

known, at least not to me, and therefore I am not able to judge concerning the alleged affinity between *Ovibos* and *Budorcas*. So much may, however, be said, that if there should exist any great affinity between these forms, *Budorcas* cannot be a Sheep. It is to be regretted that the anatomy of the Antelopes is so incompletely known. When our knowledge of them becomes greater, then only will a satisfactory classification of the Cavicornia be possible. But, to judge from its soft anatomy, the Musk-ox is entitled to form a subfamily of its own, at least *pro tempore*, as well defined as the *Caprinæ* or the *Bovincæ*.

3. On a Species of Earthworm from Western Tropical Africa, belonging to the Genus *Benhamia*. By FRANK E. BEDDARD F.R.S., &c.

[Received January 30, 1900.]

A few weeks ago I received, through the kindness of Mr. Martin Woodward, a bottle containing some Earthworms which had been collected in Ashanti, and which I refer to two distinct species, both of which, so far as I can see, have already been characterized. As, however, I am able to extend our knowledge of at least one of these, I think it worth while to bring the notes of my dissections before the Society.

***Benhamia cæcifera* (W. B. Benham).**

Five years ago Dr. Benham described<sup>1</sup> a large Earthworm from the Gold Coast which he referred to the genus *Benhamia*, and to a new species of that genus named by him *B. cæcifera* on account of the numerous cæca with which the intestine was furnished. The larger specimen of those kindly presented to me by Mr. Woodward appears to belong to this species. Dr. Benham's example is in the collection of Earthworms in the British Museum; and—as it was the type of his new species—he was compelled to respect its integrity as much as possible. I have been under no such necessity, and am able therefore in a few points to supplement his description. In order to avoid useless repetition, I shall in the following notes upon this species abstain from commenting upon such facts as are, according to my own investigations, rightly described in Dr. Benham's memoir. I shall only deal with those matters which he was compelled to leave unnoticed, or as to which my own observations do not agree with his. The different state of maturity of our two examples enables me, moreover, to add facts which were evidently not apparent in Dr. Benham's specimen.

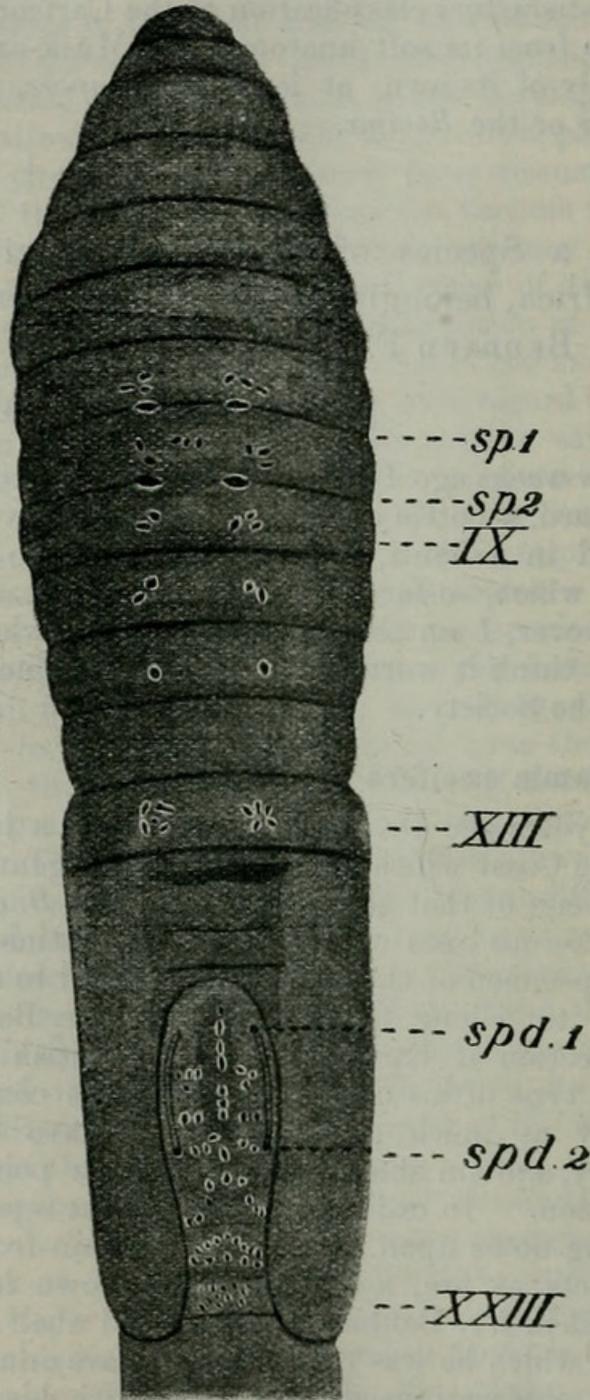
The worm was fully mature and 80 cm. long. Though much softened through imperfect preservation, a number of points were

