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Genus SIPYLUS.

Sipylus, Stål, Hem. Afr. iv. p. 89 (1866).

Sipylus dilatatus.

Centrotus dilatatus, Walk. List Hom. ii. p. 630 (1851).

Sipylus nodipennis, Funkhous. Journ. Ent. & Zool. (Pomona College, Calif., U.S.A.) vi. p. 72, fig. 5 (1914).

Hab. Philippine Islands.

Walker described his species as having the "fore wings greyish, ferruginous at the base; veins ferruginous, nodose," whereas in his type the tegmina are also very distinctly ferruginous on the apical areas, as in Funkhouser's figure.

XXXVIII.—On some of the *External Structural Characters of the Striped Hyæna* (*Hyæna hyæna*) and related Genera and Species. By R. I. Pocock, F.R.S.

THIS paper is based primarily upon the carcase of a female example of *Hyæna hyæna*, from India, which died in the Zoological Society's Gardens in Dec. 1915. Of the other species of Hyænas I have seen no fresh specimens; but in 1908 I made some sketches of the anal pouch and glands of an example of *Proteles cristatus*. These I take the opportunity of reproducing. Unfortunately, no notes were made of other external features of this animal.

The Facial Vibrissæ and Rhinarium.—The facial vibrissæ of *Hyæna hyæna*, as in all Æluroid Carnivora, except the Felidæ*, consist of the normal number of tufts—namely, the mystacial, superciliary, two genal, and the interramal. The latter consists of about four well-developed bristles, and each of the two genal tufts of approximately the same number. These tufts are set rather close together near the middle of the cheek, the inferior of the two being above the posterior corner of the mouth. All the vibrissæ may be described as of medium length and considerable thickness.

In living examples of the Spotted Hyæna (*Crocuta crocuta*) the corresponding tufts of vibrissæ are quite apparent, and on a dried skin of a *Proteles* from South

* In this family the interramal tuft is always absent, as I have elsewhere recorded (P. Z. S. 1914. ii. p. 901).

Africa I find the vibrissæ precisely as described by Flower (P. Z. S. 1869, p. 476)—that is to say, the mystacial, superciliary, and interramal tufts are present; but the upper genal tuft appears to be suppressed, while the lower is

Fig. 1.

- A. Head of adult *Hyaena hyæna*, showing the facial vibrissæ and the ear.
 B. Head of newly-born cub of the same, showing the facial vibrissæ.
 C. Rhinarium of *Hyaena hyæna* from above. $\frac{3}{4}$ nat. size.
 D. The same from the front.

represented by a single stiff vibrissa. Supplementing Flower's account, I may add that the mystacial vibrissæ are unusually thick for a terrestrial mammal of the size of

Proteles, being actually as thick as those of the Hyænas, thus recalling the stiff vibrissæ of predatory aquatic or amphibious mammals like *Cynogale* or the Seals.

The rhinarium is large, naked, and nearly smooth. From the front its upper edge is evenly and lightly convex from side to side. Its lower half is marked by a groove ascending to a point midway between the two nostrils and continuous inferiorly with the cleft dividing the upper lip. The infranarial portion on each side is deep and its lower edge curves obliquely upwards and outwards, overlapping laterally to a considerable extent the internal rim of the narial slit above. In profile view the upper anterior margin is rounded and not prominent. From the dorsal aspect, the naked portion, measured from the inner margins of the narial slit, is rather more than twice as wide as long; its antero-lateral margin is convex from side to side, and, as stated above, is considerably overlapped externally by the naked margins of the narial slits. It may be added that the height of the upper lip in the middle line is about two-thirds the height of the middle line of the rhinarium above it.

The rhinarium of *Crocuta* appears to be similar to that of *Hyæna*; and the same applies to *Proteles*, except that Flower described the anterior orifices of the nostrils as "turning upwards." In the hyænas they look straight forwards.

