

# HIRUDINEA

BY

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## INTRODUCTION

The *Hirudinea* collected by Mr. G. F. DE WITTE, from 1933 through 1935, were sent to the author for study and identification. The material, consisting of 27 lots, was taken at altitudes ranging from 450 to 2,075 meters. Despite the meagerness of the collection and the fact that nearly all specimens were taken in the Parc National Albert, it is of considerable interest.

A locality within brackets indicates the place is not within the boundary limits of Albert National Park.

Although several of the earlier hirudinologists, viz., BLANCHARD, DEQUAL, HARDING, and JOHANSSON, have been concerned with leeches of east Africa, it remained for AUGENER (1936) and MOORE (1939), especially the latter, to treat the synonymy and place the nomenclature on a satisfactory basis. The meticulously done descriptions of MOORE, based on both external and internal morphology, involving painstaking dissections of the reproductive system and frequently serial sections, represent an example that future workers might follow with profit. If the description of a new species is to meet the requirements for a critical comparison of any two species, it should include an account of the principal features of the internal as well as the external morphology. Otherwise, it will be without value to all except the perpetrator.

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A much more ambitious undertaking but far from satisfactory, culminating in several short papers dealing with the African leech fauna, chiefly from the Belgian Congo, was that of SCIACCHITANO (1935-1941). He named no less than eight genera and 59 species and subspecies as new. Unfortunately, however, the accompanying figures and the « descriptions » are so sketchy and undiagnostic, consisting in most cases chiefly of a brief statement concerning the general color and size, that most if not all are unrecognizable and regretfully must be regarded as *nomina nuda*.

In view of the possible variations resulting from different degrees of contraction and distention (due to methods of killing and fixation, and recency of feeding), from age of the specimen, from color changes (due partially to action of the chromatophoral pigments, the kind of preserving solution employed, the length of time in the preservative), or from undetermined factors (possibly hereditary) that are accepted as having a role in determining the external morphological characteristics of leeches, the exactness of measurements and color descriptions are without the taxonomic validity assigned them in some other groups. They are included, however, primarily for comparative purposes when additional specimens are studied.

The system of segmentation and annulation followed herein is that proposed in 1900 by CASTLE and by MOORE simultaneously but independently and based on different material, and adopted almost without exception by contemporary students of leeches. They concluded from their studies that if the ganglion is the important element of a segment, as had already been established, it was only natural to expect all its nerves to supply that segment. Accordingly they decided that the anterior or first pair of nerves went to the first or anterior annulus, the second nerve to the second annulus, which contains the ganglion and bears the dorsal sense organs, and the third nerve to the third or posterior annulus.

Although the number of segments is thirty-four, designated by the Roman numerals I through XXXIV, in all leeches that have been studied, the number of annuli varies in different species and in different segments of any given species. Since the number of annuli per segment is reduced in the anterior and the posterior regions, the number comprising the mid-body segments is taken as typical for the species. As in most species of leeches, the species herein concerned have either three primary or one primary and four secondary annuli in a complete segment. The triannulate segment, which is regarded as primary, may undergo three successive divisions, resulting in secondary, tertiary and quaternary annuli. The four orders are indicated by the symbols *a*, *b*, *c* and *d* respectively, and the annuli in each order are numbered from anterior to posterior. Thus the complete segment of *Glossiphonia*, *Placobdella* is expressed as  $a1+a2+a3$ , of *Hirudo*, *Limnatis* and most other quinquannulate genera as  $b1+b2+a2+b5+b6$  (since only the primaries,  $a1$  and  $a3$  have undergone division).

When the furrow between two successive annuli is less than one-half

as deep as the neighbouring furrow(s), and when it is not extended across the entire dorsal or ventral half of the circumference, the annulus is regarded as being in the incipient stage, and is designated by the symbols of the incipient annuli enclosed in parentheses. Thus the enlarged first annulus of IV of *Salija perspicax* is expressed as ( $a1+a2$ ). The segment-annuli counts of different workers are not infrequently in disagreement, due to whether the division(s) of an annulus is considered only incipient, or differentiated and worthy of being designated by its specific symbols.

The relative sizes or the ratios of the lengths of different annuli compared may be expressed in the formulæ by adding the appropriate mathematical symbols : =, >, <. Thus, if the first primary annulus of the seventh segment is less than the third primary annulus of that segment, it would be expressed in formula as : VII  $a1 < VII a3$ . The same system is used to designate furrows also by writing the symbols of the bounding annuli in fractional form separated by a diagonal line, e.g., XI  $b5/b6$  indicates the position of the  $\sigma$  gonopore in *Limnatis fenestrata*.

This system of segmentation-annulation terminology, proposed by MOORE (1898), is employed generally by hirudinologists. For a much more detailed explanation of the scheme, one is referred to MOORE (1927 : 1ff.).

The collection comprises three families, (*Glossiphoniidæ*, *Hirudidæ*, *Erpobdellidæ*)<sup>(2)</sup> and represents eight species, belonging to five genera. A new species belonging to the genus *Limnatis* is described. For the new species a holotype has been designated and is deposited in the « Institut des Parcs Nationaux du Congo Belge (Bruxelles) ». Additional specimens of the new species are regarded as paratypes and these are deposited in the « Institut des Parcs Nationaux du Congo Belge » and in the United States National Museum. Specimens of known species are deposited in the « Institut des Parcs Nationaux du Congo Belge », and, in so far as available, specimens of these have also been added to the United States National Museum collections. In order that the locality data may be specifically recorded for each species, the transcripts from the labels, supplemented by other pertinent locality information furnished by the « Institut des Parcs Nationaux du Congo Belge », are included under *Occurrence*. Unfortunately, no ecological data are available.

The list of localities from which leeches were collected include Vitshumbi, Kalinga, Kalondo, Katanda, Magera, [Monga], Mushumangabo, Ngesho, and Zulu, or N'Zulu.

(2) Some authors have followed AGASSIZ (1846, *Nomenclatoris zoologici index universalis*, Soloduri, V, p. 179) and BLANCHARD (1894, *Boll. Mus. Zool. Anat. Comp. Torino*, IX, 51), who changed de BLAINVILLE'S (1818, in DE LAMARCK, *Histoire naturelle des animaux sans vertèbres*, Paris, V, 296) original spelling of the generic name *Erpobdella* to *Herpobdella*. Since this is inadmissible under Art. 19 of the International Rules of Zoological Nomenclature, the original spelling is adopted herein. Further, *Erpobdella* being the genotype of the family, the latter should be *Erpobdellidæ*.

## Order RHYNCHOBDELLÆ.

## Family GLOSSIPHONIIDÆ.

Genus **HELOBDELLA** R. BLANCHARD, 1896.**Helobdella conifera** (MOORE, 1933).

*Glossiphonia conifera* MOORE, Jour. Linnean Soc., Vol. XXXVIII, 1933, pp. 297-298.

*Helobdella conifera* AUTRUM, Klassen und Ordnungen des Tierreichs, Bd IV, Abt. 3, Buch 4, 1936, p. 30.

*Helobdella conifera* MOORE, Proc. Acad. Nat. Sci. Philadelphia, Vol. XC, 1939, pp. 300-302, Pls. 25 and 26.

Form broad ovate, strongly depressed, tapering to the small head, broadly rounded posteriorly. Anterior sucker small, with lip broadly rounded and closely studded around the margin with goblet cells; its cavity rather deep, with well-marked rim all around. Mouth or proboscis aperture a conspicuous pore just anterior to center of oral sucker in segment III, ventral to the eyes. Eyes, one pair on the posterior half of the large anterior annulus of III. They are large, simple, separated by about 1.5 times their diameter and directed anterolaterally.

