IX STUDIES IN INDIAN HELMINTHOLOGY, No I

By F. H. STEWART, *M.A., D.Sc., M.B., Capt., I.M.S.*
Hon. Asst., Indian Museum.

(Plates xviii-xxiii).

In the present report the following species are recorded, *viz.*:—

1. *Oxysoma macintoshii*, n. sp.
2. *Oxysoma kachugae*, n. sp.
3. *Heterakis macronis*, n. sp.
4. *Dacnitis callichroi*, n. sp.
5. *Spiroptera denticulata*, R. var. *minor*, n. var.
6. *Atractis kachugae*, n. sp.
7. *Physaloptera*, sp. larva.
8. *Ascaris*, sp., larva (L. 33, 36).
9. ,, ,, ,, (L. 15).
10. Larva undiagnosed (L. 30).
11. ,, ,, (L. 14).
12 *Oncholaimus indicus*, v. Linst.

1. **Oxysoma macintoshii**, n. sp.

(Pl. xviii, figs. 1–12).

From rectum of *Rana tigrina*, Daud., and *Bufo stomaticus*, Lütken Lucknow.

Plump little worms, the body cavity being more developed and less closely packed with viscera than in many nematodes; greater variations in shape and consequently in the measurements occur—(*vide* tables I and I*a* pp. 184, 185). The head can be invaginated into the anterior part of the body, a fact which also contributes to variations in the measurements.

Females (fig. 1) 1·9–2·78 mm. long. Head (fig.3). The mouth is surrounded by three lips, one dorsal, two subventral. Each lip is low, semicircular and membranous, the edge thickened The lips curve in toward the mouth forming a diaphragm over the shallow oral cavity. The base of this cavity is formed by the anterior end of the oesophagus from which three powerful chitin-covered teeth, one dorsal, two subventral, project into it.

A curved chitinous flagellum can be observed in some specimens, springing apparently from the apex of the dorsal tooth.

The head can be retracted into the neck until the mouth is at the level of the collar.

The cuticle of the head is not ringed, that of the body shows annulation, but this is probably artificial as the rings are completely irregular in breadth.

Lateral membranes extend from the head to the base of the tail, but it has not been found possible to measure them.

A large ventral pore (fig. 1, v. p.) lies in the midline opposite the oesophageal bulb, ·323 mm. from head and opens into a wide sac.

The vulva is transverse, midventral, without prominent lips and lies somewhat nearer the head than the tail (fig. 1, v.).

The anus also has no prominent lips and lies in the midventral line.

Behind the anus, the tail (fig. 2) narrows rapidly and then again more gradually, forming a sharp spine.

The body wall is of the meromyarian type. The lateral lines measure ·039 mm. in breadth shortly behind the oesophageal bulb.

Internal organisation.—Oesophagus. The anterior extremity is slightly thickened, but the greater length of the organ is cylindrical and of uniform calibre. It moves and bends with the retraction or protraction of the head.

The anterior portion of the oesophagus, ·0187 mm. in length, is marked off by a transverse diaphragm of closely set muscle fibres, corresponding to the pharynx described by Dujardin in *Heterakis brevicaudata*.

The lumen of the oesophagus is of the usual triradiate form with a tubular dilatation at the outer end of each radius such as also occurs in *Oxysoma kachugae*, mihi, and which is described by Schneider (9) in *Asc. ferox*, Ehrbg. At its posterior extremity it expands to form the chestnut-shaped bulb, which possesses a triradiate lumen, the inwardly projecting angles of which are armed with chitin.

The bulb is succeeded by a pear-shaped dilatation of the intestine, but behind this the intestine is compressed by the reproductive organs.

Males (fig. 4) are relatively infrequent. Only three specimens were found among a large number of females. They measure ·99–1·07 mm. in length; relatively more stout than the females.

The head probably has the same structure as in the female, but the three membranous lips have not been observed by the present writer. The three teeth arising from the anterior end of the oesophagus are distinct. The head can be withdrawn. The anterior portion of the oesophagus is marked off by a diaphragm. Lateral lines extend from head to anus. Ventral pore as in female.

The cuticle of the body is transversely striated. The striae measuring ·0017 mm. in breadth. The head and tail are unstriated.

The anogenital aperture (figs. 7 and 8) is enclosed in front and at the sides by a fine bursal membrane, which is supported on each side by three papillae shaped like delicate nine pins. A row of three additional papillae lies in front of the bursa on either side.

Thus the characteristic three preanal ⊕ and three perianal papillae of the genus *Oxysoma* are found.

The tail is sharp pointed but relatively stouter than in the female. Postanal papillae (fig. 6) occur, seven pairs on the ventral half of the tail and six pairs on the dorsal half.

The spicules (figs. 8, 9, 11, 12) two in number, are long, measuring each $\frac{1}{5}$ of the body length. They are stout hollow cylindrical structures, ·013 mm. in thickness. In one specimen the wall of the cylinder is so thick that vacuoles can be observed in it. Two muscular bands are attached to the anterior end of each spicule.

The gonads appear to consist of a single tube divided into an upper testicular region, a large seminal vesicle and a short vas deferens.

The species is named in honour of my teacher and friend Professor MacIntosh of St. Andrews.

Comparison of this species with species described by Dujardin (3).

(*A.*) **Heterakis acuminata,** Schrank. The Lucknow specimens differ from *Heterakis acuminata,* Schrank, as described by Dujardin, in that the males possess long spicules ($\frac{\text{Sp. length}}{\text{T.L.}} = \frac{1}{5}$), not short spicules.

(*B.*) **Heterakis brevicaudata,** Duj. They agree with the *Heterakis brevicaudata* of Dujardin in characters of generic value, namely: (i) as regards the head, "tête obtuse, à trois lobes peu distincts, non mucronés, separés a l'intérieur par des pièces cornees" "Pharynx long de ·05. mm. à trois angles—et séparé de l'oesophage par une sorte de diaphragme armée de trois pointes horizontales" may be the same structure as the anterior portion of the oesophagus described above. A specimen of *Oxysoma* sp.? from the rectum of an English specimen of *Rana temporaria* (kindly given to me by my friend Dr. Dobell) exhibits the structure of the head identical with that of the Lucknow specimens. Dujardin's specimens were obtained in Paris and Rennes; (ii) as regards the tail of the male—"Mâle à queue..munie de deux membranes trèsétroites et de deux rangées de..papilles..; deux spicules trés-longs.

They however differ from this species in many characters. (i) Size—females not longer than 2·78 mm., whereas *H. brevicaudata,* Duj., measures 4·5–6 mm. The relation $\frac{\text{Mx. Br.}}{\text{T.L.}}$ equals $\frac{1}{13}$ as contrasted with $\frac{1}{25}$ in *H. brevicaudata.* (ii) The vulva is in front of the middle, in *H. brevicaudata* it is behind the middle. (iii) $\frac{\text{Postanal length}}{\text{T.L.}}$ in ♀ equals $\frac{1}{6}$: in ♂ equals $\frac{1}{5}$, contrasted with $\frac{1}{20}$ in both sexes in *H. brevicaudata.* (iv) Papillae of tail in ♂ 6 pairs contrasted with 13 in *H. brevicaudata.* (v) Spicules strong, stout,

hollow cylinders, not "trés-minces trés-flexibles..terminés en pointe falciforme très-aiguë." (vi) Viviparous not oviparous.

Comparison with **Oxysoma brevicaudatum**, *Zeder as described by Schneider* (19).

Schneider's specimens were "immature" and engaged in moulting. He nevertheless identifies them with *H. brevicaudata*, Dujardin, and on the results of his examination of these dubious specimens criticises adversely and corrects Dujardin's definition.

The Lucknow *Oxysoma* is smaller, since Schneider's measurements are given as ♀ 5·5 mm. ♂ 3 mm. In Schneider's species the $\frac{\text{Hd.—Vulva}}{\text{V.—Tail}}$ is $\frac{1}{\cdot 84}$ and the male does not bear a bursa.

Comparison with **Oxysoma contortum**, *v. Linstow* (7) from the large intestine of *Bufo vulgaris*, Korfu. This species measures

♂ 5·4 long by ·3 mm. in Br.
♀ 5·9 ,, ,, ·35 m. in Br.

the males are therefore more than five times as long as those of *Oxysoma macintoshii*, the females about three times as long; the species does not exhibit the marked difference in size between males and females. The relation of $\frac{\text{Br.}}{\text{Length}}$ in the male is very different, $\frac{1}{18}$, contrasted with $\frac{1}{8} - \frac{1}{10}$ in *O. macintoshii*. The spicules are relatively much longer $\frac{\text{Length of spicule}}{\text{T.L.}}$ in *O. contortum* $= \frac{1}{2 \cdot 8}$ in *O. macintoshii* $= \frac{1}{5 \cdot 8}$. Caudal papillae of ♂ in *O. contortum* preanal 12, postanal 6 pairs, in *O. macintoshii* preanal 6, postanal 13 pairs.

In the female, the vulva is behind the middle of the body in *O. contortum*, in front of it in *O. macintoshii*. $\frac{\text{Postanal L.}}{\text{T.L.}}$ in *O. contortum* $\frac{1}{37}$ in *O. macintoshii* $\frac{1}{5} - \frac{1}{6}$.

The following two species of *Oxysoma* have been described in recent years from batrachians:

Oxysoma tuberculatum, v. Linst., from *Megalophrys montana* (10) differ from *O. macintoshii* in possessing six lips each bearing a thorn-like spine: the immature female measures 4·5 mm.