Ears.—A detailed description of these organs has been rendered unnecessary by the exact account of them published by Boas*. The principal point to notice is the complete absence of the marginal bursa found in all other Æluroids, except the mongooses. Boas considers the bursa to be represented by a shallow depression on the postero-inferior portion of the surface of the pinna, rather nearer to the auditory cavity than to the posterior edge of the pinna and a little below the level of the supratragal ridge (*plica principalis* of Boas). There is nothing particularly remarkable about this ridge, which follows the usual longitudinal course and exhibits a swelling near the middle of its length. The antero-internal ridge descends as a long crest with a sinuous edge, but without definite enlargements of any kind, and disappears inferiorly behind the much shorter antero-external or tragal ridge. The inferior orifice of the ear is a small notch bordered in front by the tragus and behind

* 'Ohrknorpel und äusseres Ohr der Säugethiere,' pp. 145-146, pl. xxi. fig. 223 (1912).

by the antitragus, the inferior prominence of the postero-external ridge which ascends obliquely upwards and backwards. The postero-internal ridge is well developed, but there is no definite supplementary ridge on the pinna outside the lower end of the postero-external ridge.

The interesting point connected with the ear of the hyæna is the absence of the marginal bursa, a feature which suggests affinity with the mongooses. But the arrangement of the main cartilages of the ear is not in the least like that of the mongooses, and differs in no important respects from the arrangement seen in other *Æluroidea*.

There is nothing in Flower's account of the external ear of *Proteles* to distinguish it from that of the Striped Hyænas, if, as appears tolerably certain, he was describing in the following passage the depression regarded by Boas as the homologue of the marginal bursa :—"The hinder edge [of the ear] is produced near the base into a slight 'lobule' with a hollow on its inner side, separated from the 'concha,' or main cavity of the pinna, by a well-marked ridge."

Feet.—Certain characters in the feet of hyænas, such as the complete absence of the pollex and also of the hallux, the shortness and bluntness of the unretractile claws, have often been described; but it does not appear that the feet have ever been figured or described in detail, and, since they differ somewhat remarkably in certain points from the feet of all other *Æluroidea* that I have examined, it may be useful to supply the defects above alluded to. In the fore foot the pads are smooth. The plantar pad is cushion-like and trilobed; but the lobes are ill-defined marginally and are not marked by superficial grooves. It is comparatively long and narrow*, its length being approximately equal to its width. In the middle line posteriorly it is depressed and obliquely corrugated, and its posterior border is emarginate.

The digital pads, which like the plantar pad are smooth, show several peculiarities. In the first place, the plane of the lower surface of each is approximately at right angles to the long axis of the foot when the latter is in the lying position. This indicates the extreme of digitigradism exhibited in the *Æluroidea*. Another peculiarity is their shape. Instead of being elliptical, or approximately so, in outline as in most *Æluroidea*, their shape may be described as irregularly semi-conical. The posterior margin of each is truncated, the external margin lightly convex, and the internal

* In the newly born cub this pad is much broader than in the adult.

margin lightly concave. They narrow somewhat rapidly from the base to the apex, and the infero-internal angle is prominent. The digits are very symmetrical, and compactly united by strong webbing extending up to the proximal end

Fig. 2.

- A. Right fore paw of *Hyæna hyæna* from below, with the digits fully spread. $\frac{1}{2}$ nat. size.
 B. Right hind paw of the same.
 C. Right hind paw from the side, showing the vertical plane of the digital pads.

N.B.—In figs. A and B the digital pads are drawn diagrammatically in the same plane as the plantar pad to show their shape. Naturally, they only assume this position by great muscular contraction.

of the digital pads. The underside of the sole of the foot between the digital and plantar pads is naked, but the webs are marked with scattered speckling, showing the position

of hair-follicles in the skin. The upperside of the webs is naked and the tips of the digits carry long hairs, some of which spread on to, and to a slight extent beneath, the edge of the web joining the third and fourth digits together.