<sup>1</sup> "On *Benhamia cæcifera*, n. sp., from the Gold Coast," *Quart. Journ. Micr. Sc.* vol. xxxvii. p. 103.

quite clear. But the state of the worm did not encourage me to pursue my studies into the microscopic structure.

As to external characters, all that I have to remark upon are the numerous copulatory papillæ. A distinguishing feature of this

Fig. 1.



*Benhamia cæcifera.*

Ventral surface of anterior segments: *sp.* 1 & 2, spermathecal pores;  
*spd.* 1 & 2, orifices of spermiducal glands.

species is, as Dr. Benham has pointed out, the great number and the somewhat peculiar form of these organs. But his figure does

not entirely agree with my observations. The very greatest care has often to be exercised in defining species from these very generally present organs of adhesion, which are often when discreetly used of great value in distinguishing the species of many genera. These papillæ, however, are of more than one kind. In the present species they are, as Dr. Benham has indicated and illustrated, of the nature of pits from the bottom of which a papilla may protrude. They resemble so far the genital papillæ of the *Perichæta*, *P. novæ britannicæ*<sup>1</sup>. But they are extraordinarily numerous—much more numerous in the specimen of *Benhamia* which I have studied than in that which forms the subject of Dr. Benham's paper. The accompanying drawing (fig. 1, p. 168) will illustrate their distribution on the surface of the body and save a full description. It will be seen from that drawing that they are as numerous in the region of the spermathecal apertures as in the neighbourhood of the male orifices. In Dr. Benham's specimen there were by no means so many of these sucker-like organs anteriorly as posteriorly. The orifices were quite small, and the fact that each was surrounded by a white circumference gave to them an exceedingly conspicuous appearance. In many cases they were crowded together upon a single segment. Elsewhere there were fewer on a single segment. I noticed no glands in the interior of the body which correspond to them. In this they differ from the (physiologically?) similar papillæ of some other earthworms.

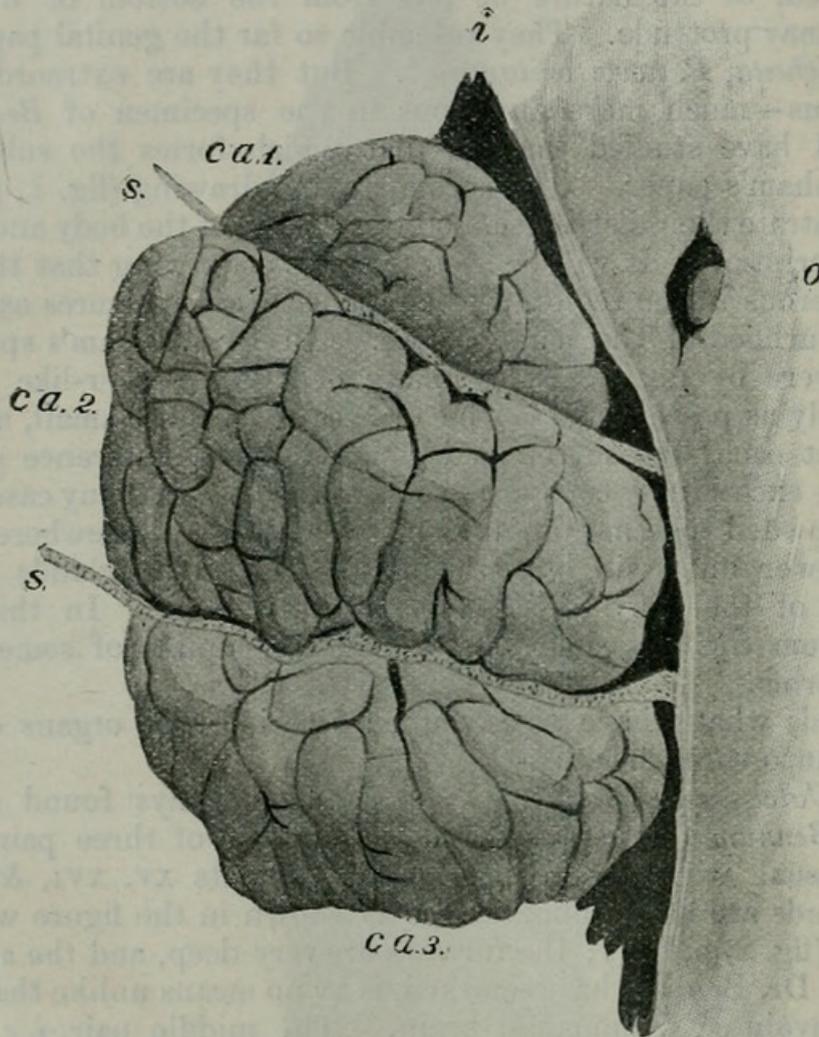
I divide what I have to say upon the internal organs of this species into three heads:—