O. terdentatum, v. Linst. (9) from the gut of *Triton cristatus*. Head with three lips, each lip with two papillae. The oesophagus projects between the lips forming three rounded projections each of which is armed with a tooth (So far agrees with *O. macintoshii*). The oesophagus has no enlargement (Herein differing from *O. macintoshii*) ♀ — 15 mm.—br. ·46 mm.

v. Linstow gives a poor figure of the head of *O. brevicaudatum*. Zed. in (8). The figure does not show any teeth.

2. Oxysoma kachugae, sp. nov.

Pl. xxix, figs. 13–16.

From intestine of *Kachuga lineata*, Gray: Lucknow.

A single female specimen was found. For measurements see table II, page 186.

The head (figs. 13, 14) is expanded like the head of a nine-pin. Body diminished in breadth uniformly from the middle toward either extremity. The tail (fig. 16) is moderately sharp pointed and curved on itself at the tip.

The head bears three flattened lips, one dorsal, two subventral, which are entirely composed of cuticle. Each lip is however supplied with two forked papillae of corium. As can be seen in fig. 13 the outer branch of the papilla is flask-shaped and parallel with the length of the body, the inner is thinner and inclined inward. The corium from which these papillae spring surrounds the commencement of the oesophagus.

The cuticle is transversely striated, the striae being very uniform in breadth.

There are narrow lateral membranes.

The vulva is a narrow slit in the ventral line without prominent lips.

The anus has slightly prominent lips.

The oesophagus (fig. 15) is divided into three sections: (1) ·074 mm. long, represents the 'pharynx' of Dujardin. Its anterior extremity is dome-shaped—the dome rising into the space between the lips. Three fine tubular structures—one ventral, two subdorsal—are found in this portion, and are doubtless tubular dilatations of the outer ends of the radii of the oesophageal lumen. The body of this part of the oesophagus shows the same muscular structure as the remainder of the organ. Part 1 is separated from part 2, by a transverse diaphragm. (2) 1·416 mm. long, shows three fine cuticular tubes corresponding with those of part 1. The tubes, however, do not appear to be continuous with those of part 1, but are separated from them by the diaphragm. Their anterior extremities are dilated (fig. 15), and it is the cuticle lining these dilatations, which produces the appearance of teeth referred to by Dujardin. With the exception of a short portion at its anterior end, this part of the oesophagus is of a dark brown colour. The colour ceases abruptly at the commencement of the bulb. Special aggregations of this pigment occur on the surface of the organ in the median and lateral lines ·272 mm. from the head. (3) The bulb is pear-shaped ·425 mm. long.

The intestine is dilated at its commencement where it embraces the bulb, but further back is compressed by the gonads. It is coloured in the same manner as the oesophagus.

Impregnation with this colouring matter renders the reproductive organs difficult to decipher. The vagina is apparently non-

muscular and runs forward. There appear to be two uteri and ovarian tubes.

The ventral pore is small, 1·275 mm. from the head. Lateral lines were not distinguished. A nerve ring was also not seen.

This specimen agrees with *Oxysoma falcatum*, v. Linst. (14a) from the intestine of *Geoemyda* (*Nicoria*) *trijuga*, Schweigg. in size, general shape, structure of head, proportion $\frac{\text{Oes. L.}}{\text{T.L.}}$, and proportion $\frac{\text{Hd.—Vulva}}{\text{V.—Tail}}$. It differs from it in possessing a striated cuticle and in the proportion $\frac{\text{Postanal length}}{\text{T.L.}}$ which is $\frac{1}{8·6}$ instead of $\frac{1}{14}$ as in *O. falcatum*.

3. **Heterakis macronis**, n. sp.

(Pl. xix, figs. 17–24. Pl. xx, figs. 25–34.)

Seven specimens, four males and three females, were found in the intestine of *Macrones aor*, Ham. Buch., obtained from the market, Lucknow. They are delicate hair-like animals. Their absolute and relative measurements are given in table III, page 186. The greatest diameter of the body is situated at the posterior end of the oesophagus, and the breadth of the body diminishes rapidly toward the head, gradually toward the tail. In the majority of fixed specimens, the anterior end of the body is curved toward the dorsum. The tail of the male curves toward the ventral surface.

The head (figs. 17, 18 and 19) is rounded and very slightly greater in diameter than that part of the body which immediately succeeds it. There are no lips (figs. 18 and 19). The mouth is formed by a shallow funnel-shaped depression in the anterior end of the oesophagus, and is surrounded by a ring of slightly thickened cuticle. This ring is somewhat thicker in the ventral than in the dorsal segment; the anterior end of the oesophagus is also slightly more prominent in the ventral than in the dorsal segment, consequently the transverse plane of the mouth is tilted very slightly toward the dorsum. Viewed in the sagittal plane (fig. 17), the same cuticular ring is visible, and it can be seen that it is carried outward in the two midlateral lines to form ribs, which support the commencement of the lateral membranes. Cephalic papillae, if present, are very small and do not raise the cuticle.

The lateral membranes (figs. 17 and 24–34) extend from the head to a level shortly in front of the anus. At the head they are supported by sickle-shaped thickenings of their outer and anterior margins. They increase rapidly in breadth to a maximum of ·048 mm. at the level of the end of the oesophagus. At this level the breadth of each membrane is equal approximately to half the diameter of the body. At a distance of ·56 mm. from the head a thread-like process of protoplasm passes outward from the lateral line in the substance of the lateral membrane to the outer margin of the latter structure (fig. 24). This is doubtless a sense organ.

In cross section the lateral membrane has the form of an equilateral triangle.

The cuticle is entirely plain and unringed.

The lateral lines measure 0238 mm. in breadth in the oesophageal region. Lateral canals are not visible.

Female.—The tail of the female (fig. 20) is sharply conical, the anus is situated ·25 mm. from the tip. The body cavity of the tail is occupied by a glandular mass. The vulva is situated at the junction of the middle and posterior thirds of the body. It is a transverse slit extending through one-third of the circumference of the body. The internal reproductive organs of the female will be described in a later paper.

Male.—The tail of the male when viewed in profile is seen to be arched on the dorsum and flattened on the ventral surface by the formation of the bursa (figs. 21 and 22, 33 and 34). It is terminated by a sharp narrow caudal appendage ·073 mm. in length. The region of the tail which carries the bursa measures ·44 mm. in length, both the transverse and sagittal diameters are enlarged compared with that portion of the body which immediately precedes it. The bursa is formed by two flatly semicylindrical cushions applied lengthwise to the body between the midventral and lateral lines (figs. 33, 34). The anterior boundary is marked by the sucker (fig. 22), the posterior by the base of the caudal appendage (fig. 21).

Five rows of papillae occur on the surface of the bursa—two sublateral and two subventral on the cushions, and one median ventral in the space between the cushions. The sublateral series consists of three papillae with finger-like pulpae: (i) (numbered from behind forward) situated dorsal to the posterior end of number 1 subventral papilla; (ii) dorsal to the anterior end of number 2 subventral; (iii) dorsal to the interval between numbers 2 and 3 subventral.

The subventral series consists of eight papillae—numbered again from behind forward they are situated and shaped as follows: (1) at the posterior end of the bursa, large and capsule-like showing a tendency to division into two compartments; (2) immediately in front of 1, capsule-like but somewhat smaller; (3) shortly behind the anus; (4) shortly in front of the anus; (5) opposite the junction of the vas deferens and intestine with the cloaca; (6) midway between the anus and the sucker; (7) opposite the sucker; (8) 14 mm. in front of the sucker.

The median series consists of two papillae which are slightly raised above the surface—1m. shortly in front of the anogenital aperture; 2m.—shortly in front of the termination of the vas deferens.

The space between the two cushions is flat and contains the anogenital aperture and sucker. The former is surrounded by a ring-like thickening of cuticle. The latter is slightly raised above the surface and resembles a flattened volcano. It does not possess a cuticular cup. It is situated ·45 mm. from the tip of the tail.

The spicules (fig. 23) are two in number and are so delicate that they are invisible when not extended. Each spicule measures ·0765 mm. in length; is hollow at its base (figs. 33 and 34), where it measures ·0068 mm. in breadth. Toward the point it becomes flattened and bears five longitudinal ribs on its outer and posterior surface. It has a reversed S-shaped curve, curving outward and backward at the tip. An accessory piece has not been observed.

The testis is a single tube which is sharply bent upon itself. The fundus (fig. 31) lies 1 mm. in front of the tip of the tail. From the fundus the testicular tube runs forward to the mid-point of the body where it comes in contact with the body of the ventral gland. It here bends abruptly and runs backward (fig. 26). After the bend the sperm mother cells are arranged in a definite cylinder, the nuclei around the periphery. The testis is succeeded by a dilated thin-walled seminal vesicle (fig. 31), and this in turn by a thick-walled ductus ejaculatorius (figs. 32–35). The junction of the rectum and ductus is surrounded by unicellular glands the cells belonging to the lateral and midventral lines (fig. 34). The glands have well-developed tubular ducts.

Ventral gland. At the middle of the body a large unicellular gland occupies the ventral half of the body cavity (fig. 25) The protoplasm of this cell stains only with difficulty, is granular and contains two canaliculi in its substance. Shortly behind the middle of the body this cell divides into two finger-like processes (fig. 26), which as they run backward come into more and more close relationship with the two lateral lines (fig. 27), ultimately running in the substance of the lateral lines (fig. 28). The processes can be traced to the three-quarter point of the body length. The canaliculi are visible throughout the entire length of the processes and acquire thickened walls as they run backward. Behind the level at which the processes can be recognized, fine ducts are to be seen in the lateral lines which doubtless open into the canaliculi. These ducts can be recognized as far back as the level of the anus.[1]

Alimentary canal. The oesophagus (fig. 17) is simple and club-shaped. Its walls are darkly pigmented behind the nerve ring. There is no short anterior segment divided off by a transverse diaphragm (pharynx of Dujardin) as in *Heterakis vesicularis*. There is no oesophageal bulb.