The carpal pad is small, nearly hemispherical, and set almost in the middle line a long distance above the plantar pad. The area between the carpal and plantar pads is covered with hairs, which arise in two streams above the carpal pad, encircle it, and converge to a line passing between that pad and the postero-external angle of the plantar pad. Just above the plantar, to a point nearly midway between it and the carpal pad, the skin is scantily hairy and there is a similar scantily hairy area on the inner side and in front of (below) the carpal pad.

The hind foot is very similar to the front foot, but is shorter and narrower, and the hairs above the plantar pad run in a continuous downward direction; but there is here also a scantily hairy area just above that pad in the middle line.

In rigidity, compactness, and in the shape and uptilting of the digital pads, as well as in the shortness and bluntness of the claws, the feet of hyænas resemble those of the Canidæ, generally speaking, rather than of other Æluroidea. In the latter the plane of the digital pads, which are almost always elliptical in outline, is usually the same as that of the plantar pad when the foot is in the lying position.

The feet of *Crocuta* seem to be quite like those of *Hyæna*; and the same applies to the feet of *Proteles*, except for the presence of the pollex, which is situated halfway between the wrist-joint (carpus) and the tips of the other digits, and of a patch of naked skin on the heel, which Flower considered to be normal and not due to wear. It may be particularly noticed that this author stated:—"The animal appears to be perfectly digitigrade." There is, however, one point connected with the feet of *Proteles* to which Flower did not allude. In the skin of a South African specimen, the area between the plantar and digital pads is covered tolerably thickly, though not so thickly as the rest of the foot, with short hair, and the upperside of the webs is also hairy. In this particular the feet of *Proteles* differ from those of all the hyænas, judging from skins of the Striped, Brown, and Spotted species in the Zoological Society's collection.

Anal Pouch and Glands.—These structures have been described by several authors in the three existing species of hyænas. Murie's account of the pouch in *Hyæna brunnea*

and Watson's in *Crocota crocuta* agree closely with that of Daubenton in *H. hyæna* ; and my observations in connection with the latter species are quite in accord. In *Crocota*, however, the skin of the pouch is said by Watson to be partially hairy, whereas in *Hyæna* it seems to be quite smooth.

When the tail is lowered, the walls of the pouch are in close apposition and its orifice appears as a curved slit above the anus, the concavity of the curve being downwards. It has a thickened rim, the inferior portion of which is continuous with the naked skin above the anus. Thus the orifices of the pouch and of the anus lie one above the other in a large disk of naked skin surrounded by hair, the hair in the middle line below forming a narrow strip above the vulva. The skin of the disk is very soft and pliable, and the pouch is susceptible of considerable dilatation. The orifices of the anal glands lie deeply within it, one on each side of, but not close to, the middle line. They are thus far removed above the anal orifice, a condition not known, so far as I am aware, in any other Carnivore, though foreshadowed in some mongooses, e. g. *Cynictis*.

In the newly-born young the pouch is well developed and in the same position as in the adult, but the orifice of the pouch is transverse with the two ends slightly upcurved, instead of downcurved, and this orifice and the anus are sunk in a common depression near the centre of the anal disk.

Mivart, perhaps (but not certainly) correctly, cites the presence of an anal pouch as evidence of affinity between the hyænas and the mongooses. There is, however, considerable difference between the pouches in the two groups. In the mongooses the anus opens near the centre of the pouch, which, apparently in these animals, represents the entire anal disk in the hyænas ; and the margins of the pouch close right over the anus when the pouch is closed. In the mongooses, moreover, the orifices of the two anal glands open into the pouch tolerably near the anus, and not very far above it and remote from it as in the hyænas.

As Murie (Tr. Zool. Soc. vi. p. 505, pl. lxiii.) described in the case of *Hyæna brunnea*, the anal glands are enveloped in muscular tissue ; but the glands in *H. hyæna* differ from those of that species in the following particulars. In *Hyæna brunnea* it appears that the normal anal gland found in all *Æluroid* Carnivores is tripartite. At all events, Murie figured three closely juxtaposed saccular glands, each with a separate compartment for storage of the secretion, which makes

Fig. 3.