Cutaneous papillæ are well developed on the dorsum of sensory annuli (*a2*) only. They form five longitudinal series, arranged as follows : a single median, paired outer paramedians and intermediates, separated respectively by six and five muscle bands, with four or five more between the intermediates and the marginals of the body and two in each of the papillæ lines, making a total of 40 or 42. The median and paramedian séries begin on VIII or IX and continue through XXV. The intermediate series is very incomplete, being represented by small and inconspicuous papillæ on only a few segments in the posterior middle of the body. Papillæ are distinct low cones containing much black pigment, very prominent in the median and the paramedian series, on which they increase in size anteroposteriorly until they occupy the full length of the annulus. The series are not strictly linear, as papillæ frequently lie to one side or the other of the middle line. Gonopores obscure, concealed in the deep furrows between the annuli. The ♂ gonopore appears to be at XII *a1/a2*, the ♀ gonopore at XII *a2/a3*; there may even be a common gonopore. Due to the poor condition of the material, the position of the gonopores is somewhat uncertain.

Segments I and II are uniannulate and biannulate respectively, the separating furrow being shallow, and the broadly rounded anterior rim of the lip of oral sucker being separated from I by a shallow furrow.

III biannulate,  $(a1\ a2) > a3$  with a faint  $a1/a2$  furrow. Segment IV biannulate, with both  $a1/a2$  and  $a2/a3$  better developed than on III but becoming obsolete at the margins, where the segment merges with V to form the buccal ring. Segment V triannulate dorsally, biannulate ventrally where  $(a1\ a2)$  forms the post-buccal ring, the total length of the annulus being slightly  $<$  than IV. Segment VI is the first completely triannulate both dorsally and ventrally,  $a1 < a2 < a3$ . Segments VII through XXIV triannulate; on pregenital somites  $a2$  is generally more elevated and projects slightly above the general surface, especially at the margins, while posterior to the gonopores  $a3$  is usually longer and faintly biannulate; on XXIV  $a3$  is reduced,  $a1 = a2 > a3$ . Segment XXV biannulate,  $(a1 + a2) > a3$ ,  $a1$  being incipient at the margins, completely merged with  $a2$  in the middle. Segment XXVI biannulate, with no trace of  $a1$ , and  $a3$  very small. Segment XXVII uniannulate and partly including the anus. The dimensions of the largest specimen in millimeters are : Length 6,9; maximum width 2,7; width of oral sucker 0,7; width of anal sucker 1,3.

Proboscis relatively short and stout, nearly cylindrical but slightly tapered to the free end, which bears a circle of 12 small, rounded papillæ. Salivary glands extensively developed, forming a loose cluster extending along each side from segment IX through XVII, their ducts being aggregated into a pair of stout bundles which empty into the esophagus in XIII. Gastric cæca five pairs arising in XIV through XVIII, small and simple, slightly bulbous and bilobed at the ends; the paired post-cæca arising in XIX and reaching to XXV, long and reflexed, with a stout, rounded, lateral lobe in each segment from XX through XXIV. Intestinal cæca, four pairs, in XX through XXIII, short and simple.

*Occurrence* : to the north of Rutshuru, on the Rutshuru river, alt. 950 m, V.1935. Three much curled and contracted specimens.

Genus **PLACOBDELLA** R. BLANCHARD, 1893.

**Placobdella pulchra** MOORE, 1939.

*Placobdella pulchra* MOORE, Proc. Acad. Nat. Sci. Philadelphia, Vol. XC, 1939, pp. 314-316, Pl. 25.

Slender lanceolate-ovate outline with the head fairly well marked off by a slight nuchal constriction; only moderately depressed, with flat venter, slightly arched dorsum and medium sharp margins. Mouth or proboscis pore a minute pore at the extreme anterior tip of sucker rim in segment I. Eyes, one pair close together or united, on segment III, in a colorless area, but, owing to the shortness of I and II, very far forward, close to the apex. Papillæ are all very small and clearly visible only in the posterior half; each annulus bears on the dorsum a transverse row of 19 to 23, all of the same

size and form. Sensillæ are conspicuous on the head segments and less so, but quite evident, throughout the body. They are slightly elevated and are clearly distinguished from the papillæ as colorless dots in small brownish-yellow spots. Gonopores : ♂ at XI/XII, a conspicuous round orifice, the ♀ a very minute pore at XII  $a2/a3$ . Nephropores on the anterior margin of  $a2$  from VIII through XXIV, except in the genital region. Anus behind XXVII, cutting into its posterior half. Posterior sucker of moderate size, flat and discoid, largely exposed, with well defined peduncle. The single specimen in the collection measures in mm : Length 9.9; maximum width 4.5; width of oral sucker 1; width of anal sucker 1.7.

Preserved specimen dull yellowish ventrally and in the median field dorsally, the dorsum elsewhere tinted brown by numerous minute chromatophores largely disposed in longitudinal intermuscular lines. In addition to these there are more or less distinct, broken, longitudinal stripes in the median, paramedian, intermediate and supramarginal lines.

Segments I and II are two very short, closely united rings bearing paramedian sensillæ; III biannulate with very shallow  $a2/a3$  furrow and larger anterior annulus bearing the large paramedian eyes and intermediate sensillæ; IV biannulate like III but larger, with faint  $a1/a2$  and distinct  $a2/a3$  furrow, and paramedian, intermediate and supramarginal sensillæ on  $a2$ ; V triannulate ( $a1 < a2 < a3$ ) dorsally,  $a1/a2$  furrow much  $< a2/a3$ , all dorsal sensillæ on  $a2$ ; ventrally  $a1$  and  $a2$  annuli in buccal ring, with  $a3$  only faintly distinct; VI triannulate ( $a1 < a2 < a3$ ) dorsally with  $a1/a2$  slightly  $< a2/a3$ , triannulate [ $(a1\ a2) > a3$ ] ventrally and bearing the full set of both dorsal and ventral sensillæ; VII through XXII complete and fully triannulate,  $a1 = a2 < a3$ , at least dorsally. Segment XXIII triannulate ( $a1 = a2 = a3$ ) dorsally, while ventrally the annuli become crowded and the furrow  $a1/a2$  shallow; XXIV triannulate ( $a1 = or > a2 > a3$ ) dorsally, ventrally all annuli crowded and entering into the base of the sucker peduncle; XXV triannulate, ( $a1\ a2$ ) much  $> a3$ ; XXVI similar but smaller; XXVII uniannulate.

The very slender retracted pharynx reaches from ganglion eight to the posterior limit of X, in which somite it forms a loop and passes into the esophagus in segment XI, where there is a second loop just anterior to the atrium. Three pairs of salivary glands, opening by separate bundles of ducts into the posterior end of the proboscis in the anterior part of XI. The largest is the second pair, mostly in X but extending into XI. The anterior pair in VIII or IX, intermediate in size; those of the third pair, chiefly in XI, but reaching into XII close to the esophagus, smallest. Gastric cæca, six pairs, the first of which arising in XIII and extending into XII, are trilobate and small. Those of the next five pairs (XIV-XVIII) are broad, spacious and simple or slightly bilobed distally. The post-cæca, arising in XIX, extend along the sides of the intestine into XXIII, with lobes similar to the preceding cæca in each of the five segments. Intestine slender, with four

pairs of simple cæca, the first two directed obliquely anteriorly in XX and XXI, the third obliquely and posteriorly in XXII, and the last much more posteriorly in XXIII and XXIV. Male reproductive organs have the bursa and atrial chamber small, the atrial horns short, thick and globoid, the ducti ejaculatorii and epididymes forming a few open folds laterad of the atrium and extending caudad into XII as a pair of wide loops serving as sperm vesicles, into which the narrow vasa deferentia open. Six pairs of testes from XIII/XIV through XVIII/XIX. Female organs consist of a short vertical duct from which the two ovisacs extend side by side to XIV or even beyond.

