the labia of which pass forwards in front of the vulva and clitoris, foreshadowing the condition seen in *Paradoxurus* and *Paguma*, as I have recently pointed out (P. Z. S. 1915, pp. 401–405) ; but, as in the Viverrines, the walls of the space are covered with short hair. It is also interesting to note that an examination of dried skins of *Galidia* and *Galidictis* shows that the prepuce is situated far in advance of the scrotum, as in *Fossa* and *Cryptoprocta*, and that this character alone serves to separate the genera concerned from the mongooses. The absence of the anal pouch and the structure of the ear, which has a well-developed marginal bursa and a long and strong tragus-bearing crest, further distinguish *Galidia* and *Galidictis* from the mongooses.

Nothing is known apparently about the presence or absence of scent-glands in *Mungotictis* and *Salanoia*. The provisional inference as to their presence—at all events, in the female—is justified by the many likenesses and few unlikenesses between those genera and *Galidia* and *Galidictis*.

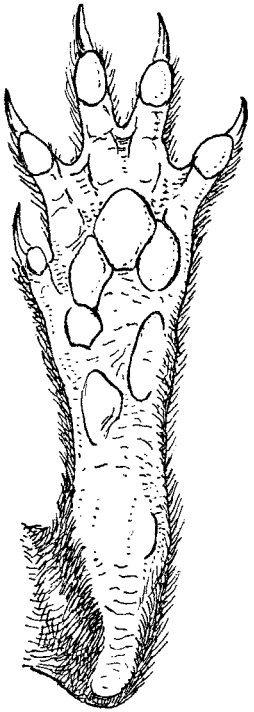
The Vibrissæ, Rhinarium, and Ear.—The tufts of facial vibrissæ are normal in number and situation, consisting of mystacial, supraocular, and two genal on each side and of an interramal in the middle line of the throat. The individual vibrissæ are mostly long.

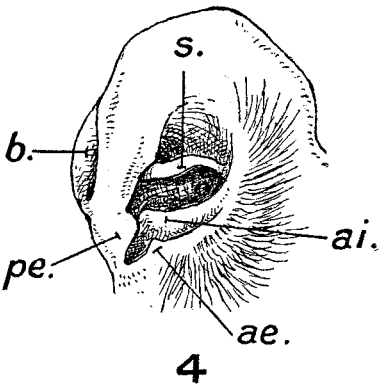
The rhinarium, judging from dried skins, is small, as in the genets and mongooses. The upper lip is cleft and the groove marking it extends at least up to the summit of the anterior surface. The infranarial portion is deep, but not laterally extended as a broad band beneath the slit of the nostril. Seen from above, the anterior edge of the upper

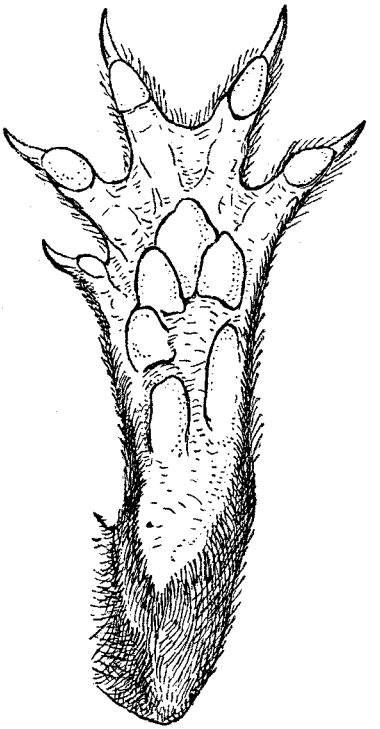
surface is medianly notched and apparently lightly biconvex in *Galidictis* and *Galidia*, but without a notch and straight or lightly convex from side to side in *Mungotictis*.

The pinna of the ear (Pl. XV. fig. 4) is larger than in most mongooses, except *Cynictis*, but smaller on the average than that of the Viverrines and Paradoxurines. It has a well-developed bursa (*b.*), of which the anterior and posterior flaps arise together from the margin of the pinna above, giving this margin the appearance of bifurcation. The edge of the anterior flap is not notched or markedly concave. The two anterior basal ridges (*ae.*, *ai.*) are well developed, the external or tragus-bearing ridge extending upwards nearly to the anterior base of the supratragus or *plica principalis* (*s.*), and the internal sweeps across beneath the supratragus somewhat as in the mongooses, without sloping so obliquely downwards as in the Viverrines and Paradoxurines; but the supratragus has no thickening. The ridge of the antitragus (*pe.*) rises from the inferior orifice of the meatus, but there is no apparent groove or ridge on its outer surface. The possession of a well-developed bursa distinguishes the ear of the Galidictinæ from that of the mongooses, and in none of the latter is the tragus-bearing antero-external ridge so well developed. Nevertheless, in the simpler structure of the ridges, the higher position and lesser downward inclination of the antero-internal ridge, and the absence of lobate thickening on the antitragus, the ear recalls that of the mongooses.