- A. Anal pouch of female *Hyæna hyæna*, partially distended. *v.*, vulva; *a.*, anus; *x.*, arrow indicating bristle passed through orifice of duct of anal gland; *m.*, upper margin of anal pouch.
- B. The same cut away and seen from its inner aspect, with the principal glands dissected out on the right side. *ag.*, saccular or flask-shaped anal gland, with its upper wall cut away to show the orifice of the duct, with arrow indicating a bristle passed through it from the pouch; *sg.*, auxiliary glandular mass; *g/s.*, mass representing the glands enveloped in muscular and connective tissue and fat; *v.*, vagina in section; *r.*, rectum cut short and turned aside.

its way to the exterior along a narrow passage—the three passages converging and fusing to form a common duct opening to the exterior within the anal pouch. In the example of *Hyæna hyæna*, on the contrary, the normal anal gland is piriform and saccular and undivided, and opens at its narrow end by a small duct into the anal pouch. Close to its narrow end, externally and in front, there is a large, double, supplementary, glandular mass, which differs from the flask-shaped or piriform gland in containing no cavity and no definite duct. The secretion from this gland makes its way into the anal pouch by means of a number of minute orifices scattered over the wall of the pouch adjacent to the orifice of the duct of the piriform gland, which unmistakably corresponds to the normal anal gland of other Carnivora.

According to Murie, therefore, *H. brunnea* has a single pair of anal glands, each subdivided into three compartments, the passages from which join to form a common duct, and there are no accessory glands; whereas in *H. hyæna* there is a single pair of simple undivided anal glands, each being accompanied by an accessory mass of enlarged cutaneous glands opening into the anal pouch by numerous small apertures. Considering the tolerably close resemblance in other respects between the two species, this difference is full of interest.

Judging from Watson's account of these glands in *Crocuta crocuta* (P. Z. S. 1877, p. 369, pl. xli. and 1878, p. 416, pl. xxv.), there is also a single pair of piriform anal glands in the Spotted Hyæna, and these are connected along the lower portion of the pouch by a band of accessory glands opening into the pouch by a "line of perforations."

The very exact and detailed account given by Daubenton (Buffon's Hist. Nat. ix. pp. 287-288, pls. xxvii. & xxviii. 1761) of the glands in the Striped Hyæna agrees closely with my observations upon that species, except that in Daubenton's example the walls of the sack above the rectum were more highly glandular than in my example, and the lateral glandular mass does not appear to have been in any way subdivided.

Mivart (P. Z. S. 1882, pp. 198-199 and 201) summarised the facts recorded by Daubenton, Murie, and Watson by saying "There is an anal pouch with two (*H. striata* = *hyæna*) or three (*H. brunnea*) pairs of anal glands on each side of the rectum; and in one [*H. hyæna*], if not in both, species there is a transverse band of isolated [glandular] follicles at the bottom of the anal pouch" (pp. 198-199); and in *Crocuta* "there is but a single pair of anal glands, one on

each side of the rectum and a transverse band of follicles" (p. 201). Again, when comparing *Proteles* with the hyænas, he remarked: "There is an anal pouch with one pair of anal glands and a supra-anal band of follicles as in *Crocota*" (p. 203).