This species is placed temporarily in the 'genus' *Heterakis* pending a thorough revision and division of the group. It does not belong to the genus as defined by Dujardin, since (1) it is devoid of lips and of a 'pharynx,' (2) it has no oesophageal bulb, (3) the spicules are equal, (4) the caudal papillae of the male are

[1] The form of this gland is of interest in connection with the evolution of the excretory organs of Nematodes. See Jägerskiöld, Zool. Jahrbb. Anat., Bd. vii, p. 449, and the present writer, Q. J. M. S., vol. L, p. 141.

arranged in three series. On the other hand it resembles Dujardin's *Heterakis* in the following points; (1) the two uterine branches are opposed; (2) lateral membranes are present, (3) the tail of the male bears a sucker and papillae. It cannot be included in Dujardin's genus *Dacnitis* on account of the absence of the characteristic anterior enlargement of the oesophagus.

Schneider's '*Heterakis*' includes many genera. *H. macronis* should be included in the same group as *H. distans*, R., a parasite of *Simia sabaea*, which it resembles in the absence of lips and of a chitinous ring in the sucker. This group is identical with *Heterakis*, *Acheilostomi* of Railliet (18, p. 409) characterized by 'bouche sans lèvres, deux spicules égaux assez courts, ventouse sans anneau chitineux.' Railliet identifies *Heterakis*, *Acheilostomi* with *Stelmius* of Dujardin and *Subulura* of Molin. The species at present under consideration differs from *Stelmius* in the fact that the vulva lies in the middle of the body length and not shortly in front of the anus.

4. **Dacnitis callichroi**, n. sp.

(Pl. xxi, figs. 35–38.)

Two females were found in the intestine of *Callichrous macrophthalmus*, Blyth, from Lucknow. Owing to contraction in the preservative (Looss' fluid) the body wall has been thrown into wrinkles to a considerable extent, which diminishes the value of the measurements.

They are moderately plump worms; for measurements see table IV, page 187. The region corresponding to the anterior two-thirds of the oesophagus is narrower than the remainder of the body (fig. 35). The head (figs. 36 and 37) is rounded. The mouth is of the usual *Dacnitis* type, of elongated lozenge-shape, the long axis lying in the sagittal plane, with its aperture directed forward and to the dorsum. It is surrounded by the usual membranous collar springing from a cuticular thickening resembling a wire frame. Each side of the collar bears 32–36 longitudinal striae. There are four cephalic papillae—two subdorsal, two subventral. The head does not curve toward the dorsum.

No lateral membranes.

The cuticle is not striated in the anterior oesophageal region, but is transversely striated from the posterior oesophageal region backward. The striae are caused by fibrillae lying in the deeper layer of the cuticle and encircling the body. Intervals between the striae ·002 mm. in the anterior half, ·0012 mm. in the posterior half of the body.

The vulva is narrow and oval, not prominent, in the mid-ventral line, $\frac{H-V}{V-T}=\frac{1\cdot4}{1}$

The tail (fig. 38) is conical and pointed, and bears a prominent papilla on either side, slightly behind the mid point between the anus and tip of the tail.

The anus (A—T=·2 mm.) is broad transversely and has a prominent anterior lip.

The oesophagus (fig. 35) has the form usual in the genus. Circumoesophageal nerve ring not seen. A large unicellular gland lies on one side of the oesophagus.

Female gonads. The vagina runs forward from the vulva for a distance of ·55 mm. and is furnished with thick walls. The uteri (two, anterior and posterior) are distended with eggs which possess thin shells. The usual coiled ovarian tubes are visible in front of and behind the uteri.

Discussion of the systematic position. Comparison with :—

1. **D. foveolata,** R. (*vide* Dujardin (3) p. 270. Schneider (19) p. 74) = *D. esuriens,* Duj.

D. callichroi is a much more stout animal $\frac{\text{Br.}}{\text{T.L.}} = \frac{1}{17}$ contrasted with $\frac{1}{43}$ in *D. foveolata.*

In figures 39 and 40, representations are given of the head and oesophageal region of *D. foveolata,* R., from *Pleuronectes platessa* (collected at Plymouth) for comparison with figs. 36 and 35, respectively. Some measurements from *D. foveolata* are also included in table IV (see page 187). The difference in the relation $\frac{\text{Oes. Br.}}{\text{Oes. L.}}$ is very marked.

2. **D. abbreviata** R. (Dujardin, p. 269), in *Perca cirrosa.* The description of this species is insufficient for recognition.

3. **D. globosa,** Duj. (Dujardin, p. 269) from *Salmo fario*—is a larger animal than *D. callichroi* ♀ =16 mm., is thinner $\frac{\text{Mx. Br.}}{\text{T.L.}} = \frac{1}{55}$ $\frac{\text{Post an. L.}}{\text{T.L.}} = \frac{1}{50}$ ($\frac{1}{39}$ in *D. callichroi*). The head bears a tubercle on its dorsal aspect which is absent in *D. callichroi.*

4. **D. hians,** Duj. in *Muraena conger.* A larger animal than *D. callichroi,* length 20·7 mm. contrasted with 6–7·5 $\frac{\text{Br.}}{\text{T.L.}}$ $\frac{1}{39}$ contrasted with $\frac{1}{17}$.

5. **D. sphaerocephala,** Rud. fr. *Acipenser microcephalus,* a larger animal, ♀ length 15·6 mm.; and thinner $\frac{\text{M. Br.}}{\text{T.L.}} = \frac{1}{26}$ not $\frac{1}{17}$. $\frac{\text{Post anal}}{\text{T.L.}} = \frac{1}{56}$ not $\frac{1}{39}$. Ova smaller — ·052 × ·027 contrasted with ·085 × ·055.

6. **D. squali,** Duj., a larger animal, ♀ length 18·5 mm., and thinner $\frac{1}{37}$ (contrast $\frac{1}{17}$). $\frac{\text{Post Anal L}}{\text{T.L.}} = \frac{1}{56}$ (contrast $\frac{1}{39}$). $\frac{\text{Hd. V.}}{\text{V.T.}} = \frac{1}{6}$.

7. **D. rotundata,** Mol. (Molin (16) from *Cantharus vulgaris,* Padua, description of ♀ insufficient for recognition.

5. **Spiroptera denticulata,** Rud., var. **minor,** nov.

(Not *Spir. denticulata,* Molin—from *Merops apiaster* and *Falco palumbarius*).

(Pl. xxi, figs. 41-43.)

Two male worms from the stomach of *Wallago attoo*, Bl. Schn., from Lucknow.

For measurements see table V (page 188).

Elongated cylindrical animals expanding in club-like manner at the anterior extremity. The body divided into a series of rings, each of which in the anterior $\frac{1}{3}$ of the body bears a circle of cuticular hooks. Fig. 41 represents the head of one specimen, and shows the cone at the apex of which the mouth opens, and the expanded 1st, 2nd, 3rd and 4th rings.

The hooks are strong outgrowths of cuticle ·0238 mm. in length on the 2nd ring. There are 26 on the 1st ring, 22 on the 2nd, and 20 on the 3rd ring.

The tail (fig. 42) is flattened on its ventral surface, ·277 mm. from the tail end, to form spear-head-shaped adhesive surfaces, the margins of which are sharpened and supported by papillae.

The number of these papillae is as follows:—

Spec. 1.	Right side—Preanal 6.	Postanal 6.	
	Left side	,, 4.	,, 5.
Spec. 2.	Right side	,, 4.	,, 5.
	Left side	,, 4.	,, 6.

The preanal group is separated from the postanal by a distinct gap.

The two spicules are unequal, the right is short and pointed, the left (fig. 43) long ($\frac{1}{4}$ of the body length) and has a curious foot-shaped termination.

It measures ·015 mm. in length. The spicules can be moved independently of one another; in both specimens the right spicule is extended, but the left is withdrawn in the one and extended in the other.

The lateral lines are relatively narrow, $\frac{1}{8}$th of the breadth of the body and show a line in their centre which may represent the longitudinal canal. The animal therefore belongs to the family Secernentes of v. Linstow.

The mouth is devoid of lips, narrow and circular, situated at the end of the oral cone. A tubular pharynx leads from the mouth to the anterior end of the oesophagus; it is slightly curved, and has a very fine cuticular lining. The oesophagus is broadest at its anterior extremity where it expands like the capital of a pillar, and decreases steadily in its first third. The second two-thirds are uniformly cylindrical. Before joining the intestine it forms one complete loop by curling upon itself. There is no bulb.

A nerve ring or ventral pore have not been observed.

The single testis commences ·7 mm. from the anterior extremity and measures ·5 mm. in length. It is followed by the seminal vesicle ·185 mm. long which ends at the base of the left spicule and by a ductus ejaculatorius measuring ·481 mm.

Systematic Position.—The two specimens agree with *Spiroptera denticulata*, R., as described by Schneider (19) except (1) in size—(being only $\frac{1}{5}$th of the length of *S. denticulata*), (2) in the number of spines on each ring—*S. denticulata* bears 56 per ring on the head, (3) the bursal edges are shown as cushion-like in *S. denticulata* by Schneider, whereas they appear sharp in the variety. Schneider does not refer to the remarkable left spiculum.