*Occurrence* : Vitshumbi (lake Edward), alt. 925 m, 9-12.X.1933; one specimen.

***Placobdella multistriata* (JOHANSSON, 1909).**

*Clepsine multistriata* JOHANSSON, Zool. Anz., Bd XXXV, 1909, p. 151.

*Placobdella ægyptiaca* HARDING, Ann. Mag. Nat. Hist., Vol. VII, 1911, pp. 388-389, 1 fig.

*Clepsine multistriata* JOHANSSON, Results Swedish Zool. Exped. to Egypt and the White Nile, Pt. 5, No. 24, 1913, pp. 14-16, Pl. 1, fig. 5.

*Hæmenteria multistriata* AUGENER, Sitzber. Gesellsch. Naturfor. Freunde Berlin, 1936, pp. 392-395, fig. 3.

*Hæmenteria (Placobdella) multistriata* AUTRUM, Klassen und Ordnungen des Tierreichs, Bd IV, Abt. 3, Buch 4, 1936, pp. 72-73.

*Hæmenteria (Placobdella) ægyptiaca* AUTRUM, Ibidem, 1936, p. 73.

*Placobdella multistriata* MOORE, Proc. Acad. Nat. Sci. Philadelphia, Vol. XC, 1939, pp. 311-313, Pl. 26.

Ovate-oblong, moderately depressed with flat venter and convex dorsum. Head fairly distinct as a result of nuchal constriction. Mouth or proboscis pore at the extreme anterior tip of sucker rim in somite I. Eyes, one pair, close together, distinct in (*a1 a2*) of III, with deep, sharply defined pigment cups and no trace of accessory eyes. Large papillæ are entirely absent but minute ones are very numerous and nearly uniformly scattered over the dorsal surface, approximately 100 occurring in a double transverse row on each annulus of large specimens. In smaller animals they are evident only in the supramarginal and the intermediate fields of posterior annuli.

Although the color is much faded, there are traces of the longitudinal stripes as described by JOHANSSON (1913 : 15). Dorsally there are several dark longitudinal stripes, consisting of three broader ones, a median and a pair of supramarginals, and eight narrower ones, viz., two pairs of paramedians and two pairs of intermediates. Gonopores : ♂ XI/XII, ♀ XII *a2/a3*. The largest and best preserved specimen measured in mm : Length 9.9; maximum width 5.3; width of oral sucker 1; diameter of posterior sucker 2.

Segments I and II scarcely separated by a very faint furrow; III and IV biannulate; V triannulate dorsally and forming most of the buccal ring ventrally; VI is triannulate dorsally and biannulate ventrally in the median field; VII through XXIV triannulate both dorsally and ventrally. But the *a1/a2* furrow of the last triannulate segment XXIV is shallow dorsally, especially in the median field. Somites XXV, XXVI and XXVII biannulate, with the anus opening between the rings of the last.

Two pairs of compact salivary glands, the first occupying segments VIII and IX and the second, somewhat larger, in X and XI. Six pairs of gastric cæca, the first arising in XIII, extending forward into X, the next five pairs, usually bilobed distally, confined to XIV through XVIII. The paired post-cæca arising in XIX, reflexed and reaching to XXIII. Male reproductive organs of large size, the sperm ducts compactly folded and lacking the long posterior loop characteristic of *Glossiphonia* spp. Six pairs of testes at XIII/XIV through XVIII/XIX.

*Occurrence* : 11 specimens, Vitshumbi (lake Edward), alt. 925 m, 9-12.X.1933; 11 specimens, Vitshumbi (lake Edward), alt. 925 m, 9-12.X.1933. The latter contained a label reading, « *Hæmenteria (Placobdella) ægyptiaca* subsp. *congoensis* AUTRUM, Det. H. AUTRUM 1936 ».

***Placobdella (Parabdella) stuhlmanni*** (BLANCHARD, 1897)

emend. MOORE, 1939.

*Glossosiphonia stuhlmanni* BLANCHARD, Die Tierwelt Deutsch-Ost-Afrika, Bd IV, 1897, pp. 3-4, Pl. 1.

*Glossiphonia garoui* HARDING, Proc. Zool. Soc. London, 1932, pp. 81-83, fig. 1.

*Glossiphonia stuhlmanni* MOORE, Jour. Linnean Soc. (Zool.), Vol. XXXVIII, 1933, p. 299.

*Glossiphonia garoui* and *G. stuhlmanni* AUTRUM, Klassen und Ordnungen des Tierreichs, Bd IV, Abt. 3, Buch 4, 1936, pp. 9-10, fig. 7.

*Placobdella (Parabdella) stuhlmanni* MOORE, Proc. Acad. Nat. Sci. Philadelphia, Vol. XC, 1939, pp. 306-309, Pl. 25.

? *Glossiphonia papillosa* SCIACCHITANO, Rev. Zool. Bot. Africa, Vol. XXXII, 1939, p. 350, fig. 2.

Form ovate-cuneate, flattened; slight nuchal constriction; posterior margins parallel or only slightly subparallel from about segment XVII posteriorly. Mouth or proboscis pore on the lip apex in I. Eyes, three pairs in subparallel rows; the first pair on II, second pair on (*a1 a2*) of biannulate III, and the third pair on the sensory annulus (*a2*) of IV. The eyes of the first pair are variable in their distance from the second pair and from each other, being united as a common pigment mass in some specimens and well separated in others. Those of the third pair are shallow cups which vary in size and in the number of visual cells which are always small. Nuchal constriction is formed by somite VI, which is very short.



Cutaneous papillæ, bearing the sensillæ, are well developed on *a2*. In addition to the conspicuous dorsal outer paramedian and the intermediates of HARDING (1932 : 81), the latter pair of which is the larger, there are paired supramarginal series and two pairs of ventral series. Besides the segmental papillæ there are from 20 to 30 small conical papillæ in a regular transverse row on the dorsum and as many on the venter of each annulus of complete somites. The most constant features of the color pattern are the deep brownish-black buccal crescents, at V *a2*, which are widest at the extreme margins and taper to a point both above and below, so that from either dorsal or ventral views they appear triangular. Prominent also are the dorsal paramedian longitudinal brown stripes, consisting usually of a series of short dashes on *a1*, sometimes extending onto the preceding annulus but not onto the segmental papillæ on *a2*, which are pale yellow or whitish. Other individuals may have, in addition, any or all of the following longitudinal stripes which are double lines; median, intermediate, supramarginal and marginal. The last three include the corresponding sensillæ. Anus XXVI/XXVII. Venter plain yellow or gray. Gonopores : ♂ XI/XII, ♀ XII *a2/a3*. Of the two specimens available the measurements in mm of the larger were : Length 23; maximum width 6,6; width of oral sucker 2; width of anal sucker 2,3. Although much faded, the oculation, buccal crescents, paramedian longitudinal brown stripes and other characteristic essentials are clearly evident.