(1) *Calciferous Glands*.—These glands, always found in the genus *Benhamia*, are present to the number of three pairs and, as is usual with the genus, lie in segments xv, xvi, & xvii. The glands are much lobulated, as is shown in the figure which I exhibit (fig. 2, p. 170); the furrows are very deep, and the appearance, as Dr. Benham has remarked, is by no means unlike that of a well-convoluted mammalian brain. The middle pair, *i. e.* those occupying segment xvi, are the largest of the three; the anterior pair are the smallest. An important anatomical fact respecting these calciferous glands is their opening into the œsophagus by a single orifice on each side, which is common to all three glands. The large size of the worm permitted this fact to be ascertained by simple dissection without any doubt; when the œsophagus was slit open the orifice was not only plainly visible, but the secretion of the glands in the form of a brownish powder was seen to escape like a cloud into the alimentary tube by one orifice only. The slightest pressure produced this result. The single orifice belonged to the anterior gland; the two following glands apparently communicated with that and with each other. Dr. Benham states of the calciferous glands that "each is . . . connected to the œsophagus by a short, narrow, but distinct duct."

<sup>1</sup> "On a Collection of Earthworms, &c.," Willey's Zool. Results, Cambridge, 1899.

There does indeed seem to be an attachment of each gland to the œsophageal wall, but it is rather of a membranous character; at the same time it is quite possible that the adhesion represents an embryonic duct which becomes occluded in the fully developed

Fig. 2.



*Benhamia cecifera.*

Calciferous glands (*ca. 1.*, *ca. 2.*, *ca. 3.*): *o*, their orifice in œsophageal wall; *s*, septa.

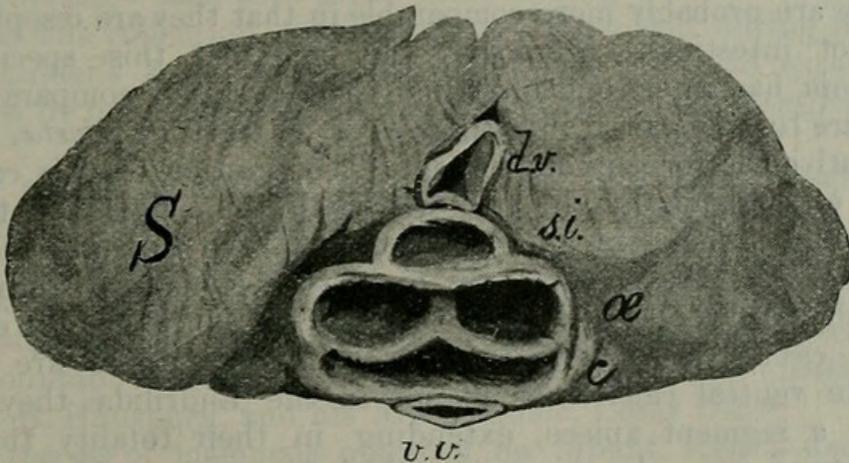
worm, like the ductus arteriosus in many mammals. The discovery of a single duct into the œsophagus which does duty for all three glands of one side of the body is not, however, my own, not even for this genus *Benhamia*.