6. **Atractis kachugae**, n. sp.

(Pl. xxi, figs. 44–47. Pl. xxii, figs. 48-49.)

A large number of small organisms found in the intestine of *Kachuga lineata*, Gray: Lucknow. They were so abundant that the water used for washing the intestine appeared to swarm like a magnified bacterial culture.

The specimens vary in degree of maturity, some possessing merely the rudiments of sexual organs, such as specimen 41/1/1, others, such as 41/1/3, possessing fully developed sexual organs, others, such as 41/4/-, containing larvae in utero.

For measurements see table VI, page 189). It will be observed that they are fine and delicate organisms, the maximum breadth not exceeding 2·4% of T.L. The head is truncated, the maximal breadth lies at the end of the oesophagus at 20% of T.L. (except when the body is distended by larvæ). The tail is long and fine.

The head bears a circle of six lips—two lateral with simple peg-like pulpa and four submedian which possess a pulpa of a curious cross-like figure springing from a thick pedestal. The form of these lips is best appreciated by referring to fig. 44.

Lateral membranes (fig. 45) measuring ·0085 mm. in depth run from the level of the 2nd bulb to behind the anus. A fine cuticular transverse ringing is visible on some specimens only and is probably artificial. The vulva is a transverse slit with slightly prominent lips ·102 mm. in front of the anus.

The anus is not prominent.

Genital papillae in the male. Two pairs of simple papillae preanal and one postanal (fig. 47). The tail of the male is curved to a right angle with the rest of the body at the anus (fig. 49).

Internal organisation.—Alimentary canal. The anterior end of the oesophagus is square and lies at the level of the bases of the lips. The anterior portion of the body of this organ, ·005 mm. in length, is marked off by a ring of vacuoles between the muscle fibres. The remainder is again divided into two portions, each portion terminated by a bulb. The anterior portion shows definite muscular striation, the posterior is granular in appearance. The anterior bulb is fusiform, the posterior pear-shaped, and the

latter contains three semi-circular thickenings of the cuticular lining constituting a grinding apparatus.

The intestine presents no features of note.

No oesophageal nerve ring or ventral pore have been observed.

Reproductive organs of male.—Three pairs of simple papillae referrred to above, in the anogenital region, two preanal, one postanal. Spicules two unequal (fig. 48). Right, short, ·0925 mm. measured in a straight line from head to tip and ·0042 mm. in maximum breadth, nail-shaped with a distinct closed head. Left, long, ·187 mm. in length, ·005 mm. in breadth, simple tubular, narrowing toward the tip, with head slightly expanded, open and receiving insertion of a retractor muscle.

Testis single tubular. Fundus lying dorsal to alimentary canal ·68 mm. from head. Cells at fundus spherical. As it passes backward the tube curves round the left side of the intestine to assume a ventral position, the cellular contents are large square cells with large round distinct nuclei. At a distance of about ·25 mm. from the fundus the cells change abruptly in appearance, the protoplasm becomes filled with small granules. A long simple vas deferens, lying in front of intestine and spicules, leads into the cloaca.

Female reproductive organs (fig. 46).—In immature specimens (measuring ·217 mm. in length) the female gonads are represented by a flattened and elongated group of cells lying ventral to the intestine. The cells are large and angular and contain large spherical nuclei. In the adult (2·63–3·06 mm.) only a single functional ovary is to be found, which is conical in shape, the apex of the cone (the fundus) directed backward. The cellular contents are of the usual type, ova broad and disc-shaped at the junction of ovary and caecum. The caecum contains two large ova and also a considerable number of other smaller cells which appear to arise from proliferation of the wall cells. Attached to the anterior end of the caecum is a cellular appendix possibly representing a second ovary. The opening of the caecum into the uterus lies close to the ovarian opening. The uterus is an elongated spindle-shaped sac. At its anterior extremity its walls are thickened to form a sphincter. In young adults it contains spermatozoa—sometimes in large numbers. A cellular gland surrounds the junction of the uterus and the caecum. In older specimen (3·06 mm.) the uterus contains from 6–8 larvæ, some doubled on themselves, others fully extended but never coiled or enclosed in a shell. The larvae distend the uterus from the sphincter to the vulva.

The following species of *Atractis* have been described up to the present:—

(1) **Atractis dactylura** Duj., from *Testudo graeca*. (Dujardin —(3) p. 654. Diesing (2) ii, p. 151. Schneider (19), p. 124. V. Linst. (11), p. 516.

This species has a two-horned uterus and only one oesophageal bulb—Schneider. The porus excretorius is very prominent and surrounded by a ring of chitinous rods—v. Linst.

(2) **Atractis opeatura,** Leidy. (Leidy (5), p. 410), from the intestine of the iguana *Cyclura baeolopha,* Cope, Australia. The head is tripapillate, ♀ and ♂ both 5 mm. long.

(3) **A. hystrix,** Dies. (Diesing (2) p. 188) from *Podocnemis erythrocephala,* America.

(4) **A. perarmata** v. Linstow (v. Linstow (11), p. 516, from *Cinixys belliana,* German East Africa, ♂ 5·6 mm. ♀ 6·2 mm. Spicules of ♂ almost equal.

(5) **A. cruciata,** v. Linstow (v. Linstow (12), p. 29) from *Metapoceros cornutus,* Daud. Haiti, ♀ 6·2 mm.

(6) **A. fasciolata,** Gendre. (Gendre. (4), p. 30). I have not been able to obtain a copy of this article.

7. **Physaloptera,** sp. Larva.

(Pl. xxii, figs. 50–51.)

Two specimens were found encysted in the wall of the urinary bladder of *Bufo stomaticus,* Lütken (=*B. andersoni,* Blgr.[1]) at Lucknow. The cyst wall consisted of an outer capsule of loose connective tissue and an inner membranous capsule. The embryo was coiled up within the cyst.

The measurements of one specimen are given in table VII, p. 190.

The body (fig. 50) tapers slightly and gradually toward the head, abruptly at the conical tail.

The head (fig. 51) is surmounted by two lateral lips, each of which bears a nipple-shaped tooth at its apex. Each lip is shaped roughly as the half of a hemisphere, the two lips together forming a hemisphere. On the inner aspect of each lip a flat triangular area (1) projects slightly inwards, the apex of which forms the tooth referred to. The outer aspect of each lip bears two papillae, one subdorsal, one subventral. The third, lateral, pair of papillæ, which occur in *Physaloptera* have not been distinguished in this larva. Even in the adults of the genus they are however flat in contrast with the raised submedian papillae. The two circular spots marked 2 and 3 are situated on the internal face of the left lip, (2) in the base of a flagellum.

The anus is a narrow slit.

The rudimentary vulva (?) a transverse slit-like depression in the cuticle, is situated somewhat behind the midpoint of the body.

The rings of the cuticle are highly irregular.

The oesophagus is divided into two sections: (1) Anterior shorter section—muscular and with lumen lined with cuticle; the anterior end somewhat broader than the remainder and forming the floor of the interlabial space. The nerve ring surrounds this portion. (2) Posterior longer section somewhat narrowed anteriorly, but uniform in diameter for the greater part of its length. Histological structure shows a parenchymatous appearance. The lumen is not lined by cuticle.

---

[1] See Annandale, *Rec. Ind. Mus.* III, p. 283.

The intestine is dilated where it receives the oesophagus.

The rudimentary gonads extend from the junction of the oesophagus and intestine to the anal canal, and lie ventral and to the side of the intestine.

Systematic position.—After considering the structure of the head and of the oesophagus little doubt remains that we are dealing with a *Physaloptera*. The two lateral lips with their teeth and papillae are characteristic. The division of the oesophagus into an anterior muscular and a posterior glandular section also occurs in this genus,—compare *Physaloptera clausa*, Rud. (Dujardin, p. 85).

The adult doubtless inhabits a snake or bird.

The only adult *Physaloptera* recorded from an amphibian is *Physaloptera amphibia*, v Lin., which inhabits the oesophagus and stomach of *Rana macrodon*, Kuhl., in the island of Luzon (v. Linstow (13), p. 15).

8. **Ascaris**, sp. Larvae (L. 33, 36).

(Pl. xxii, figs. 52, 53, 54.)

Larvae (L. 33 and 36)[1] from the peritoneal cavity of *Wallago attoo*, Bl. Schn. and *Callichrous pabda*, Ham. Buch.: Lucknow and Calcutta, numerous specimens encysted For details of measurements refer to table VIII, columns 36 and 33 (page 191).

The head (figs 52, 53), bears three lips of which the dorsal and right subventral are less prominent than the left subventral. The latter is apparently used as a boring organ and carries a thickened cap of cuticle which is either sharply conical or more rounded and surmounted by a nipple-like projection. The surface between the lips is formed by the body wall and not by the anterior extremity of the oesophagus as in L. 15. No cephalic papillae observed. The head is separated from the body by a slight constriction, ·033 mm. from the anterior extremity, and behind this constriction the cuticle shows a succession of rings for a distance varying from ·18 to ·646 from the head.

The tail is represented in fig. 54. There is no definite caudal appendage.

Oesophagus:—The anterior end is sharpened by portions cut out opposite the three lips. Oesophageal and intestinal diverticula are present, the former ·731 mm. long, the latter ·935 mm.

9. **Ascaris**, sp. Larvae (L. 15).

(Pl. xxii, figs. 55, 56.)

Two specimens from the peritoneal cavity of *Wallago attoo*, Bl. Schn. They were free, moveable and extended, not encysted and coiled up.

---

[1] Numbers preceded by an L. are serial numbers of the specimens.