The Feet.—So far as I am aware, the feet of *Galidictis* have never been examined on fresh material and never figured. Those of *Galidia*, as figured by Miss Carlsson, show some interesting points, which I have verified as far as possible on available skins. The fore foot (Pl. XIV. fig. 2) is naked beneath from the toes back to and including the region of the carpal pads. The digits are webbed up to the proximal end of the digital pads, and the edges of the web are not deeply emarginate. The claws are of moderate length, not retractile, unguarded by skin lobes, and unprotected basally by thick-growing hair. The pollex, although rather short, is not set high up, but projects nearly in a line with the middle of the plantar pad, which is typically trilobed and has a large pollical lobe barely in contact with its internal lateral lobe. The elements of two carpal pads are present, and these, taken together, seem to be at least equal to the plantar pad in area. The outer, on the ulnar side, is very large and is defined from the inner, which is in contact throughout its width with the pollical element of the plantar pad, by a deep notch jutting







MUNGOTICTIS AND GALIDICTIS.

backwards from the rather short, naked, depressed area between the carpal and the plantar pads.

The hind foot (Pl. XIV. fig. 1) is naked back to the heel. The digits and plantar pad resemble in a general way those of the fore foot. Two metatarsal pads are retained. The inner, the thicker of the two, is separated from the hallucal lobe of the plantar pad. The outer, which is thinner and subfusiform, is set lower down. Its proximal end is in contact, or nearly so, with the middle of the admedian edge of the inner lobe ; its distal end runs downwards and ceases before reaching the plantar pad, the interval between the two being a little less than that which separates the inner metatarsal pad from the hallucal lobe of the plantar pad.

None of the examples of *Galidia* which I have seen bear out Mivart's statement (P. Z. S. 1882, p. 188) that "the tarsus and metatarsus are covered beneath with sparse short hairs, or are more or less inclined to be bald." The feet appear to me to be quite naked beneath.

From an examination of dried skins it appears that the feet of *Galidictis* differ in the main from those of *Galidia* in having the digits longer, less fully webbed, and provided with longer claws, those of the fore feet being especially elongated. In these respects they recall the feet of the true mongooses, but, as is also the case in *Galidia*, the pollex and hallux are lower down than in those animals, thus attesting a more primitive type of foot. The fore foot, moreover, is more markedly asymmetrical than in *Galidia*, the third digit being considerably longer than the fourth and the fifth being set far back so as to be only a little in advance of the pollex and considerably behind the second digit. The foot, in fact, approaches the "perissodactyl" type more closely than in any living carnivore I have seen, in the sense that the long third digit lies nearly in the middle line and is flanked by the second and fourth, which are not very unequal in length, with the first and the fifth much shorter and higher up. This arrangement is not noticeable on the hind foot (Pl. XV. fig. 3), which is artiodactyl, the middle line passing between the third and fourth, which are subequal, the second on the inner side of the foot balancing the fifth on the outer side.

The feet of *Mungotictis* are similar to those of *Galidictis*, except that the heel is naked and not hairy (Pl. XV. figs. 1, 2).

The Pattern.—Apart from the annulation of the tail in *Galidia*, this genus and *Salanoia* show no trace of pattern. *Galidictis* and *Mungotictis*, on the other hand, have a definite pattern of longitudinal stripes on the body, and *Galidictis*, in addition, shows spots or stripes on the base of the tail.

It would be rash to claim that the pattern in either of these genera is the primitive carnivore pattern; but, since there is a good deal of convergent evidence that the primitive pattern of this order consisted of longitudinal lines, it is interesting to find this type present in Mascarene genera, intermediate in some respects between such widely divergent groups as the genets and mongooses. Analysis of the pattern of the genets, as a whole, shows that on the body it is resolvable into five longitudinal bands of spots on each side and a median uninterrupted stripe down the back. Over the shoulders and the nape of the neck the continuity of these stripes is generally interrupted to a greater or less extent, and their course is not always easy to follow; but the extension of the three dorsal stripes on each side over the shoulders and up to the occiput in *Mungotictis vittatus* (see Ann. & Mag. Nat. Hist. (8) xvi. pl. vii. fig. 3), suggests that the pattern on the neck of genets is derived from the breaking up of at least six stripes with the addition of the median stripe. Although in some examples of Galidictinæ the median spinal stripe does not exist, nevertheless, it can be detected as a narrow band on the fore part of the neck of *Galidictis eximius* and on part of the dorso-lumbar area in *Mungotictis vittatus*.

The resemblance in pattern between *Galidictis* and *Mungotictis*, on the one hand, and the Genets, on the other, strengthens the claim of relationship between the Galidictinæ and the Viverrinæ based upon the structure and relations of the perfume-gland.

EXPLANATION OF THE PLATES.

Plate XIV.

Fig. 1. Right hind foot of *Galidia elegans*, drawn from dried skins.
Fig. 2. Right fore foot of the same.
Fig. 3. Anal and genital area of *Galidia elegans* (after Carlsson). *a.*, anus; *gl.*, glandular pouch, with labia distended; *v.*, vulva.
Fig. 4. Anal and genital area of *Galidictis eximius*; lettering as in fig. 3, the labia of gland in contact.

Plate XV.

Fig. 1. Left hind foot of *Mungotictis substriatus*, drawn from dried skin.
Fig. 2. Left fore foot of the same.
Fig. 3. Left hind foot of *Galidictis eximius*.
Fig. 4. Right ear of *Galidictis eximius* (from dried skin). *b.*, *bursa*; *s.*, supratragus; *pe.*, postero-external or antitragal ridge; *ae.*, antero-external or tragal ridge; *ai.*, antero-internal ridge.