Somites I and II, the latter very short, are indistinctly separated from each other; III biannulate (*a1 a2*) > *a3*; IV through XXIV fully triannulate; XXV and XXVI biannulate and in both (*a1 a2*) > *a3*; XXVII uniannulate. The intersegmental furrows are generally deeper than the interannular and on the venter of the middle body region strongly emphasize the metamerism; *a3* > the other annuli and secondarily faintly biannulate both dorsally and ventrally, whereas the other annuli are subdivided only dorsally, if at all.

The stout pharynx receives the ducts of a pair of compact salivary glands at its posterior end in somite XI. Six pairs of gastric cæca, the first arising in XIII, small and prolonged forward into XII, the next five pairs confined to XIV through XVIII and trilobed distally; the paired post-cæca arising in XIX, reflexed and reaching to XXV.

The atrium is small and its cornua long and conical. Besides the loosely folded epididymis and ejaculatory duct in XI and XII, the sperm duct forms a long posterior loop or spermatic vesicle of enlarged diameter. Testes six pairs. Ovisacs long, may reach to XVII.

*Occurrence* : lake Magera, at the eastern base of Kirorwe mountain and west of the Nyamuragira volcano, alt. 2.000 m, 5.III.1934; with *Limnatis fenestrata* and *Hirudo hildebrandti*.

UNIDENTIFIED *GLOSSIPHONIIDÆ*.

There are two lots, comprising three specimens, which can not be identified with certainty further than family. All three are so engorged as to be mere bags of blood, the skin being so tightly stretched that the annulation, the tuberculation, the oculation, and the alimentation can not be determined. In the absence of these diagnostic essentials, identification beyond *Glossiphoniidæ* is not possible.

*Occurrence* : from Vitshumbi, lake Edward, alt. 925 m, 17-22.X.1933. Without indication as to possible host.

## Order GNATHOBDELLÆ.

## Family HIRUDIDÆ.

Genus **LIMNATIS** MOQUIN-TANDON, 1826.

***Limnatis fenestrata* MOORE, 1939.**

*Limnatis fenestrata* MOORE, Proc. Acad. Nat. Sci. Philadelphia, Vol. XC, 1939, pp. 343-347, Pls. 27 and 28.

Form typical of the genus, robust, outline elongated. Well preserved specimens with three pairs of sharply defined black stripes; the paramedians the broadest, supramarginals next, and intermediates the narrowest. Although of regular width, the stripes are much cut into and punctured by numerous round pale yellow spots, giving a conspicuously fenestrated pattern. Supramarginal stripes especially strongly developed on *b2* and *b5* as deeply pigmented quadrilateral spots joined by smaller spots. The sensory annuli (*a2*) appear somewhat lighter colored than the others. On the posterior sucker the pigment is concentrated at the margin. Ventral ground color paler, with dark blotches concentrated to form a continuous submarginal black line. Ventral surface of caudal sucker heavily blotched, with the posterior half often almost solid black.

Lip of oral sucker rather narrow, rounded, with a distinct median ventral fissure and two or three shallower fissures on each side. Five pairs of eyes arranged as usual on segments II through VI. Gonopores small, the ♂ at XI *b5/b6*, the ♀ at XII *b5/b6*. Nephropores close to the posterior border of *b2* of segments VIII through XXIV. Sensillæ of the number and distribution characteristic of the genus, but, especially posteriorly, the dorsal ones resemble those of *Hirudinaria* in being short, linear, elevated on large elliptical translucent papillæ. Dorsum characterized by 20-25 small non-metameric papillæ on each annulus. Annulation as in the genus, 15 complete segments.

MOORE (1939 : 345) gives the tooth count of from 72 to 78, and as measuring about  $21 \mu$  in exposed length by  $10 \mu$  in diameter. On the jaws of the two specimens dissected and mounted by the author the numbers were from 73 to 81, while the dimensions agreed with those of MOORE. Some 20 salivary papillæ on each side of each jaw, about eight larger ones averaging about  $54 \mu$  in diameter.

Epididymis relatively small, its diameter little greater than the slender penis sac, having the usual form of two limbs continuous on the side of the bulb, the posterior the larger and formed of a relatively few folds of a larger tube opening at the free end into the ejaculatory bulb, the anterior of a more intricately folded tube of smaller diameter, which receives the vas deferens at its anteromedian end. Ejaculatory bulb, about 75 mm near the posterior end, from which it tapers forward to its continuation as the ejaculatory duct, its length about 3 mm, strongly curved and enclosing most of the epididymis. Ejaculatory ducts connect the small end of the bulb with each side of the lower end of the prostate. Penis sac much elongated, cylindrical, nearly uniformly about 2 mm in diameter but enlarged somewhat to form the bursa at the ♂ gonopore, folded longitudinally three or four times, the first fold at the point where it joins the prostate enlargement. Prostate with a conspicuous ovate head, sharply bent on the penis sac and measuring about 3 mm in length by 2,3 mm in greatest diameter. In the one specimen dissected for testes eight pairs were counted, at XIII/XIV through XX/XXI. Ovisacs in the usual position on the floor of the body wall at XII/XIII. Oviductules, unequal in length, open into the albumen gland, from which arises the oviduct, which joins with the extreme end of the vaginal sac. Vagina less in diameter than penis sac; vaginal sac and duct differentiated, but the former, which is little more than  $\frac{1}{2}$  as long and about twice the diameter of the duct, is a simple fusiform enlargement which tapers on the head end into the oviduct and on the other into the vaginal duct, the latter being of nearly uniform diameter except for the bursal enlargement at the ♀ gonopore end.

Judging by the number of specimens taken by the G. F. DE WITTE expedition, this species must be very abundant in the region. There were six lots, aggregating 242 specimens. Well extended, best preserved specimens measure in mm : Length 25,3; maximum width 8,6; width of posterior sucker 5; buccal width 2,7.

*Occurrence* : Lake Magera, at the eastern base of Kirorirwe mountain and west of the Nyamuragira volcano; alt. 2.000 m, 5.III.1934, 57 specimens with *Placobdella (Parabdella) stuhlmanni* and *Hirudo hildebrandti*; Kalondo, lake Ndalaga-Mokoto, alt. 1.750 m, 22.III.1934, 179 specimens with *Hirudo hildebrandti*; Katanda, to the north of Rutshuru, on the Rutshuru river, alt. 950 m, 30.XI.1934, 1 specimen; [Monga, Uele, Bili river, alt. 450 m, 18.IV and 8.V.1935], 5 specimens.

***Limnatis buntönensis* sp. n.**

Form robust, the outline elongated ovate-oblong with the greatest width beginning at about the posterior  $\frac{1}{3}$  of the body. Dorsum arched, venter flat, lateral margins subparallel and wider throughout than the rounded and narrower pregenital region. Clitellum not apparent externally. Lip of anterior sucker wide, rounded, with three ventral fissures complete for the entire exposed distance of the lip. The median furrow is somewhat deeper than those on either side. On the pair of ridges, between the median and the lateral fissures, is a partial furrow, only about half the exposed distance from the lip rim.

On all annuli the dorsal surface roughened by about 21 non-metameric large papillæ, each bearing a crown of conical sense organs, of which the central one is usually larger than the others; papillæ of venter similar but smaller and less prominent on the whitish background. The 17 pairs of nephropores, clearly visible on one of the paratypes, are on the posterior border of *b2* or at *b2/a3* of segments VIII through XXIV. Gonopores : ♂ XI *b5/b6*, ♀ XII *b5/b6*.

Measurements of holotype and largest specimen in mm : Length 50,6; maximum width 9,9; width of caudal sucker 5,3; buccal width 2; distance from lip apex to buccal ring 2,4.