The measurements are given in table VIII, col. 15 (see page 191).

T.L. 25 and 30 mm. One sp. (i. 30 mm.) showed rudiments of ♀ organs, the second gave no indication of sex. They taper very slowly and uniformly from the middle to the head, which is truncated; the posterior half is of fairly uniform diameter and the posterior end tapers more abruptly than the anterior.

The head bears two short conical horns—dorsal and ventral, composed partly of thickened cuticle, but also resting on a raised pulpa. From each horn two fillets of thickened cuticle curve, one on either side, to meet in the midlateral lines. These fillets form the anterior margin, a ring of thickened cuticle which surrounds the head. On this ring are situated four submedian papillae, two submedian dorsal, two submedian ventral. Between the horns the anterior end of the body of the oesophagus projects in front of the fillets.

Intestinal and oesophageal diverticula are present, the latter long and narrow. Both the oesophagus and its diverticulum are of a black-grey colour.

One specimen contains developing sexual organs, vulva and single gonad tube, which latter lies on the left side of the intestine.

The tail is conical, but its shape varies according to the state of contraction or relaxation of a circular band of muscle which surrounds the body at the level of the anus.

Probably the larva of an *Ascaris* belonging to Schneider's group C. or D.

10. Larva undiagnosed. (L. 30).

(Pl. xxii, figs. 57–60. Pl. xxiii, figs. 61, 62.)

A single specimen obtained from the intestine of *Wallago attoo*, Bl. Schn. Lucknow. It exhibits only the rudiments of sexual organs. Length 4·67 mm. For measurements see table VIII, column 30 (page 191). It narrows fairly abruptly toward the head (fig. 57), more gradually toward the tail. The head is of a flattened dome-shape with a rounded funnel-shaped mouth (fig. 58) and two conical horn-like processes—one dorsal, one ventral.

The lateral lines (figs. 61, 62) are broad and divided into two sections longitudinally, each occupies about $\frac{1}{8}$th of the circumference of the body; musculature is meromyarian. Transverse rings appear to be artificial.

The postanal region (fig. 60) is short and conical, and bears a small caudal appendage. The anterior lip of the anus is very prominent and broad, and measures half the length of the tail.

The oesophagus (fig. 51) occupies the region measuring ·56 mm. from the head. It is contorted and without a bulb.

The intestine presents nothing of note. Neither oesophageal nor intestinal diverticula are present.

In the posterior oesophageal region a peculiar spine lies embedded in the right side of the body wall, extending from the

dorsal line to the right lateral line, the sharp point lying in the latter, the base in the former (fig. 57).

The pore of the ventral gland is situated ·27 mm. from the head in the ventral line, and the gland extends from this point backward to about 2 mm. from the head (figs. 57, 59, 61, 62). It consists of a bulky hyaline body, somewhat of a yellow colour in unstained preparations. It is closely applied to the ventral surface of the intestine and oesophagus, and the anterior portion is divided into several lobes. A thread-like duct traverses the entire organ, but in the portion which was cut in sections this ' duct ' did not exhibit a patent lumen.

Two narrow cellular cords applied to the posterior end of the ventral gland probably represent the rudiment of the gonads.

It is not possible to diagnose this larva more exactly than as belonging to the meromyaria.

11. **Larva undiagnosed.** (L. 14):

(Pl. xxiii, figs. 63–65.)

Two immature worms from the stomach of *Wallago attoo*, which cannot be referred with certainty to any genus, from the same locality.

The measurements are given in table IX (page 192).

There are no lips (fig 63). The mouth is circular and leads into a barrel-shaped buccal cavity. The walls of this cavity are cuticularised, brown in colour, thinnest in front, thickening to the equator (*a*), then again becoming somewhat thinner with a thickened ring at the posterior extremity (*b*).

The cuticle of the body covering shows annular markings on its outer surface, of irregular breadth (·0017–·0034 mm.) on the anterior half of the body, more regular (·0017 mm.) on the posterior half.

The anus (figs. 64, 65) opens in a broad transverse cleft ·0374 mm. from the base of the caudal spurs, and ·0544 mm. from the tip of the tail.

The caudal spurs (figs. 64, 65) are two in number, subventral, conical in shape, and equal in size to the tail.

Internal structure—The oesophagus (fig. 63) is simple and without a bulb. At its commencement it is twisted. It possesses the usual triradiate lumen, its substance is hyaline in appearance and devoid of distinct muscular fibres

The intestine is divided into two sections, the first with finely granular walls and a straight lumen, the second and longer section with curved transverse markings.

These larvae cannot be referred with certainty to any genus. The oesophagus is the organ which shows the greatest constancy in the transition from larval to adult life, and in this respect the larvae which we are considering resemble the Filariae. The two prominent characters which these organisms possess, namely the

barrel-shaped buccal capsule and the caudal spurs, are not of great systematic importance since the former may well be lost during one of the moultings and the latter are doubtless converted into caudal papillae such as occur in widely separated genera, *e.g. Filaria* (*F. papillosa*, Rud.) and *Dacnitis* (*D. callichroi*, mihi), *Cucullanus* (*C. elegans*, Zed.).

The mouth capsule might point to genera:

(1) **Angiostoma,** Duj. No species of this genus have been recorded from fishes, the larvae might however belong to a species parasitic in limax, *e.g.*, *A. limacis*, Duj. The shape of the oesophagus however renders this identification unjustifiable (compare larvae of *A. macrostomum*, V Linstow (6) p. 325, see also Neuhaus (17), p. 653).

(2) **Cucullanus.** There is however no longitudinal striation as in the larva of *C. elegans* figured in Schneider (19) Pl. xxvi, fig. 10. The oesophagus of *Cucullanus* is also characteristically divided into two sections.

(3) **Leptodera,** Schneider (=*Leptodera*, Duj. *Angiostoma*, Duj. and *Rhabditis*, Duj , ex parte). The oesophagus is furnished with one or two dilatations (Schneider (19) p. 156).

(4) **Dacnitis.** The buccal capsule might alter to form the cuticular collar of this genus, but the oesophagus is again quite different in form.

12. **Oncholaimus indicus,** v. Linstow.

(Pl. xxiii, figs. 66–70.)

This species was described for the first time by v. Linstow in 1907 (*Rec. Ind. Mus.*, Vol. I, p. 45). The specimens at the disposal of this distinguished observer do not appear to have shown clearly certain important characters of the head. Consequently a redescription will not be out of place.

The species occurs among filamentous algae and sponges in pools of brackish water at Port Canning in Lower Bengal and also in a canal of brackish water on the outskirts of Calcutta.

Measurements	♀ (1)	♀ (2)	♂
Total length	2·07	2·55	2·43
Max. breadth	·059	·068	·05
Buccal cavity, length	·034	·037	—
Oesophagus ,,	·357	·374	·357
Head-Vulva	1·035	1·326	—
Vulva-tail	1·035	1·224	—
Anus-tip of tail	·129	·125	—
Tail appendage, length	·085	·076	·085
Uterine egg, length	·272	—	—

General shape (fig. 66). Tapers very gradually to both ends. The head is truncated. Shortly behind the anus the body

narrows (figs. 69, 70) in a club-shaped manner to form the tail which bears a thin appendix-like termination. This thin portion of the tail is of almost uniform diameter, and is somewhat crooked toward the ventral surface.

Head (figs. 67, 68). Mouth wide, surrounded by six leaf-like semicircular lips, each bearing a sharp flat spine-like process. The lips are situated two in the lateral lines, two subdorsally, two subventrally. They can be folded in over the mouth, closing it, or extended to lie parallel with the length of the body. No setae on head in either sex.

Buccal cavity. Cylindrical, lined with stout chitinous membrane. It contains three teeth—one large right subventral and two smaller, one dorsal, one left lateral, the smaller teeth lie somewhat posterior to the large one, all three in front of the middle of the length of the buccal cavity.

The oesophagus (fig. 66) is muscular and club-shaped with a small segment, also muscular, at its posterior extremity, distinctly separated from the main mass. This small segment projects into the lumen of the intestine.

Nerve ring not very distinct, ·0017 from anterior extremity. The circumoesophageal ganglionic collar is well marked. Pore of ventral gland (?) opposite nerve ring even in adult female. The tail bears a few setae at its tip.

Female.—Vulva at the mid point of the body-length. Gonad tubes two—anterior and posterior, each bent on itself and divided into ovary and uterus.

Male.—There are a few hairs on the oesophageal region of the body, and a row of 9-10 setae on either side of the anogenital aperture (fig. 69). Two sabre-shaped spicules with a hollow conical accessory piece are present.

This species is closely allied to *Oncholaimus fuscus*, Bast. (1) from the English Channel and North Sea. It possesses in common with the latter species (1) the head bearing six mobile lips, and (2) the peculiar appendix-like termination of the tail. It differs from *O. fuscus* in size: ♂ 2·4 mm. contrasted with 6·5 mm. in *O. fuscus*, ♀ 2·5 mm. contrasted with 7 mm. (De Man. 15). The writer has not observed the tubular organ described by De Man in *O. fuscus*.

Tables of Measurements.

TABLE I.

Oxysoma macintoshii, n. sp., from *Rana tigrina*.

Cobb's Formula.

