Vertebræ fully ossified, cervicals opisthocœlous [1], dorsals biconcave; no hypapophyses between the dorsal vertebræ; limb-bones with condyles; humerus with ectepicondylar foramen or groove..... 2. *Proterosauridæ*.

Subord. II. RHYNCHOCEPHALIA VERA.

Each transverse segment of the plastron composed of three pieces, a median angulate and a pair of lateral. Pubis and ischium elongate and fifth metatarsal modified, as in the Lacertilia.

A. Nasal openings distinct. Mandible with coronoid process, the rami not united by suture. Vertebræ deeply biconcave.

Humerus with ectepicondylar and entepicondylar foramen; ribs with uncinate processes; all the vertebræ with intercentral hypapophyses ..... 3. *Hatteriidæ*.

Humerus with entepicondylar foramen; ribs without uncinate processes; no hypapophyses between the dorsal vertebræ..... 4. *Homœosauridæ*.

B. Nasal opening single. Mandible without coronoid process, the rami united in a solid symphysis. Vertebræ fully ossified, feebly biconcave; no hypapophyses between the dorsal vertebræ. Humerus with ectepicondylar foramen or groove.

Snout short, ending in a beak ..... 5. *Rhynchosauridæ*.

Snout Crocodilian in shape, with toothed præmaxillaries ..... 6. *Champsosauridæ*.

The first family comprises a single genus, *Palæohatteria*, Credn.; the second, *Proterosaurus*, H. v. Mey., and perhaps *Cadaliosaurus*, Credn., and *Aphelosaurus*, Gerv.; these four types are Permian. The third family is for the recent *Sphenodon*, Gray; the fourth contains the Jurassic *Homœosaurus*, H. v. Mey., *Sapheosaurus*, H. v. Mey., and *Pleurosaurus*, H. v. Mey.; the fifth the Triassic *Rhynchosaurus*, Ow., and *Hyperodapedon*, Huxley; the sixth and last the Upper Cretaceous and Lower Eocene *Champsosaurus*, Cope.

6. Preliminary Account of an Earthworm from West Africa referable to a new Genus. By FRANK E. BEDDARD, M.A., F.R.S.E., Prosector to the Society.

[Received February 17, 1891.]

The investigations of Rosa [2], Michaelsen [3], and myself [4] have

[1] I think, after careful examination of the type specimen in the College of Surgeons, that the cervical vertebræ were opisthocœlous in *Proterosaurus*, as described by Seeley; that hypapophyses were absent, except between the anterior-most cervical vertebræ; and that the long, slender cervical ribs were forked proximally.

[2] "Lombrichi dello Scioa," Ann. Mus. Civ. Genova, vol. vi. (1888).

[3] "Beschreibung der von Herrn Dr. Franz Stuhlmann im Mündungsgebiet des Sambesi gesammelten Terricolen," Jahrb. Hamb. Wiss. Anstalt, Bd. vii. (1890); and "Oligochæten des naturhistorischen Museums in Hamburg, IV.," *ib.* Bd. viii. (1891).

[4] "Preliminary Note on a new Earthworm belonging to the Family Eudrilidæ," Zool. Anz. no. 346 (1890); and "Preliminary Note upon *Heliodrilus*, a new Genus of Eudrilidæ," *ib.* No. 349 (1890).

shown that the Earthworm fauna of tropical Africa is very distinctive of that region. A large number of the species that have been described belong to a series of remarkable new genera of the family Eudrilidæ; and these have been found both upon the East and the West coasts, though at present the species and the genera are confined to one side of the continent or the other. Besides the Eudrilidæ, representatives of the genus *Acanthodrilus* have been met with and a few other forms.

The following is a complete list of Central and South-African Earthworms, excluding only representatives of the genera *Lumbricus* and *Allolobophora*, which are probably not indigenous except in the North; those that are queried require further identification.

(1) **Eudrilus** *jullieni*, Horst. Liberia[1].
(2) *Teleudrilus ragazzii*, Rosa. Scioa.
(3) *Nemertodrilus griseus*, Michaelsen. Quilimane.
(4) *Libyodrilus violaceus*, nov. gen. et n. sp. Lagos.
(5) *Polytoreutus cæruleus*, Mich. Mainland opposite Zanzibar.
(6) *Stuhlmannia variabilis*, Mich. Mainland opposite Zanzibar.
(7) *Preussia siphonochæta*, Mich. Barombi, Cameroons.
(8) *Paradrilus rosæ*, Mich. Barombi, Cameroons.
(9) *Eudriloides gypsatus*, Mich. Zanzibar.
(10) *Eudriloides parvus*, Mich. Quilimane.
(11) *Hyperiodrilus africanus*, mihi. Lagos.
(12) *Heliodrilus lagosensis*, mihi. Lagos.
(13) *Pygmæodrilus quilimanensis*, Mich. Quilimane.
(14) **Acanthodrilus** *capensis*, mihi. Cape.
(15) *Acanthodrilus* (*Benhamia*) *stuhlmanni*, Mich. Quilimane.
(16) *Acanthodrilus* (*Benhamia*) *schlegelii*, Horst. Liberia.
(17) *Acanthodrilus* (*Benhamia*) *büttikoferi*, Horst. Liberia.
(18) *Acanthodrilus* (*Benhamia*) *beddardi*, Horst. Liberia.