Dorsally the basic coloration of alcoholic specimens is brownish, with four pairs of light yellowish longitudinal stripes; ventrally the basic color is lighter and more or less blotched with irregular black spots, which submarginally are more constant and tend to form a line bounded by the yellowish stripe. This yellowish marginal stripe is seen both from above and below. All stripes extend for the entire length from lip to posterior sucker and are very regular, without the fenestrated pattern of *L. fenestrata*. There is a median brown stripe, a pair of paramedians, a pair of intermediates and a pair of somewhat darker supramarginals; the paramedians are the broadest, the median and the supramarginals (approximately equal) are next in width, while the intermediates are the narrowest. Alternating with the brownish stripes are four pairs of yellowish stripes, of which the paramedians with the marginals (viewed dorsally), about equal in width, are the narrowest, while the intermediates and the supramarginals, also approximately equal in width, are about twice as wide as either of the other two pairs. At the terminal regions the stripes on each side more or less coalesce. Frequently, discontinuous black lines separate the stripes, as indicated in Fig. 1. The narrow paramedian light stripes bear the paramedian sensillæ, the intermediate brown stripes, the intermediate sensillæ, and the darker supramarginal stripes, the supramarginal and marginal sensillæ.

The sensillæ are exceptionally well developed in this species, differing from the typical *Limnatis*, in being short and linear, elevated on large

elliptical translucent papillæ and resembling those of *Hirudinaria*, especially dorsally. If the determination had been based on external characters only, one would have been justified in assigning it to the latter genus. This is mentioned as indicative of the uncertainties inherent in attempts to identify hirudinids from external features only. Throughout the greater part of the length the full complement of eight sensillæ, situated on *a2*, is present dorsally; the paramedians are inclined to the median axis of the body at an angle of about 30°, the intermediates at about 45°, and the supramar-

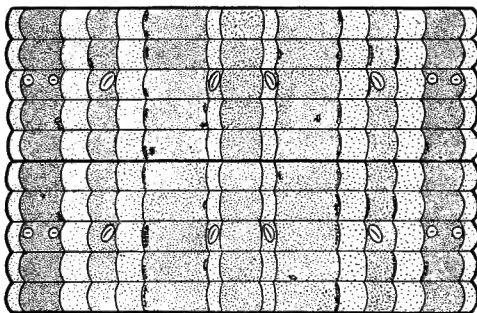


FIG. 1. — *Limnatis buntonensis* n. sp.

Semidiagrammatic drawing of two complete segments of a paratype specimen showing relationship of annuli, sensillæ, and dorsal striping. The relative sizes of annuli, sensillæ, and stripes are drawn accurately but the depth of the dividing furrows is somewhat exaggerated by the light and heavy lines, the former indicating annuli as counted in the text.

Somite limits are designated by heavy lines. ( $\times$  about 7)

ginals and marginals are directed at about an angle of 90°. Except for the paramedian pair, which are borne on the paramedian light colored lines, the sensillæ are within the brownish stripes; the intermediates on the intermediate brown stripe and both the supramarginals and the marginals on the inner and the outer margins, respectively, of the marginal brownish lines. Ventrally there are three pairs of small, conical sensillæ, quite discernible but less prominent than those situated dorsally.

There is nothing peculiar about the annulation of this species to distinguish it from others of the genus. Segment I, faintly separated from II only mesially, comprises the preocular lobe; II and III are indistinctly separated from I and IV, as well as from each other, and both bear a pair of eyes; IV biannulate, the first (*a1 a2*) bearing a third pair of eyes, slightly  $<$  than *a3*; V also biannulate, the first bearing the fourth pair of eyes and slightly  $>$  than *a3*; VI triannulate *a1* conspicuously  $>$  than *a2*, while the latter is decidedly  $<$  *a3*, *a1* only slightly  $<$  *a3*, fifth pair of eyes on *a2*; VII also triannulate, *a1* only slightly  $>$  *a2*, which is distinctly  $<$  *a3*; VIII quadrannulate, *a1*  $>$  *a2* slightly  $>$  *b5* = *b6*; IX through XXIII quin-

quannulate  $b1 = b2 = a2 = b5 = b6$ ; XXIV quadrannulate  $b1$  slightly  $> b2 = a2$  slightly  $< a3$ ; XXV triannulate,  $a1$  distinctly  $> a2 = a3$ ; XXVI biannulate ( $a1 a2$ ) distinctly  $> a3$ ; XXVII uniannulate, followed by the anus. A partial post-anal annulus was observed on only one specimen.

Dissections of the reproductive system were made of two mature and one of the smaller specimens, which, though less developed in the young specimen, agreed in their general morphology. In each case the nerve cord was to the right of the vagina, while in two the atrium was to the left of the cord and in the other one to the right. Testes were not dissected beyond the first three pairs, at XIII/XIV, XIV/XV and XV/XVI respectively.

Epididymis, divided into two limbs, consists of an intricately convoluted tubule of irregular diameter, the vas deferens opening into the posterior limb and the anterior limb emptying into the caudal end of the ejaculatory bulb. The sub-fusiform ejaculatory bulb, measuring approximately 7 mm in maximum diameter by 2 mm in length, is strongly arched and encloses about  $\frac{3}{4}$  of the epididymis in its concavity. From the anterior end of each bulb a capillary ejaculatory duct leads to the proximal portion of the prostate gland area. Prostate head of the penis sac sub-lobate, yellowish, the transverse diameter 2,4 mm and the length 3,4 mm. Prostate glands distinct, not enveloping the adjacent ejaculatory ducts.

Penis sac relatively short and small, cylindrical, approximately about 1 mm in diameter but enlarged somewhat to form a bursa at the  $\sigma$  gonopore. Only one distinct longitudinal fold, the prostate segment measuring 4,6 mm in length from the point where the ejaculatory ducts empty to the anterior curvature.

Although there was only a single longitudinal fold of the penis sac and the prostate limb overlaid the bursal limb in each specimen dissected, the form of the prostate end differed somewhat among the specimens. In the other large specimen, instead of the prostate end lying between the left ejaculatory bulb and dorsal to the ovary, as shown in Fig. 2, it was directly in the median longitudinal line, followed first by a slight posterior curving of the atrium, then ventrad before continuing anteriorly. In the case of the smallest specimen, apparently immature, the prostate glands were undeveloped and the posterior end of the atrium did not curve to either side. These differences are considered as only variations within the species.

Ovisacs in the usual position (XII/XIII), oviductules short, having a length about equal to that of the ovisacs before joining the albumen gland, from which arises the common oviduct that empties into the distal end of the dorsocephalad curved vagina. The transverse diameter of the oviductal end of the vagina is 1,3 mm, the same measurement of the albumen gland 9 mm, and the length of the latter 1,7 mm. The width of the vagina, including the distal and bursal enlargements, is much less than that of the atrium.