Dr. Horst has recently given some account<sup>1</sup> of the anatomy of a Liberian species of this genus, *B. liberiensis*, which is characterized by precisely the same state of affairs; but it is not by any means universal in the genus *Benhamia*; for in the same memoir which

<sup>1</sup> "On two new *Benhamia* Species from Liberia," Notes Leyd. Mus. xvii. p. 21.

has just been referred to, Dr. Horst expressly states of *B. stampflii* that the three glands of each side open separately into the œsophagus. I have since examined a number of small species of *Benhamia* coming from various localities—East Indian, West Indian, and African; and in these I find that there is but one œsophageal duct for the three calciferous glands of each side, and that each gland is in communication with its neighbour. I have also to add that in *Millsonia rubens* the same thing occurs, as far as I could make out by a dissection. This is an additional point supplementary to those enumerated by Dr. Horst in which this worm agrees with *Benhamia*. I may observe incidentally, while mentioning this latter species, that I am quite in accord with Dr. Michaelsen<sup>1</sup> in regarding my *Millsonia rubens* as congeneric with his *Dichogaster minus*<sup>2</sup>, since he has discovered the numerous intestinal cæca of the latter species. I am not, however, convinced of their specific identity. For in the original description there is mentioned a tract lying round the male pores which remains free of modification into the more glandular epidermis of the clitellum; I did not find this in my single example of *M. rubens*. Nor can I see any trace of diverticula to the spermathecæ. Still the generic identity being established, I must drop *Millsonia* for the present species, though I propose to retain it for *Millsonia nigra*<sup>3</sup>.

Fig. 3.

*Benhamia cæcifera.*

Septum with intestine &c. cut across: *d.v.*, dorsal vessel; *s.i.*, supra-intestinal; *v.v.*, ventral blood-vessel; *œ*, œsophagus; *c*, cæcum; *S*, septum.

(2) *Œsophageal Cæcum*.—One feature in the anatomy of the œsophagus has not been noted by Dr. Benham.

Nearly opposite to the entrance of the ducts of the calciferous glands, the œsophagus gives off a single forwardly running cæcum

<sup>1</sup> "Terricolen von verschiedenen Gebieten der Erde," Mitth. nat. Mus. Hamburg, xvi.

<sup>2</sup> "Terricolen der Berliner zoologischen Sammlung," Arch. Naturg. lvii. p. 212.

<sup>3</sup> "On two new Genera of Earthworms from Western Tropical Africa," P. Z. S. 1894, p. 382.

from its ventral side. The diameter of this cæcum is nearly, if not quite, equal to that of the œsophagus itself. The accompanying drawing (fig. 3, p. 171) shows the relations of this cæcum during the course of the œsophagus. The drawing represents a part of the intersegmental septum dividing segments XII/XIII cut out of the body and viewed from behind. Above are the dorsal (*d.v.*) and supra-intestinal (*s.i.*) blood-vessels, the latter of rather greater calibre than the former. The œsophagus ( $\alpha$ ), and the cæcum (*c*), as will be seen, look like a single subdivided tube, the former having a light fold projecting into its interior from below, not to be compared therefore to a typhlosole. Below again to this comes the ventral blood-vessel (*v.v.*) This œsophageal cæcum passes forward as far as to the XIth segment, where it appears to end without any diminution of calibre.

There are two structures among Earthworms with which this median ventral œsophageal cæcum may perhaps be compared. I mention them in order of probability. Dr. Benham described in *Perichæta sedgwicki*<sup>1</sup>—and I have been able to confirm<sup>2</sup> his statement—that instead of the usual pair of cæca found in the species of this genus, there was a single median ventral cæcum, like the paired ones in general appearance but not visible until the gut was lifted up.