	9/1/♀	10/1/♀	9/2/2			10/1/♂	10/2/♂
T.L.	2·414	2·55	2·261	...	...	*1·48	·999
Br. Hd. / Hd.—Hd. ...	1·07 / 0	1·16 / 0	1·14 / 0	...	...	—	2·6 / 0
Br. at N.R. / Hd.—N.R. ...	3·2 / 6·6	2·61 / 6·2	3·1 / 6·5	...	...	—	6·5
Br. at end oesoph. / Hd.—end oesoph. ...	5·36 / 17·5	3·62 / 18·3	4·4 / 19·6	...	...	—	8·6 / 28·8
Br. at vulva or middle / Hd.—V. or middle	7·7 / 49·6	4·4 / 49·6	5·72 / 48·8	...	...	—	9·3 / 50
Br. at Anus. / Hd.—Anus. ...	4 / 80·7	2·8 / 83	2·7 / 88	...	...	—	3·3 / 84·5

	L9/1/♀	L10/1/♀	9/2/2			L10/1/♂	10/2/♂
T.L.	2·414	2·55	2·261		...	*1·48	·999
Mx. Br.	·185	·111	·1295	...	...	·0851	·0925
Mx. Br. / T.L.	1 / 13·05	1 / 23	1 / 18·2	...	...	*1 / 17·4	1 / 10·8
Br. at Hd. Ant. ...	·0259	·0296	·0259	...	...	*·037	·0259
Br. Body Ant. ...	—	·0555	—	...	...	—	·0518
Length of Hd. ...	—	·0444	—	...	...	—	—
Br. at N.R. ...	·0777	·0666	·0703	...	...	—	·0646
Hd.—N.R. ...	·1591	·1591	·148	...	...	—	—
B. at end Bulb. ...	·1295	·0925	·0999	...	...	·0777	·0851
Hd.—end Bulb. ...	·4218	·4588	·444	...	...	·37	·2857
Br. at Vulva or middle	·185	·111	·1295	...	...	·0925	·0925
Hd.—Vulva ...	1·19	1·241	1·105	...	...	—	—
Br. at Anus. ...	·0962	·0703	·0629	...	...	·0333	·0333
Hd.—Anus. ...	1·938	2·074	1·989	...	...	1·276	·8366
Anus—Tail ...	·476	·476	—	...	...	·2035	·1924
Post anal L. / T.L. ...	1 / 5·07	1 / 5·35	—	...	...	*1 / 7·3	1 / 5·19
Oes. T.L.	·425	·4421	·425	...	...	·2479	·2627
Oes. T.L. / T.L. ...	1 / 5·6	1 / 5·8	—	...	...	*1 / 5·3	1 / 3·8
Oes. Bulb. L. ...	·085	·0851	·085	...	...	·0555	·0518
Oes. Ant. Br. ...	·0296	·0333	·0333	...	...	·0257	·0259
Oes. Mid. Br. ...	·037	·0333	·037	...	...	—	·0259
Oes. Post. Br. ...	·0259	·0259	·0185	...	...	—	—
Oes. Bulb. Br. ...	·0999	·0814	·0814	...	...	·0518	·0518
Oes. Bulb. Br. / Oes. T.L. ...	1 / 4·25	1 / 5·43	1 / 5·22	...	...	1 / 5·4	1 / 5·07

* Corrected by addition for invagination.

Vulv.—Tail	1·224	1·309	1·156	...	...	—	—
Hd.—Vulv. / Vulv.—Tail	1 / 1·029	1 / 1·05	1 / 1·04	...	...	—	—
L. Memb. Br. / Body Br.	—	—	—	Br. Spicule Ant.		·0119	—
Uterine Egg. L.	·0814	·0962	·0925	,,	,, Md.	·0136	—
,, ,, Br.	·0407	·0407	·0518	,,	,, Post.	·0102	—
Spicule L.	—	—	—	...	...	·2295	·1785
Hd.—Ventr. Pore.	—	·3145	—	...	...	—	—

TABLE Ia.

Oxysoma macintoshii, n. sp., from *Bufo stomaticus*.

Cobb's Formula.

	♀	♀ 2/1/2	2/1/3	2/1/1	...	...	♂ 1/1
T.L.		2·48	2·78	1·901			1·017
Br.—Hd / Hd.—Hd.		1·79 / 0	1·59 / 0	1·36 / 0			1·85 / 0
Br. at N.R. / Hd.—N.R.		4·4 / 5·66	5·4 / 7·6	5 / 6·8			5·92 / 9·52
Br. at end oesoph. / Hd.—end oesoph.		6·7 / 16	6·9 / 13·5	7·4 / 18			11·1 / 20·35
Br. at Vulva or middle / Hd.—Vulva or middle		7·62 / 46·6	8·5 / 46·4	8·17 / 43·6			12·58 / 50·
Br. at Anus. / Hd.—Anus.		5·1 / 83·6	4·9 / 82·8	5 / 77			6·4 / 80·61

	♀	2/1/2	2/1/3	2/1/1	2/3/1	2/3/3	...	♂ 1/1/
T.L.	2·32	2·48	2·78	1·901*	2·445*	2·658		1·017
Mx. Br.	—	·187	·238	·1554	·221	·255		·1258
Mx. Br. / T.L.	—	1 / 13·2	1 / 11·6	1 / 12·2	1 / 11·06	1 / 10·4		1 / 8·08
Br. at Head Ant. end	—	·0444	·0444	·0259	·0222	·0481	...	·0185
,, Body Ant. end	—	·0777	·0777	·0518	·0555	·0851	...	·0444
Length head	·034	·0444	·0444	·037	·0333	·0481	...	·0444
Br. at N. R.	—	·111	·1517	·0962	—	—	...	·0592
Hd—N. R.	—	·1406	·2035	·1295	—	—	...	·0592
Br. at end oesoph.	—	·1665	·1924	·1406	·148	·1961	...	·111
Hd—end oesoph.	—	·3996	·3774	·3441	·37	·425	...	·2035
Br. at V. or middle	·204	·1924	·238	·1554	·2035	·255	...	·1258
Hd—V.	1·07	1·156	·1291	·828	1·17	1·128	...	...
Br. at Anus.	—	·1295	·1369	·0962	·1036	·1295	...	·0444
Hd—Anus.	—	2·073	2·302	1·476	2·061	2·182	...	·8061
Anus.—Tail	·408	·407	·544	·425	·3848	·476	...	·2109
Post anal L. / T.L.	1 / 5·7	1 / 6	1 / 51	1 / 4·47	1 / 6·36	1 / 5·59	...	1 / 4·8
Oes. T.L.†	·34	—	·442	·362	·3145	—	...	·2405
Oes. T.L. / T.L.	1 / 7	—	1 / 6·2	1 / 5·2	1 / 7·5	—	...	1 / 4·2
Oes. Bulb. L.	—	—	·0999	·074	·0814	—	...	·0481
Oes. Ant. Br.	—	·0555	·0592	·0333	·0333	·0481	...	·0222

* Corrected by addition for invagination. † Including bulb.

Oes. middle Br.	... —	·0444	·0444	·0333	·037	·0444	...	·0259
,, bulb. ,,	... —	·1184	·1221	·0962	·0851	·1295	...	·0518
Oes. Mx. Br. bulb. / Oes. T.L.	... —	—	1 / 3·6	1 / 3·7	1 / 3·7	—	...	1 / 4·6
Vulva—Tail	... 1·258	1·326	1·495	1·073	1·275	1·53	...	—
Hd—Vulv. / V.—Tail	... 1 / 1·17	1 / 1·16	1 / 1·16	1 / 1·29	1 / 1·09	1 / 1·3	...	—
Uterine Fgg. L.	... —	·0925	·0925	—	·0814	—	...	—
,, ,, Br.	... —	·0625	·0666	—	—	—	...	—
Spicule L. ...	... —	—	—	—	—	—	...	·2035

TABLE II.

Oxysoma kachugae, n. sp.

T. L.	... 13·68	Post anal / T. L.	... 1 / 8·6	*Cobb's Formula.*	
Mx. Br.	... ·612	Br, at Anus	... ·306	Br. at comm. oes. / Hd.—comm. oes.	1·5 / ·54
Mx. B. / T. L.	... 1 / 22·3	Oes. Pt. 1, L.	·074	Br. at end oes. / Hd.—end oes.	3·1 / 14·6
Head L.	... ·102	Oes. pigmented part L.	... 1·416	Br. at Vulva / Hd.—Vulva	4 / ... 62·4
Hd. Mx. Br.	... ·204	Bulb L.	... ·425	Br. at Anus / Hd.—Anus	2·2 / ... 88·9
Hd.—Oes. Comm.	·074	Oes. T. L.	... 1·915		
Hd.—Bulb end...	1·989	Oes. T. L. / T. L.	1 / ... 7·1		
Body Br. behind Hd.	... ·17	Oes. Br. Ant.	·119		
Body Br. at end Bulb	... ·425	Oes. pigmented part Br.	... ·153		
Hd.—V.	... 8·49	Bulb Br.	... ·255		
V.—T.	... 5·19	Br. Bulb / Oes. T. L.	1 / ... 7·5		
Hd.—V. / V.—T.	1 / ·64 ($\frac{·5}{3·2}$)	Hd.-Vent. pore	1·275		
Br. at V.	... ·544	Cuticular striae ant.	... ·0037		
Hd.—Anus	... 12·09	Cuticular striae post.	... ·0037		
Anus—Tail	... ·59				

TABLE III.

Heterakis macronis, n. sp.

Cobb's Formulae.