This summary is, however, not very happily worded. In the first place, "the transverse band of isolated follicles" referred to by Mivart in connection with *H. hyæna* appears to be the enlarged cutaneous glands generally distributed over the wall of the sack, between the flask-like glands, which Daubenton described. Judging from Flower's account of *Proteles* (P. Z. S. 1869, p. 495), which Mivart consulted, the corresponding area of the sack is very similarly glandular in that animal; whereas in *Crocota* alone does it seem that the enlarged glands form a definite and comparatively narrow transverse band running across the sack from one flask-like gland to the other. Watson, at all events, figures it so. In the second place, it is wholly misleading to say that *H. hyæna* has two pairs of anal glands. Like *Proteles* and *Crocota*, it has but a single pair, corresponding to the saccular anal glands of other Carnivora. What Mivart described as the second pair is the mass of greatly enlarged cutaneous glands of the anal sack, each with a pore to itself, opening upon the surface. These in the aggregate do not constitute an "anal gland," properly speaking, any more than the transverse belt in *Crocota* constitutes an anal gland. Therefore, since *Hyæna hyæna*, *Crocota*, and *Proteles* have but a single pair of anal glands, it is in the highest degree probable that *Hyæna brunnea* is similarly supplied, with the difference that each of these glands is tripartite instead of simple.

Probably the correct way of expressing the facts is to say that in the Hyænidæ and *Proteles* the normal pair of anal glands is retained, usually unmodified in form (*H. hyæna*, *Crocota*, and *Proteles*), but sometimes partially subdivided into three compartments (*H. brunnea*); and that, except in *H. brunnea*, certain cutaneous glands of the anal pouch adjoining the saccular glands are enlarged and active, and emit their secretion by separate pores into the anal pouch—the most highly developed of these form a great mass outside and above the saccular gland on each side (*H. hyæna*) or are arranged in a band between these glands (*Crocota*).

Enough has been said to show that the anal sack and glands of *Proteles* resemble those of the hyænas tolerably closely; but, since Flower's figure only displays the parts dissected from the dorsal aspect, I take this opportunity of

reproducing two sketches, made many years ago, of the anal disk as it appears from behind, when the tail is raised, and when dissected from the inside. From the first sketch it may be seen that when the disk is slightly spread, the orifice of the pouch is somewhat Y-shaped, the upright branch extending downwards towards the anus and the transverse branches obliquely upwards with their ends curving slightly downwards over the orifices of the anal glands. The disk is carried on a very distinct anal prominence, jutting backwards beneath the tail. A corresponding prominence is well marked in newly-born cubs of the Striped Hyæna, but is hardly so noticeable in the adult.

Fig. 4.

- A. Anal pouch of male *Proteles lagundii*, partially distended. *p.*, the pouch with Y-shaped crease, showing its deepest part; *o.*, orifice of right anal gland; *a.*, anus; *sc.*, scrotum.
- B. Median vertical section through the anal prominence. *t.*, tail raised; *p.*, anal pouch; *o.*, orifice of left anal gland; *gl.*, left anal gland; *m.*, muscle; *r.*, rectum; *a.*, anus.

The odour of the secretion of the anal glands in *Proteles* is much stronger and more repulsive than in the hyænas. According to a note I made at the time of dissection, the secretion has a "waxy consistency and smells like strong cheese blended with the scent of skunk or pole-cat."

The repulsiveness of the odour, to which several observers have testified, is interesting in connection with the comparative uselessness of the teeth of *Proteles* for defensive purposes; and, considered in connection with the record

that the animal discharges the secretion when attacked*, is suggestive of the use of the secretion for defence to make good the deficiency of the teeth in that respect.

Since the above-given account of the female *Hyæna hyæna* was written, a male of the same species, also from India, has come into my hands. Apart from its sexual organs it agrees with the female in all essential respects.

Although the external sexual organs of the male were described and illustrated by Daubenton, neither his description nor his figures are quite as detailed as is desirable. The following account of them may therefore prove useful :—

The scrotum (fig. 5, A, B, *sc.*), as in *Crocota*, is not a prominent or pendulous sack, but consists of an area of naked skin slightly raised above the level of the surrounding integument and marked with a median groove. It looks backwards just beneath the lower edge of the anal sack, and is separated therefrom by a hairy tract of skin. The perineal region beneath the scrotum inclines convexly forwards, and the prepuce forms an excrescence far in advance of the scrotum in approximately the same position on the prepubic area as in the Canidæ and Ursidæ and in some *Æluroids*, e. g. *Cryptoprocta* and *Paradoxurus*. Dorsally the prepuce is tied closely to the abdominal wall, so that the penis when retracted is in no sense pendulous (fig. 5, A, B, *pr.*).