Jaws of three specimens were dissected out and mounted. The number of monostichodont teeth of the seven jaws, suitable for counting, ranged from 70 to 85, one specimen having 70, 72, 74, another 72, 72, and the third 75, 85. The jaw with the 85 teeth differed from the other six in that, after about the seventy-fifth tooth, the teeth diminished progressively in length until they disappeared, while in the others the dentigerous region ended

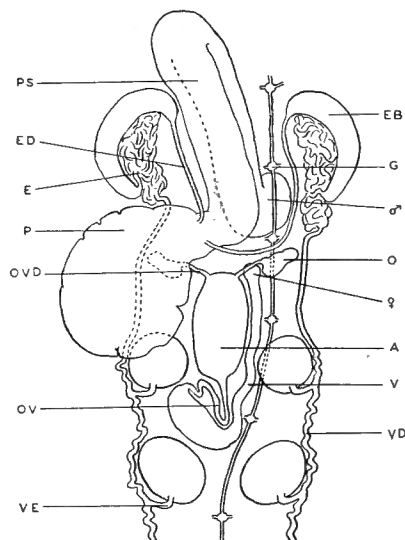


FIG. 2. — *Limnatis buntonensis* n. sp.

Free-hand drawing of a dissection of the holotype specimen showing general morphology of the reproductive organs as viewed dorsally. A, albumen or oviducal gland; E, epididymis; EB, ejaculatory bulb; ED, ejaculatory duct; G, ganglion 11; O, ovary or ovisac; OV, oviduct; OVD, oviductule; P, prostate region (glands); PS, penis-sac or stem of atrium; V, vagina; VD, vas deferens; VE, vas efferens; ♂, male gonopore; ♀, female gonopore. (× about 7)

rather abruptly. Average exposed length of teeth is about  $21 \mu$  and the average width is  $8,4 \mu$ . There are about eight large papillæ, averaging  $57 \mu$ , on each side of each jaw and a greater number of smaller papillæ.

Summarization of the points available for distinguishing between *L. buntonensis* and other members of the genus which seem to be most closely related to it are as follows : 1) *L. buntonensis* differs from *L. fenestrata* in having seven dorsal, non-fenestrated longitudinal stripes, and the penis-sac folding longitudinally only once. From species other than *L. fenestrata* which have the *Hirudinaria*-like sensillæ, *N. buntonensis* may be distinguished as follows : 2) the number of teeth is more than those of *L. oligodonta* JOHANSSON, 1913 [both JOHANSSON, and HARDING (1932) reported

about 60, while MOORE (1939 found 58], and fewer than those of *L. africana* BLANCHARD, 1897. BLANCHARD gave the diagnostic number as 80-90 but in the text gave the number as 76-80 for most specimens, with a specimen from the French Congo having 84, 85, and 91. Among the specimens examined by MOORE for teeth the number varied from 78-83. 3) As compared with *L. obscura* MOORE, 1939, with which the tooth count closely agrees, *L. buntonensis* is clearly distinguished by its peculiar sensillæ as well as differences in the morphology of the ♂ reproductive system.

*Occurrence* : A total of 24 specimens was available : all from Vitshumbi, lake Edward, alt. 925 m, 27, 28, 29.IX.1933 and 5, 7, 9, 12.X.1933, 17 specimens; and Kalinga, a hill immediately to the east of the place known as Ndeko, to the southwest of camp Rwindi, on the left bank of Kwabembe river, alt. 1.082 m, X.1933, 7 specimens.

Genus **HIRUDO** LINNAEUS, 1758.

**Hirudo hildebrandti** BLANCHARD, 1897.

*Hirudo Hildebrandti* BLANCHARD, Die Tierwelt Deutsch-Ost-Afrika, Bd IV, 1897, pp. 5-6, Pl. 1.

*Hirudo hildebrandti* JOHANSSON, Results Swedish Zool. Exped. to Egypt and the White Nile (Pt. 5, No. 1), No. 24, 1913, p. 29.

*Hirudo Hildebrandti* JOHANSSON, SitzBer. Akad. Wiss. Wien, Bd CXXIII, 1914, p. 847.

*Hirudo Hildebrandti* var. *Carossii* DEQUAL, Boll. Mus. Zool. Anat. Comp. Torino, Vol. XXXII, 1917, pp. 7-8.

*Hirudo hildebrandti* CUNNINGTON, Proc. Zool. Soc. London, 1920, No. 4, p. 576.

*Hirudo hildebrandti* MOORE, Jour. Linn. Soc., Vol. XXXVIII, 1933, p. 299.

*Hirudo hildebrandti* MOORE, Proc. Acad. Nat. Sci. Philadelphia, Vol. XC, 1939, pp. 333-334, Pls. 26, 27, 28.

A total of 38 specimens is somewhat doubtfully referred to this species. The color pattern, although slightly altered by preservation, is in most specimens evident in good light, and agrees with the description of MOORE. BLANCHARD (1897 b : 5) described the dorsal surface as being typically of gray, olive-gray or reddish, and provided with six brown, longitudinal stripes of unlike width. Beginning laterally, according to BLANCHARD, there is a submarginal stripe (bearing the two lateral sensillæ); next is the intermediate stripe (bearing the third sensilla), which is narrower than the submarginal stripe; and next is the paramedian brown stripe (without sensillæ), which is the widest of the brown series of stripes. A second color type is described as having, in addition to the six above mentioned stripes, a narrow median stripe. In the figures accompanying the text (Pl., Figs 5 and 6), only the latter color type is shown. The fourth sensilla is situated between the narrow median and the wide paramedian brown stripe. The color of



the ventral surface was described by BLANCHARD, as uniformly reddish and possessing a black submarginal band.

MOORE (1939 : 334) described one lot of specimens having a color pattern agreeing exactly with that figured by BLANCHARD. A second series of specimens was described by MOORE as having a median and five *pairs* of dark longitudinal lines, the latter due to the concentration of black pigment at both borders of the paramedian and intermediate and the median border of the supramarginal stripes of BLANCHARD's figure, making 11 in all.

The color pattern of the specimens in the present collection, although somewhat faded, agrees closely with that described by MOORE in relation to the doubling of the stripes. Reading mesiad from the lateral margin are : 1) a submarginal double dark stripe, the two parts separated from each other by 0,7 mm; 2) the intermediate dark stripe, the lines separated from each other by about half the distance, as are the submarginals; 3) the single very narrow submedian, separated from the much wider median only by a distance of its own width. The median measures 0,7 mm in width. Thus the single median plus the paired submedians, plus the paired double intermediates, plus the paired double submarginals make a total of 11 stripes. The sensillæ are situated as follows : 1) two lateral to the pair of dark submarginal lines, 2) one between the paired submarginals and the paired intermediates, and 3) one between the narrow paramedian and the wide median. Since MOORE made no mention of the sensillæ, except to state they are small, circular and regular, it is not possible to compare their position with those of his material. It will be noted, however, that their position does not agree with that described by BLANCHARD.

It was not until after an examination of the jaws and the reproductive systems had been made that the close resemblance of the material with *H. hildebrandti* was suggested. Agreement is seen in the presence of a weak ventral labial fissure, in the absence of large salivary papillæ, and in the number of teeth. Only on two of the jaws were a few scattered very small papillæ seen. Based on the eight jaws upon which tooth counts were made the number varied from 56-63, the actual count being 56, 59, 60, 60, 60, 62, 63, and 63. The morphology of the reproductive system, as determined by two dissections, is identical with that figured by MOORE (Pl. 28, Fig. 60). Ten pairs of testes, beginning at XIII/XIV, were counted. Measurements of one of the largest and best preserved specimens in mm : Length 26; maximum width 7,3; width of caudal sucker 3,7; buccal width 1,4.

*Occurrence* : A total of 38 specimens was available; lake Magera, at the eastern base of Kirorirwe mountain and west of the Nyamuragira volcano, alt. 2.000 m, 5.III.1934, 12 specimens, with *Placobdella (Parabdella) stuhlmanni* and *Limnatis fenestrata*; Kalondo (village), lake Ndalaga-Mokoto, alt. 1.750 m, 14.VI.1935, 3 specimens, with *Limnatis fenestrata*; Mushumangabo (old crater), lying east of the volcano Nyamuragira, along the Rugari-Mushari trail, alt. 2.075 m, 14.VI.1935, 23 specimens.