Measurements expressed in units = $\frac{1}{100}$ T. L.

	i ♀	ii ♂	iii ♂
T. L.	mm. 8·5	7·31	7·5
Br. of Hd. / Hd.—Hd.	0·6 / 0	0·55 / 0	0·54 / 0
Br. at Nerve Ring / Hd.—Nerve Ring	1·4 / 5	1·4 / 4·4	1·3 / 4·3
Br. at end oesoph. / Hd.—end oesoph.	1·8 / 9	2 / 10·7	2 / 11·3
Br. at Vulva or middle of body / Hd.—Vulva or middle of body ...	1·3 / 63	1·3 / 50	1·43 / 50·
Br. at Anus / Hd.—Anus	0·65 / 97	0·86 / 97·6	0·8 / 98·

	♀♀ i	iv	viii	♂♂ ii	iii	v	vi
T. L. ...	... 8·5	7·82	6·596	7·31	7·5	7·412	3·65
Mx. Br. ...	... ·153	·1406	·129	·148	·148	—	—
Mx. Br. / T. L. ...	1/55	1/56	1/51·1	1/50	1/51	—	—
Br. at Head ...	... ·0518	·0518	·055	·0407	·0407	—	—
Br. at Nerve Ring ...	... ·1184	·1036	·0962		·0962	—	—
Dist. N. R. to Hd. ...	·425		·314	·323	·323	—	—
Br. at end oes. ...	153	·1406	·155	·148	·148	—	—
End Oes.—Hd.	·765	·765	·748	·782	·85	—	—
Br. at Vulva or middle ♂ ...	·11	·1073	·1147	·0962	·1073	—	—
Hd.—Vulva	5·44	5·1	4·428	3·65	3·7	—	—
Lateral Membr. Mx. Br. .		·0666	·0555			·0481	—
L. M. Mx. Br. / Br. body same plane ...	—	1/2·1	1/2·6	—	—	1/2·3	—
Br. at Anus	·055	·044	·059	·059	·059	—	—
Hd.—Anus ...	8·245	7·561	6·37	7·125	7·33	—	—
Anus—Tail	·255	·259	·221	·185	·17	—	—
Post anal L. / T. L.	1/33	1/30·2	1/29	1/39	1/44	—	—
Oes. L.	·765	·765	·731	·782	·85	—	—
Oes. L. / T. L.	1/11	1/10	1/9	1/4·3	1/9	—	—
Oes. Mx. Br.	·055	·074	·074	·077	·0703	—	—
Oes. Min. Br.	·037	·037	·0326	·029	·0296	—	—
Mx. Br. Oes. / Oes. Min. Br.	1/1·5	1/2	—	1/2·6	1/2·4	—	—
Hd.—Vulva	5·44	5·1	4·428	—	—	—	—
Vulva—Tail	2·89	2·29	2·167	—	—	—	—
Hd.—Vulva / Vulva—Tail	2/1	2·2/1	—	—	—	—	—
Uterine Egg. L.... ...	·051	·0629	·0518	—	—	—	—
,, ,, Br. ...	·037	·037	·037	—	—	—	—
Bursa L.	—	—	—	·444	·435	—	—
,, Mx. Br.	—	—	—	—	·0952	—	—
Sucker—Tail	—	—	—	·462	·41	—	—
Spicules L.	—	—	—	—	—	—	·0765
Hd.—Ant. end ♂ gonad ...	—	—	—	—	2·72	—	1·105

TABLE IV.

Cobb's Formula.

Dacnitis callichroi.

	♀ i	♀ ii
T. L.	6·63	7·225
Br. at mouth	·15/0	
Br. at end of oesoph. / Hd.—end of oesoph. ...	5·13/11·5	4·/10·1
Br. at Vulva or middle / Hd.—Vulva or middle ..	5·4/60	5·9/56·6
Br. at Anus / Hd.—Anus	1·54/95·9	1·8/97·

	i	ii	*D. foveolata.* R. Plymouth.
T. L.	6·63	7·22	6·12
Mx. Br.	·391	·425	
Mx. Br. / T. L.	1/17	1/17	
Br. at Term. oes.	·34	·289	
Hd.—Term. oes.	·765	·731	
Br. at Vulva or middle	·357	·425	
Hd.—Vulva...	3·96	4·08	
Lat. Membr.	0	0	
Br. at Anus	·102	·129	
Hd.—Anus	6·46	7·02	
Anus—Tail	·17	·203	
Post anal L. / T. L.	1/39	1/35·5	
Oes. L.	·748	·765	·935
Oes. L. / T. L.	1/9	1/9·4	1/6·5
Oes. Ant. Mx. Br.	·187	·17	·1887
Oes. Min. Br.	·102	·085	·0814
Oes. Post. Mx. Br.	·17	·17	·1332
Oes. Post. Mx. Br. / Oes. L.	1/4·4	1/4·5	1/7
Hd.—Vulva	3·96	4·08	
Vulva—Tail	2·72	3·14	
Hd.—Vulva / Vulva—Tail	1·4/1	1·3/1	
Uterine Egg. L.	·0851	·555, ·048	
,, ,, Br. without shell	·0555	·029, ·037	
Cuticular Striae Ant.	·002	·002	
,, Post.	·0012		

TABLE V.

Spiroptera denticulata, R.

Var. *minor*, var. nov.

	i	ii		i	ii
T. L.	1·87	1·88	Length of Spine of 2nd circle	·023	—
Mx. B. (at 2nd ring) ...	0·68	0·68	Lateral line Br. at Head ...	·0068	·0068
Mx. B. / T. L.	1/27	1/27	Lateral line Br. middle of Body	·0085	—
Oral cone L.	·0136	—			
Br. Ant. margin oral cone	—	·0204	Oes. max. diam. ...	·0204	—
Hd.—end Pharynx. ...	·0306	·0476	Oes. mim. diam. ...	·034	—
Br. Body at end Ph. ...	·068	·068	Hd.—Ant. end gonad ...	·703	—
Hd.—end oesoph. ...	·1275	·204	Testicular Region L. ...	·555	—
Br. Body at end oesoph. ...	·0544	·0612	Vesicul Semin. L. ...	·185	—
Br. at middle... ...	·0561	·068	Duct. Ejaculat L. ...	·481	—
Br. at Anus	·034	·034	Spicule R. Length	·0799	·0935
Hd.—Anus	1·81	1·81	Do. Br.	·0038	·0034
Anus—Tail	·059	·068	Sp. Left length ...	·442	·4441

Post anal L. / T. L.	...	1 / 31·7	1 / 27	Sp. Left Br. ...	...	·0038 ·0068
1st Ring L. ...	...	·017	—	Sp. Left Terminal joint L....		— ·0153
2nd ,, ,, ...	...	·0136	—			
3rd ,, ,, ...	....	·0102	—			
Middle Rings L.	...	·007	—			

		i	ii	
Br. Hd. / Hd.—Hd.	... ...	—	1·1 / 0	Cobb's Formula.
Br. at end Ph. / Hd.—end Ph.	... ...	3·8 / 1·7	3·8 / 2·6	
Br. at end oes. / Hd.—end oes.	... ...	3 / 7	3·4 / 11·3	
Br. at middle / Hd.—middle.	... ...	3 / 50	3·8 / 50	
Br. at Anus / Hd.—Anus	... ...	1·88 / 97	1·88 / 97	

TABLE VI.

Atractis kachugae, n. sp.

	Immat.	Mature.		Mature.
	♀	♀	♀	♂
	41/1/1	41/1/3	41/4	41/1
T. L. ...	2·17	2·63	3·06	2·24
Mx. Br. ...	·044	·055	·077	—
Mx. Br. / T. L. ...	—	—	—	—
Hd.—Br. ...	—	—	·0333	—
Hd. Comm. Oes. ...	—	·011	·011	·01
Hd.—end oes. 2. ...	·349	·391	·459	·377
Br. body at end oes. 2 ...	·044	·0555	·0629	·044
Br. at middle	·04	·0518	·077	·0408
Hd.—V. ...	—	1·95	2·23	—
V.—T. ...	—	·68	·833	—
Hd.—V. / V.—T. ...	—	1 / ·34	1 / ·37	—
Br. at middle at V. ...	—	·0407	·059	·0408
Hd.—Anus ...	1·67	2·07	2·329	1·866
Br. at Anus ...	·029	·033	·044	·037
An.—T. ...	·493	·56	·731	·374
Post anal / T. L. ...	1 / 4·4	1 / 4·7	1 / 4·2	1 / 6·3
Oes. 1 L. ...	·15	·16	·185	·17
Oes. 1 Br. ...	·018	·022	·029	·018
Bulb. 1 Br. ...	·029	·033	·04	·027
Oes. 2 L. ...	·199	·22	·255	·207
Oes. 2 Br. ...	·018	·025	·029	·018
Bulb. 2 Br. ...	·037	·048	·055	·039
Oes. T. L. / T. L. ...	1 / 6·2	1 / 6·9	1 / 6·8	1 / 6
Hd.—begin. of gonad	1·21	—	·969	·68
Spicule R. length	—	—	—	·0925
,, breadth	—	—	—	·0042
,, left length	—	—	—	·187
,, ,, Br.	—	—	—	·005

Br. at begin. oes.			1	—
Hd.—begin. oes.	...	...	0	
Br. at end oes.			2	2
Hd.—end oes.	...	...	15	17·1
Br. at middle			2·4	1:8
Hd.—middle	...	...	50	50
Br. at V.			2	
Hd.—V.	...	...	74	—
Br. at. anus			1·33	1·3
Hd.—anus	...	...	77·3	84·5

Cobb's Formula.

TABLE VII.

Encysted Embryo from bladder of *Bufo stomaticus*.