[1] This species has been recently described by Dr. Horst ("Sur quelques Lombriciens Exotiques appartenant au Genre *Eudrilus*," Mém. Soc. Zool. France, t. iii. p. 223) from Liberia, and has been described by Dr. Michaelsen as occurring in Barombi. From Horst's description it is difficult to separate the species from those which have now been recorded from New Caledonia, Martinique, Rio Janeiro, Bahamas, British Guiana, New Zealand; I can add St. Helena as a new locality. Prof. Lovén has kindly exchanged with me specimens of some of the Earthworms described five-and-twenty years ago by Kinberg; among them was a specimen of Kinberg's "*Lumbricus eugeniæ*." His definition of that species was as follows:—"Lobus cephalicus terminalis, superus reticulatus, partem mediam tertiam latitudinis, partem dimidiam longitudinis, segmenti buccalis occupans; segmentum buccale lateribus et primum corporis longitudine æquali; cingulum e segmentis 13–17 l. 12–14 conjectum; tubercula ventralia duo, inter segmenta 16–17 l. 15–16; segmenta 180; longitudo 180 mm." It is clear from the position of the clitellum that this species could not be a *Lumbricus*. Having dissected it, I find that it is a *Eudrilus*, though I have not been able to find any characters which distinguish it as a species. This genus even now requires revision; it occurs in so many and such widely separated localities that the forms must probably differ specifically.

(19) *Acanthodrilus* (*Benhamia*?) *scioana*, Rosa. Scioa.
(20) *Acanthodrilus* (*Benhamia*) *rosea*, Mich. Gaboon.
(21) *Acanthodrilus* (*Benhamia*) *affinis*, Mich. Quilimane.
(22) *Acanthodrilus* (*Benhamia*) *tenuis*, Mich. Barombi.
(23) **Perionyx**, sp., Mich. East Africa.
(24) *Callidrilus scrobifer*, Mich. Quilimane.
(25) *Microchæta rappii*, mihi. Natal.
(26) *Microchæta beddardi*, Benham. Natal.
(27) *Siphonogaster ægyptiacus*, Levinsen. Banks of Nile.
(28) *Siphonogaster millsoni*, mihi. Yoruba-land.
(29) *Digitibranchus niloticus*, Levinsen (? = *Alma nilotica*). Banks of Nile.
(30) **Perichæta** *capensis*, Horst. Cape of Good Hope.
? (31) *Lumbricus capensis*, Kinberg. Cape [1].
? (32) *Geogenia natalensis*, Kinberg. Natal [2].
? (33) *Hegesipyle hanno*, Kinberg. Natal [3].

It is clear therefore that the Ethiopian region is very well marked as a region by its Earthworm fauna, but that its resemblances are with Patagonia and New Zealand as regards the prevalence of Acanthodrilidæ. [In this list those genera which also occur outside of the Ethiopian region are printed in larger type.]

The specimens of *Libyodrilus violaceus* I owe to the kindness of Mr. Alvan Millson, Assistant Colonial Secretary at Lagos, West Africa; Mr. Millson was so good as to bring a large number of living specimens with him in January of the present year. The living worm is of a uniform greyish-purple colour; it is not active in its movements; when killed in spirit the worms generally protruded the buccal cavity, which, from its rich blood-supply, appeared bright red. One of the characteristics of the genus *Perichæta* is that the buccal cavity is continually protruded and retracted while the animal is in motion; but the protruded portion of the alimentary tract is of a greyish colour, which indicates either the thickness of its walls or

[1] Several other species have been described by Kinberg, but they cannot at present be identified, and I do not therefore think it worth while to mention them in this list. I mention *Lumbricus capensis*, because it is one of those species which I have been able, through the kindness of Prof. Lovén, to examine for myself. This examination, however, has not led to any important results; the specimen was very much softened—a fate which is apt to overtake Earthworms that have not been properly preserved in the first instance. I have found out that *Lumbricus capensis* is *not* a *Lumbricus* at all; Kinberg puts it in that genus on account of the supposed paired character of the setæ. The setæ, as a matter of fact, are not paired; the setæ of each segment are placed far apart from each other, so that from Kinberg's own point of view this species should not have been included in the genus *Lumbricus*. I find too that the gizzard is situated anteriorly, in or about the eighth segment. The species is very possibly an *Acanthodrilus*, but I could not detect any of the other organs of the body, and cannot therefore say more than that it is not a *Lumbricus*.

[2] Perrier (Comptes Rendus, t. cii.) regards this as a distinct generic form; but that was before the various papers on the Eudrilidæ of Africa were published.

[3] This, according to Perrier (*loc. cit.*), is an *Acanthodrilus*.

its deficiency in blood-capillaries—perhaps both; the extreme vascularity and the thinness of the walls of the buccal cavity in *Libyodrilus* perhaps account for the fact that it is not usually (? ever) protruded during locomotion.