## Order PHARYNGOBDELLÆ.

## Family ERPOBDELLIDÆ.

Genus **SALIFA** BLANCHARD, 1897.**Salifa perspicax** BLANCHARD, 1897.

*Salifa perspicax* BLANCHARD, Die Tierwelt Deutsch-Ost-Afrika, Bd IV, 1897, pp. 7-8, Pl. 1, figs. 1-3.

Non *Salifa perspicax* JOHANSSON, Zool. Anz., Bd XXXIV, 1909, pp. 521-523, figs. 1 and 2.

Non *Salifa perspicax* JOHANSSON, Ibidem, Bd XXXV, 1909, pp. 1-5, figs. 1 and 2.

Non *Salifa perspicax* JOHANSSON, Ibidem, Bd XXXVI, 1910, pp. 405-408, fig. 1.

*Salifa perspicax* JOHANSSON, Results Swedish Zool. Exped. Egypt and White Nile, 1901. Upsala, Pt. 5, No. 24, 1913, pp. 38-40, Pl. 1, 13 figs.

*Salifa perspicax* JOHANSSON, Zool. Anz., Bd XLII, 1913, p. 78.

*Salifa perspicax* CUNNINGTON, Proc. Zool. Soc. London, 1920, No. 4, p. 576.

*Salifa perspicax* AUGENER, Sitzber. Gesellsch. Naturfor. Freunde Berlin, 1936, pp. 385-388.

? *Herpobdella octoculata* SCIACCHITANO, Rev. Zool. Bot. Africa, Vol. XXIX, 1937, pp. 429.

*Salifa perspicax* MOORE, Proc. Acad. Nat. Sci. Philadelphia, Vol. XC, 1939, pp. 347-351, Pl. 27.

Because BLANCHARD, in the original description, overlooked the pharyngeal stylets, the species has had a complicated history from almost the very beginning. JOHANSSON (1909 *a*, 1909 *b*, 1910), working with specimens taken from the White Nile by the Swedish Zoological Expedition, which he mistakenly assumed as being identical with BLANCHARD's *Salifa perspicax*, discovered the stylets as well as the presence of a mid-dorsal gastropore at XV/XVI. He also created *Salifinæ* as a subfamily of the family *Erpobdellidæ* to accommodate this form, which he assumed belonged to *S. perspicax*. Later, JOHANSSON (1913 *a*), after comparing specimens of BLANCHARD's type material with his White Nile material, previously supposed to be *S. perspicax*; decided that the latter were not congeneric with BLANCHARD's specimens, due chiefly to the absence of a gastropore in the true *S. perspicax* material. He named his specimens from the White Nile *Trematobdella perspicax* JOHANSSON, 1913 and, established therefor the family *Trematobdellidæ* to replace *Salifinæ* of the *Erpobdellidæ*. It should be pointed out that JOHANSSON's observations were based upon specimens cleared in glycerin and serial sections, neither of which does BLANCHARD make any mention of having employed. Therefore, as concluded by MOORE

(1939 : 315), who examined specimens of both species, and with whom the author agrees, BLANCHARD correctly omitted the presence of the gastropore from his diagnosis of *Salifa* and, notwithstanding the remarkable specific resemblance between the two, JOHANSSON was justified in separating *Trematobdella* especially for its possession of that structure. AUGENER's (1936) conclusion that the genus *Trematobdella* is a synonym of *Salifa* is untenable. He assumed that since BLANCHARD overlooked the pharyngeal stylets he likewise failed to observe the gastropore, despite the fact that JOHANSSON (1913 a) showed convincingly that the latter structure did not exist in BLANCHARD's material.

SCRIBAN and AUTRUM (1934 : 347), however, regarded *Salifa perspicax* as unavailable and *Trematobdella perspicax* as the valid name. Using two columns, at the top of which are, « Zu verwerfende Namen » and « Jetzt gültige Namen », they list under the former, *Salifa perspicax* JOHANSSON, 1909 and 1913. This is not only inadmissible in respect to the correct name, but it is erroneous in the following respects : 1) JOHANSSON did not propose the name *Salifa perspicax*, 2) BLANCHARD did, but 1897 was the date rather than 1893, and 3) JOHANSSON did not propose the name *Trematobdella perspicax* until 1913.

Size small, very slender, attenuated anteriorly, posteriorly slightly widened and flattened, and with a small posterior sucker. Average measurements, based on more than a dozen specimens selected at random, were in mm as follows : Length 18,4; maximum width 3,2; width of posterior sucker 1,7; buccal width 0,5; distance from anterior end to ♂ gonopore 4,5. The dorsal surface from the lip to the posterior limit of the clitellum (XIII a2) is commonly flecked with black, diffuse, irregularly placed markings; and occasionally these markings cover the entire length, including the rear sucker.

The disposition of the eyes and the cephalic annulation, as determined in serial sections, specimens cleared in oil of wintergreen and supplemented by uncleared material, is as follows : segments I and II appear fused; III is composed of an undivided annulus; IV consists of two annuli ( $a1 + a2$ )  $> a3$ , with the pair of large, paramedian eyes borne by the undivided annulus; V is triannulate,  $a1 + a2 + a3$ , approximately equal, with  $a2$  including the first pair of lateral eyes. Segment VI is quadrannulate,  $a1 (b1 b2) > a2 = b5 = b6$ , with the second pair of laterally situated eyes in  $a2$ ; VII is quinquannulate,  $b1 = b2 < a2 = b5 < b6$ . Here, as in VI, as well as in the succeeding eye-possessing segments, the eyes are contained in  $a2$ ; and here, as in all complete segments, is located the neural ganglion. Segment VIII and succeeding complete segments are likewise basically quinquannulate,  $b1 = b2 = a2 = a5 < b6$ . In some cases, however, the intra-annular furrows are almost deep enough to be considered complete, resulting in a segment with more than five annuli.

On some specimens a darkened, well-defined clitellum beginning on

X *a2* and extending through XIII *a2*, covering 16 annuli, is evident, but in no case is the clitellum thickened and prominent, as is characteristic on fully mature erpobdellids.

The eyes show considerable variation and in one respect depart from BLANCHARD's description and figure. BLANCHARD shows two pairs of eyes, a large paramedian and a smaller intermediate, on the dorsum of his third ring. In none of the 12 cleared specimens examined was there any suggestion, on either side, of intermediate eyes, while the paramedians were large and distinct. The postcephalic or accessory eyes are strictly lateral, deeply situated beneath the surface and in most cases very conspicuous. What appears to be the typical disposition is, as figured by BLANCHARD, six pairs on the sensory annulus (*a2*) of segments V through X, but variations in the number occurred. In one specimen there were only four pairs of lateral eyes (segments V through VIII) and in two others one of the pair of the fifth series (IX) was absent; both of the sixth pair (X) were present in six specimens, only one of the pair was present in four specimens, and in the remaining two they were not observed; only three specimens possessed both eyes in XI, five had only one of the pair, three had none, and one was not determined; while in XII only two specimens had the normal two, four had only one of the pair, and in five specimens eyes were absent. One specimen was observed to have both eyes in XIII and another had both, as far back as XV, but each of these variations was observed in only one case.