T. L.	...	1·739	
Mx. Br.	...	·1184	
Mx. Br.		1	
T L.	...	14·7	
Br. at Hd.	...	·0814	
Lips length	...	0185	
Br. at end oes. 1	...	·1184	
Tip of lip—end of oes. 1	...	·148	
Br. at end oes. 2	...	·1184	
Tip lip - end of oes. 2		·74	
Br. at Anus	...	·0555	
Tip of lip—Anus	...	1·665	
Anus—Tail	...	·074	
Post anal L.		1	
T. L.	...	23·5	
Oes. 1 length	...	·1295	
Oes. 1 Mx. Br.	...	·0407	
Oes 1 Min. Br.	...	·0274	
Oes. 1 Mx. Br.		1	
Oes. 1 L.	...	3	
Tip of lip—N. R.	...	·103	
Oes. 2 length	...	·592	
Oes. 2 Mx. Br.	...	·0777	
Oes. 2 Min. Br.		1	
Oes. 2 L.	...	7·5	
Anal canal L.	...	·0629	
Lat. Line Min. Br.	...	·0085	
Lat. Line Mx. Br.	...	·0153	
Tip lip—Rud. V.	...	·888	
V.—T.	...	·851	
Hd.—V.		1	
V.—T.	...	·96	

Hd.—Br.		4·7	
Hd.—Hd.	...	0	
Br. at end oes. 1		6·9	
Hd.—oes. 1 end	...	8·7	
Br. at end oes. 2		6·9	
Hd.—end oes. 2	...	43·5	Cobb's Formula.
Br. at Vulva		6·9	
Hd.—Vulva	...	52	
Br. at Anus		3·2	
Hd.—Anus		98	

Table VIII.

Larvae from *Wallago attoo* and *Callichrous pabda*.

	15/i	15/ii		36/i	36/ii	33/1	33/2	33/i	33/ii	33/iii	33/iv	33/vi
T. L.	30	25		23·5	26	19	14·4	18	15	18	15	22
Mx. B.	·595	·544		·595	·527		·425	·518	·425	·442	·374	·595
Mx. Br. / T. L.	1/50	1/46		1/39	1/50		1/34	1/31	1/36	1/49	1/40	1/37
Hd.—Br.	·148	—		·11	·085	·081						
Hd.—junct. oes. and intest.	2·5	3·65	Hd.—post end oes. divert. Br. at above.	2·46	2·7	—	—	Hd.—junct. oes. and intest. Br. at above	1·56	—	—	—
Br. at this level ...	·476	·34		·425	·34	—	—		·298	—	—	—
Hd.—V.	13	—	...	—	—	—	—	—	—	—	—	—
V.—T.	17	—	...	—	—	—	—	—	—	—	—	—
H.—V. / V.—T.	1/1·3	—	...	—	—	—	—	—	—	—	—	—
Br. at V.	·595	—	...	—	—	—	—	—	—	—	—	—
Hd.—An.	29·83	24·9	...	21·37	25·85	18·84	13·28	—	—	—	—	—
An.—T.	·17	·085	...	·129	·153	·153	·119	·08	·085		·014	·153
Post An. / T. L.	1/176	1/300	..	1/184		1/120	1/120	—	—	—	—	—
Br. at A.	·153	·134	...	·136	·136	·153			·096	—	—	—
Oes. L.	2·5	3·65	...	—	—	—	—	—	—	—	—	—
,, Min. Br. ...	—	·136	...	—	—	—	—	—	—	—	—	—
,, Mx. Br.	—	·187	...	—	—	—	—	·077				
Oes. L. and Div. / T. L. ...	1/2·8	1/3	...	—	—	—	—	—	—	—	—	—
Oes. and Oes. Div. L. ...	10·5	8·35	...	—	—	—	—	—	2·29	—	—	—
Intest. Div. L. ...	1·36	—	...	—	—	—	—	—	—	—	—	—
Ringed area fr. Hd. ...	—	—	...	·333	·333	·646	—	·18	·238	·222	·24	—
Hd.—Vent. pore ...	—	—	...	—	—	—	—	—	—	—	—	—
Lat. line br. at middle ...	·037	—	...	—	—	—	—	—	—	—	—	—

...	30
...	4·67
...	·272
...	1/17·3
	·059
...	—
...	—
...	—
...	—
...	—
...	—
...	—
...	—
...	3·93
	·074
...	1/63
...	·074
...	—
...	—
	·063
...	—
...	—
...	—
Ant. Anal lip, length	·037
	·564
	·088

TABLE IX.

Larvae from Stomach of *Wallago attoo*. (L. 14).

	14/1					
T. L. ...	... ·578	Postanal L.	1	Br. Head	2	Cobb's Formula.
Mx. Br.	... ·034	T. L.	... 9·7	Hd.—Hd.	... 0	
Mx. Br. / T. L.	... $\frac{1}{17}$	Body Br. at Anus	·6238	Br. at end capsule	5·2	
Mouth Br.	... ·0068	Spurs L.	... ·017	Hd.—end capsule	... 6·5	
Head Br.	... ·0119	Cuticular Rings		Br. at end of oeso.	6·2	
Buccal Caps. L.	... ·0374	Ant. Br.	... ·0034	Hd.—end of oeso.	... 34	
,, Mx. Br.	... .017	,, ,, Post Br.	·0017	Br. at middle	6	
,, Br. Post	... ·0102			Hd.—middle	... 50	
Body Br. at end of Bucc. capsule	... ·0298			Br. at Anus	4·1	
Hd.—end Oesph.	... ·1955			Hd.—Anus	... 91·9	
Oes. Mx. Br.	... ·0136					
Body Br. at end Oesoph.	... ·0357					
Body Br. at middle	·034					
Hd.—Anus	... ·524					
Anus—Tail	... ·0544					

LITERATURE REFERRED TO IN THE TEXT.

(1) Bastian—Monograph of the Anguillulidae. Trans. Linn. Soc. xxv, 1866.

(2) Diesing—Syst. Helminth. *At. dactylura* and *hystrix*, *R.* II, pp. 151 and 188.

(3) Dujardin—Hist. Nat. des Helminthes.

(4) Gendre—Proc. verb. Soc. Linn. 63. *Atractis fasciolata*, p. 30.

(5) Leidy—Proc. Acad. Philadelphia, 1890, *Atractis opeatura*, n. sp.

(6) v. Linstow—Arch. mikroskop. Anat., 39, p. 325, *larvae of Angiostomum.*

(7) v. Linstow—Arch. f. Naturgeschichte, 72, p. 256, 1906. *Oxysoma contortum*, n. sp.

(8) v. Linstow—Arch. f. Naturgesch, 52, p. 113. *O. brevicaudatum.*

(9) v. Linstow—Arch. f. Naturgesch, 1890, p. 171. *Oxysoma terdentatum.*

(10) v. Linstow—Arch. f. Mikr. Anat. 62, p. 114, *O. tuberculatum* fr. *Megalophrys montana.*

(11) v. Linstow—Centralbl. f. Bakter. Orig. v. 53. *At. peramata.*

(12) v. Linstow—Centralbl f. Bakter. Orig. v. 31. *At. cruciata*, p. 29.

(13) v. Linstow—Mitth. Mus. Berlin v. I. *Physaloptera amphibia*, p. 15.

(14) v. Linstow—Recds. Ind. Mus. Vol. I, p. 45. *Onch. indicus.*

(14A) v. Linstow—Spolia Zeylanica, Vol. III.

(15) De Man.—Freilebende Nordsee Nematoden.

(16) Molin—Sitz. K. Akad. Wien. v. 38, p. 27. *Dacnitis rotundata.*
(16A) Sitz. K. Akad. Wien. v. 38, p 25. *Spiroptera papillata* fr. *Leuciscus cavedanus and Spir. acuminata.*
(17) Neuhaus—Jena. Zeitschr. Vol. 37, 1903, p. 653. *Post-embryonal dev.* of *Rhabditis nigrovenosa.*
(18) Railliet—Traite de Zoologie Médicale et Agricole.
(19) Schneider, A.—Monographie der Nematoden.

Reference Letters in Tables.

Br.—Breadth.
Comm.—Commencement.
Diam.—Diameter.
Hd.—Head.
L.—Length.
Mx. Br.—Maximum breadth.
N. R.—Nerve ring.
Pt.—Part.
T.—Tail.
T L.—Total length.
V.—Vulva.

The numbers at the head of the vertical columns refer to the serial numbers of the specimens.

Reference Letters in Plates.

A.—Anus. a.g.g.—anogenital gland. B.—bursa. b.c.—buccal cavity. C.—collar. can.—canaliculus. c.g.c.—cavity of gonocoel. c.m.—circular muscle. cl.—cloaca. cu. i.—inner margin of cushion. D—dorsal. D. ej.—ductus ejaculatorius. D.l.—dorsal lip. D.t.—dorsal tooth. du.—duct of gland. E.b.m.—edge of bursal membrane. Em—embryo in utero. f.m.—free margin. Intes.—intestine. L—larva. L.l.—lateral line. L. lp.—lateral line lip. n.r.—nerve ring. oes.—oesophagus. oes. b.—oesophageal bulb. ov.—ovary. P.—papilla. Per. p.—perianal papilla. Post.—posterior. Pr. p.—preanal papilla. R.c.—root column. Re.—rectum. R.m.—retractor muscle. R.sv.l.—right subventral lip. R.sv.t.—right subventral tooth. sd.t.—subdorsal tooth. sd.l.—subdorsal lip. sm.l.—submedian lip. sp.—spicule. sph.—sphincter. su.—sucker. s.v.—seminal vesicle. T.—testis. To.—tooth. ut.—uterus. v.—ventral. v.g.—ventral gland. v.p.—ventral pore.