More comparable, as I think, are the ventral “Chylustaschen,” as they have been termed by Dr. Michaelsen, of the Eudrilidæ.

They are probably more comparable in that they are œsophageal and not intestinal. Moreover, the fact that this species of *Benhamia* has numerous intestinal cæca, precisely comparable in structure to the paired intestinal cæca of most *Perichæta*, seems to negative the former comparison. The position of this cæcum, on the other hand, fits in very well with the suggestion that it represents, perhaps in an incipient form, the unpaired ventral glands of *Eudrilus*, *Polytoreutus*, and other genera of Eudrilidæ. One difficulty in the way of this comparison is the greater extent of the cæcum in this *Benhamia*; even where there are three separate ventral calciferous glands in the Eudrilidæ, they only occupy a segment apiece, extending in their totality through segments IX–XI. In the worm which forms the subject of the present remarks the cæcum lies in segments XI–XV. On the hypothesis, however, which is suggested, the differentiation of a single cæcum might easily result in the shortening of the total area. The intercommunication of two of these glands in *Polytoreutus* (as an occasional variation) is an argument in favour of the comparison urged here. In this case the unpaired ventral cæcum of *Benhamia cæcifera* will bear the same kind of relation to the ventral unpaired glands of many Eudrilidæ that the single diverticulum of the enteron of *Amphioxus* does to the complex liver of higher vertebrates. On the theory that the terrestrial

<sup>1</sup> Journ. Linn. Soc., Zool. xxvi. p. 201.

<sup>2</sup> “On a Collection of Earthworms from New Britain &c.,” Willey’s Zool. Results, pt. ii. p. 184.

Oligochæta are related to the marine Polychæta, and in the position of forms to be derived from them, it may be possible to compare this cæcum with the siphon of the Capitellidæ.

(3) As to the *Reproductive Organs*, I have but little to add to Benham's account. As he has observed, the anterior pair of spermathecæ are the smaller; but I also found that corresponding to this the posterior pair of spermiducal glands were smaller than the anterior pair of those glands. I could find no diverticulum to either pair of spermathecæ, and no penial setæ connected with the male pores.

4. List of Mammals obtained by Mr. H. J. Mackinder during his recent Expedition to Mount Kenya, British East Africa. By OLDFIELD THOMAS.

[Received February 15, 1900.]

The Mammal-fauna of Mount Kenya, the highest mountain in British East Africa, has hitherto been practically unknown, for although Dr. Gregory collected a few specimens during his ascent in 1893, these have not hitherto been satisfactorily determined. It has therefore been with great interest that I have worked out the excellent collection obtained on the mountain during Mr. H. J. Mackinder's recent successful expedition there, an expedition of which he has himself given an account before the Geographical Society<sup>1</sup>.

The actual collecting was done by Mr. Mackinder's two assistants, Messrs. Ernest Saunders and C. Camburn, and much credit is due to them for the way in which they have succeeded in making so admirable a collection under somewhat difficult circumstances. In addition, some of the larger animals, including the Mountain Dassies, were shot by Mr. Mackinder's colleague, Mr. C. B. Hausburg, and his Alpine guide, Cesar Ollier.

The species of mammals obtained on Mount Kenya itself are fourteen in number; and I have also added a list of those collected at Nairobi, on the Uganda Railway, where the party remained some little time. The whole series of skins has been acquired by the British Museum.

Of the special Mountain-mammals the most interesting is a new Dassy, of a rock- and not forest-inhabiting group, which appears to be isolated above the forest zone at 12,000-15,000 feet. A second new Dassy, of the forest group, comes from 8000 feet.

With the help of the fine collection of East African mammals presented to the National Museum by Mr. F. J. Jackson, and worked out by Mr. W. E. de Winton, the determination of the present series has presented few difficulties, and I must record my

<sup>1</sup> See Geogr. Journ. xv. p. 453 (1900).



Beddard, Frank E. 1900. "On a Species of Earthworm from Western Tropical Africa, belonging to the Genus *Benhamia*." *Proceedings of the Zoological Society of London* 1900, 167–173.

<https://doi.org/10.1111/j.1096-3642.1890.tb01713.x>.

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