A careful search for the gastropore was made on serial sagittal sections, mid-sagittal bisections cleared and mounted mesiad up, and cleared *in toto* mounts under a compound microscope; and uncleared specimens under a binocular dissecting microscope (with 9 X, 18 X, 27 X) in good light. Not the slightest trace of this structure was found, so its absence from this material is certain.

MOORE (1939) doubtfully suggested the possibility, since most all of his specimens of *S. perspicax* were taken during September and October while JOHANSSON's type specimens of *T. perspicax* were collected during February and March, that the presence of the gastropore may be seasonal in development, appearing and then being closed and obliterated. Since our material was taken during February, this seasonal hypothesis appears even more doubtful.

The moderately large mouth, concealed beneath the prolonged dorsal lip, opens into the buccal region, which leads into the pharynx. Slightly anterior to and alternating with the cephalic end of pharyngeal fold, are the three pseudognaths of BLANCHARD (homologues of velar lobes of *Hirudidæ*). One is situated mid-ventral and the other two dorso-lateral. On the cephalic end of each of the three jaws (homologues of jaws of *Hirudinæ*), which here are situated, one mid-dorsal and two ventro-lateral, are two stout cone-shaped stylets placed in tandem. Whether or not the stylets had been dissolved out in the preservative, which seems doubtful, or

whether they were present but not detected, they were seen convincingly only in serial sections and dissections.

The long pharynx, reaching to XIII/XIV, strongly muscular and exhibiting three weak ridges, presents a triangular lumen. The result is that the ridge that was mid-dorsal at its anterior end assumes a more or less right dorso-lateral position, the ridge originally situated right ventro-lateral now lies nearly ventral, and the left ventro-lateral ridge becomes shifted to a left nearly dorso-lateral position. To this type of pharynx OKA (1923 : 251 ff.) applied the term, *strepstilæmata*, as distinguished from the type which does not undergo torsion, which he called *euthylaemata*.

From the pharynx the stomach continues as an almost straight thin-walled tube to XIX/XX, where, between it and the intestine, there is a sphincter. The intestine is composed of two fairly distinct parts, an anterior region bearing about five pairs of small, simple caeca, and a posterior region, where these chambers become fainter. It gradually tapers to the large anus, situated six annuli anterior to the sucker. In some specimens the digestive tract was empty except for flocculent matter, while in others it contained remains of insect larvæ and Crustacea, consisting of ostracods and possibly conchostracous phyllopods, and unrecognizable portions of chitin.

In order that the description of the internal morphology might be more nearly complete a brief account of the reproductive organs, extracted chiefly from MOORE (1939 : 348 ff.), is included. The atrium is of the *Dina* type with small globoid median sac opening into a bursa, often partly everted as a ring around the ♂ gonopore at XXII *b1/b2*. The ectal or stalk end of the atrium projects freely into the cavity of the ♂ genital bursa as a short, conical, median, penial papilla, which appears to be incapable of extension into a filiform penis. The atrial horns arise from its summit on each side of the nerve cord and diverge sharply nearly horizontally caudo-lateral, passing into the ejaculatory ducts opposite the ganglion of segment XIII, with no marked constriction or change in diameter. The sperm ducts are simply wavy to about the ganglion of segment XIV where they become greatly folded and tortuous but continue nearly uniformly of the diameter of the atrial horns. At the posterior end of XIII the duct abruptly contracts to the capillary vas deferens, along which the testes are arranged from the ganglion of segment XVII to the posterior end of XXIII. The number of testi-sacs on each side averages about 39, or six on each side of each of the six and one-half segments involved. The ♀ organs consist of the usual short, simple vagina, opening at XIII *b1/b2*; beneath the nerve cord it bifurcates into the two simple thin-walled ovisacs, which then extend obliquely laterad to the sperm ducts, ventrad to which they continue nearly or quite to the level of the ganglion of segment XIV. At the blind end they may taper or become bulbous.

*Occurrence* : Sixty-nine specimens of this interesting species were taken at Zulu or N'Zulu village, lake Kivu, on the way to Sake, alt. 1,500 m, 10.II.1934. This is near the type locality, which is Kiriwia, near lakes Albert and Edward. Except for AUGENER's (1936 : 386) records from Natal, Southern Rhodesia, and Reunion Island, previous reports confine its distribution to the general vicinity of the type locality <sup>(3)</sup>.

#### UNIDENTIFIED *ERPOBDELLIDÆ*.

In addition there are two specimens which can be identified with certainty only to family. They belong to the *Erpobdellidæ*, but whether to *Salifa* or to *Barbronia* (JOHANSSON, 1918), which appears more likely, or to some other genus of the *Salifa-Trematobdella-Barbronia* complex, it is not possible to determine. They are poorly preserved, strongly curved, hardened, and, even following hydration, could not be straightened without breaking. After clearing in oil of wintergreen, the digestive, the reproductive system, and the oculation could not be studied satisfactorily due to the curvature. From about segment XIII posteriorly both are as flattened as an unengorged glossiphonid, while anterior to XIII, distinctly erpobdellid in form. As far as could be determined, the accessory eyes, present in *Salifa*, are absent. This, together with the pronounced flattening of the urosome, suggests *Barbronia*. Although the entomostracous Crustacea and insect larvæ commonly present in the alimentary canal of members of this group were absent, a trace of debris was present, indicating that the form represented in the collection by these two specimens may lead a burrowing life.

*Occurrence* : Katanda, north of Rutshuru, along the Rutshuru river, alt. 950 m, 30.XI.1934.

#### REMARKS.

The National Parks of the Belgian Congo, as well as the entire continent of Africa, afford rich areas for the collection and study of leeches. Most of the studies have been based on the fauna of the eastern part of Africa and the countries bordering the Mediterranean, while the leeches of the vast southern and western parts remain almost a virgin field. These areas are

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<sup>(3)</sup> Its occurrence in Madagascar is questionable. BLANCHARD (1897a : 7) stated, that up to then he knew of this genus from German East Africa (now Tanganyika) and Madagascar and that in both countries it was represented by a single species. Yet in a subsequent publication BLANCHARD (1897b : 102) named the specimens from Madagascar *Salifa cambouei* but in a footnote stated, that the description therefor was unpublished. Apparently *Salifa cambouei* BLANCHARD, 1897, remains a *nomen nudum*.

certain to yield new and interesting species and add greatly to our knowledge of geographical distribution of this group.

Even in the areas that have been explored there are obvious deficiencies in our knowledge. The greatest lack is in the *Piscicolidæ*, of which only one species seems to be recorded. The piscicolids occur on both fresh and salt-water fishes and crustaceans in the gill chambers or on the fins and softer parts. Almost equally deficient is our knowledge of the *Erpobdellidæ*, only five species of which are known from Africa. The erpobdellids are to be found among aquatic vegetation or beneath stones and driftwood. Better known are the *Glossiphoniidæ*, to be sought on various animals, including both invertebrates, or clinging to the underside of driftwood, stones and the leaves of aquatic plants. Best known, due to their size, are the *Hirudidæ*, the large jawed-leeches. These may be collected from the underneath side of stones, logs, etc., or from the person of the collector, who may attract them by wading along the littoral region.

Representatives of the true land-leeches (*Hæmadipsidæ*) are unreported from the continent of Africa. But BLANCHARD (1917) described four species from nearby Madagascar. Since they abound in southern Asia, Australia and the intervening islands, and occur in South America, all areas of the equatorial zone, it is possible their absence in Africa is only apparent rather than real. Yet land-leeches are such prominent and easily detected animals, that, if present, it is difficult to understand why they have escaped notice.

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