The *setæ* are strictly paired.

There are no *dorsal pores*.

The *clitellum* occupies segments 15 and 16 (in some specimens a part of segment 14 also), and is complete, that is it entirely encircles the body.

The *male reproductive pore* is single and median, upon the border line between segments 17 and 18. The orifice is situated upon the summit of a conspicuous elevation of a yellowish colour.

The *spermathecal* pore is also median and unpaired; it lies on segment 13 between the ventral pairs of setæ.

The *oviducal pores* occupy what is at present a unique position among Earthworms, viz. on segment 15. Thus another of the characters supposed to distinguish the group Terricolæ no longer holds universally.

The chief characteristic of the family Eudrilidæ is the remarkable development of cœlomic sacs which enclose the different parts of the female reproductive organs.

Libyodrilus, though in some respects approaching *Hyperiodrilus*, offers a new type. A large sac occupies the dorsal region of segments 14–18; it is closely adherent to the dorsal vessel and œsophagus; this sac gives off three pairs of approximately corresponding diverticula; anteriorly it divides into two, and embraces the œsophagus as in *Hyperiodrilus*; the two parts are reunited immediately below the œsophagus and run forwards and downwards until they reach the nerve-cord; here they again divide and reunite upon the ventral side of the nerve-cord, to open by a single median orifice upon segment XIII.

The *oviduct* passes from this sac on each side straight to its external orifice. In transverse section it may be seen that the oviducal funnel opens into the interior of an egg-sac (=receptaculum ovorum, *auctorum*) which is quite independent of the large spermathecal sac, though lodged within it.

The *ovaries* are only visible in immature worms; they occupy the usual position in segment XIII.

The *sperm-ducts*, which open by ciliated funnels into segments X. and XI., opposite to the *testes*, retain their distinctness until the point of opening into the atria.

The *atria* have a very thick muscular coat; they open by a common orifice on to the boundary line between segments XVII. and XVIII.; each is provided with a sac containing a single short penial seta, not ornamented, and ending in a blunt rounded free extremity.

The *nephridia* are paired, but are connected with an integumental network of tubules opening on to the exterior by numerous pores.

The *alimentary tract* consists of the usual divisions; the œsophagus has no calciferous glands nor ventral pouches ("Chylustaschen" of Michaelsen), which are so characteristic of the Eudrilidæ. There

are three gizzards, which, like those of *Heliodrilus* and *Hyperiodrilus*, are situated at the junction of the intestine and œsophagus; each gizzard occupies a single segment. These three genera, which belong to Perrier's Intraclitellian group, show that one of the characters made use of to distinguish that group from the Anteclitellians no longer holds. M. Perrier [1] writes:—"Chez les *Lombriciens anteclitelliens* que nous avons étudiés, le gésier s'est toujours trouvé placé *en arrière des organes génitaux* et de leurs organes accessoires, en arrière aussi des anses contractiles ou cœurs latéraux de l'appareil circulatoire. Dans ces Vers, l'œsophage est d'ailleurs très-allongé et la ceinture rejetée relativement très-loin en arrière; quelquefois presque au milieu du corps.

"Au contraire, chez tous les Lombriciens intra- ou postclitelliens, le gésier est placé *en avant des testicules et des ovaires*, c'est-à-dire en avant des *organes essentiels* de la génération. Il est également *en avant des centres d'impulsion du sang*, que ce soient des cœurs dorsaux impairs, comme chez l'*Anteus*, ou des cœurs latéraux, comme chez les autres Lombriciens." Since Dr. Horst has discovered [2] an Intraclitellian earthworm, *Glyphidrilus*, in which the clitellum occupies the "anteclitellian" position, viz. from segment 23–31, it is impossible any longer to retain the group "Anteclitelliens."

It is clear, from this brief account of the salient features in the structure of *Libyodrilus*, that it forms a quite new generic type, concerning the particular affinities of which I do not for the present offer any suggestion.

7. On a Functional Ductus Botalli in *Nycticorax violaceus* and *Dafila spinicauda*. By Frank Finn, B.A., late Scholar of Brasenose College, Oxford. (Communicated by F. E. Beddard, F.Z.S., Prosector to the Society.)

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In his memoir on the "Development of the Branchial Arches in Birds," published in the Transactions of the Royal Society of London for 1888, Dr. J. Mackay has described and figured an abnormality which he met with in the dissection of a Guillemot (*Lomvia troile*). This consisted in the existence of "the remains of the dorsal connection between the third and fourth arches upon the right side," "as a distinct cord passing between the common carotid artery and the descending portion of the aortic arch." Dr. Ferdinand Hochstetter also records two obliterated ductus botalli in *Aquila nævia* and *Circus cineraceus* ("Ueber den Ursprung der Arteria subclavia der Vögel," Morph. Jahrb. xvi. p. 484, 1890).

[1] "Mémoires pour servir etc.," Nouv. Arch. Mus. t. viii. p. 156.
[2] Nederl. Dierk. Vereen. Verslag. op. d. Vergad. v., 26 Oct. 1889.