When the skin of the prepuce is cut along its ventral side and turned over laterally, the glans penis, ovate in outline, is seen lying with it (fig. 5, F, *gl.*). The apex of the glans (fig. 5, C, G, *gl.*) is obliquely truncated, the inferior edge being more prominent than the superior, and has a shallow median orifice formed by a prominent rim of wrinkled or puckered skin, suggesting two labia or lips which can be pulled back on each side of the rigid central portion, and this is provided dorsally with a smooth low ridge, cartilaginous in consistency and ending in a point, beneath which is placed the aperture of the urethra (fig. 5, D, E). As Daubenton observed, the outer wall of the glans is beset with minute recurved spicules.

Owing to the elasticity of the skin of the prepuce (fig. 5, G) and of the tissue of the penis, the latter organ is capable of being drawn out, so that it projects about four

* Quoted by W. L. Selater, 'Fauna of S. Africa, Mammalia,' i. p. 83 (1900).

Fig. 5.

- A. Anal and genital area of *Hyæna hyæna*, ♂, the parts represented as lying in one plane. *t.*, root of tail; *as.*, anal sack, or pouch, with horseshoe-shaped orifice, closed and curving round the anus; *sc.*, scrotum; *pr.*, prepuce, the outline of the penis shown beneath the sparsely hairy skin.
- B. The same in profile view, showing the forward curvature of the penis. Lettering as in A.
- C. The penis unsheathed, but not quite fully stretched, its ventral side to the right. *gl.*, glans with its obliquely truncated or bevelled apex.
- D. Glans penis seen from the end, with its puckered labia partially separated to show the central portion with its median elevation.
- E. The same from the side with the labia pulled back below the median portion, with the median elevation apically overhanging the urethral orifice (*o.*).
- F. Prepuce cut down the median ventral line and the flaps turned aside to show the glans (*gl.*) *in situ*.
- G. The same, with the glans (*gl.*) pulled back and turned aside.

inches beyond the abdominal integument and is then pendulous. The preputial sack is then completely evaginated. When turgid and erected, the organ projects very much farther and resembles that of a horse in a similar condition (fig. 5, C).

I am unable to find any structural difference between the penis of *Hyæna* and that of *Proteles* as described by Flower, and can thus confirm his remark that, judging from Daubenton's account, the male organs in *Hyæna* "are an almost exact counterpart of those of *Proteles*." I have seen no examples of the male of *Crocota* enabling me to substantiate the small differences between the penis of that genus and *Hyæna*, pointed out by Flower on the evidence of a preparation in the Museum of the College of Surgeons.

Considering the opinion held by some authors that the relationship between the hyænas and mongooses is tolerably close, the difference in the length of the penis and the position of the prepuce in the two groups is remarkable. In the mongooses the prepuce is quite close to the scrotum, as in the Felidæ, and the penis is comparatively short, is provided with a bone, and has an elongated urethral orifice on the underside of the glans, which is simple in structure.

XXXIX.—*Edriophthalma from South America.*

By ALFRED O. WALKER.

THE Crustacea in the following list were received from :—

(A) Sr. Carlos Moreira, Director of the Laboratory of Economic Entomology in the National Museum of Rio de Janeiro, collected by him "on the shore of Capacabana near and outside the harbour of Rio de Janeiro." Of these II., III., VI., and IX. were in considerable numbers, and must have cost the collector not a little time and trouble, especially no. VI., if as active as most of the Talitridæ! The specimens are in excellent condition, reflecting great credit on Sr. Moreira, at whose request examples of each species have been sent to the British Museum (Nat. Hist.).

(B) Monsieur le Prof. Carlos E. Porter, Editor of the 'Chilian Review of Natural History,' Santiago, Chile, collected at Arica, Chile.