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(12.)

ON THE ENTO-PARASITES COLLECTED BY THE "SKEAT EXPEDITION" TO LOWER SIAM AND THE MALAY PENINSULA IN THE YEARS 1899—1900.

By ARTHUR E. SHIPLEY, M.A., F.Z.S., Fellow and Tutor of Christ's College, Cambridge, and University Lecturer in the Advanced Morphology of the Invertebrata.

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(Plate XVI.*)

C'est parmi les parasites et non chez l'homme qu'il faut chercher le dernier mot de la création.
ÉLIE METCHNIKOFF,
'Études sur la Nature Humaine.'

The collection made by the members of the Skeat Expedition of Entozoa was rich and varied, and inasmuch as it was gathered in a land hitherto unsearched for this purpose, it is not surprising that it contained a large proportion of new forms. Amongst the more interesting of the results brought to light by the investigation of the material are:—(i.) A new species of *Tetrarhynchus* found in a Holothurian. This is, I believe, the first record of a *Tetrarhynchus* being found in any Echinoderm, and indeed the presence of Tetrarhynchidæ in invertebrates at all is only recorded for one or two Molluscs and doubtfully for a species of *Aphrodite*. (ii.) An undeterminable species of *Tetrarhynchus* from a sea-snake. Here, again, we have an entirely new host, no *Tetrarhynchus* having been hitherto found in any vertebrate outside the class Pisces with the exception of the Chelonian *Testudo mydas*. (iii.) A considerable collection of new forms of Acanthocephala. The Nematodes, which have been described elsewhere by Dr. von Linstow, include some fourteen new species.

As will be seen, the collection covers a wide field and includes representatives of the Sporozoa and all the chief groups of metazoan Entozoa, except the Trematoda. The Cestoda, Acanthocephala, Nematomorpha, Nematoda, and Linguatulida severally contribute one or more species to the total.

With regard to the localities, the parasites were collected mainly in three or four places: Biserat, in Jalor, a province of Lower Siam, in Kwala Aring in the same province, and at Tremangan.

CESTODA.

Fam. BOTHRIOCEPHALIDÆ.

BOTHRIOCEPHALID LARVÆ.

The snakes of Lower Siam seem frequently to harbour the large larval form of certain of the Bothriocephalidæ, of which it is

* For explanation of the Plate, see p. 156.

impossible to identify the species or even the genus. I have recently dealt somewhat fully with a similar larval form from under the skin of a Serval from the Soudan*. These Siamese specimens differ from the African one in the thickness of the anterior end, which was cushiony, and perhaps almost as thick as one quarter of the transverse diameter; and in the regularity and extension forward of the annuli, which extend right up to and even into the orifice of the single apical sucker. Specimens of these larvæ were taken in three different snakes, almost certainly specimens of *Dipsadomorphus dendrophilus* Boie, at Biserat, and beneath the skin of a snake from Patalung.

Fam. Tetrarhynchidæ.

Tetrarhynchus holothuriæ, n. sp. (Plate XVI. figs. 5, 6, & 7.)

A small collection belonging to the genus *Tetrarhynchus* was contained in a bottle labelled "Parasites from the commonest Holothurian found in the sea off the Patani river." The specimens measure some 7 mm. in length, by a maximum body breadth of 1 mm. The suckers, however, add to this last measurement in the region of the head. The body tapers smoothly to the posterior end, where there is a slight indentation at the extreme point, into which sections show that the two longitudinal water-vascular canals open, one on each side.

The bothria are somewhat ear-shaped (Pl. XVI. figs. 5 & 7) and each is divided into two longitudinal halves by a median ridge, so that in transverse section there is the appearance of four suckers. The hooked arms which project from the head end in a conical tip, covered with very numerous spines all pointing forward (Pl. XVI. fig. 6). In the specimen figured, one of these spines is much larger than the others, but this is probably a slight abnormality. Following on this spiny end is a smooth portion, and then a second spiny region where the very numerous spines, all pointing backward, form a very firm organ of attachment.

The tapering conical body shows no trace of strobilisation and is externally smooth, the only differentiation visible being the line of the sac into which the toothed processes are withdrawn, which in some cases is seen through the surrounding tissue.

Sections reveal no trace of reproductive organs. The cuticle surrounds a mass of parenchyma which is looser and more vacuolated just under the cuticle, and this looseness is even more pronounced around the stout muscular sacs from which the four toothed introverts spring. The muscles of these sacs are unusually stout and circularly or perhaps spirally arranged. Two—there are said to be four in most adults—laterally placed water vascular vessels run down the animal, and open into the terminal depres-

* Arch. Parasit. vi. 1902, p. 604.

sion. The number of calcareous bodies is small, and other deeply staining structures, *e.g.* the nuclei and muscle-fibres, are but sparsely scattered through the tissues. There is a four-cornered nerve-mass well lying about the level of the juncture of the anterior one-third with the posterior two-thirds of the bothria, and this gives off four strands which pass peripherally and probably supply the bothria and introverts. I did not see any longitudinal nerves, though probably they exist.

In his exhaustive monograph* "Recherches sur les Tetrarhynques," Vaullegeard records his opinion that the numerous species of Tetrarhynchous Cestodes belong to but one genus, *Tetrarhynchus*. Raillet has pointed out that the generic name *Rhyncobothrius* Rudolphi, 1819, has precedence of *Tetrarhynchus* 1809, the latter name having been given to a larval form. In the present case, although it may be inconsistent with the laws of nomenclature, I have followed Vaullegeard, partly because everyone knows what *Tetrarhynchus* is, and partly because, in my opinion, needless confusion is introduced into the study of tapeworms by using a double nomenclature for larvæ and adults. In civilized society it is not considered necessary for a human being to change his name when he leaves the home of his childhood and sets up in a new house, and there seems as little reason for a young Cestode to change its name when it changes its host.

Vaullegeard arranges the various species into two sections, one of which, on the type of *T. lingualis* Cuv., has in its larval form no vesicle projecting over and protecting the head. To this section the cestode in question belongs. The larvæ which were collected by the Skeat Expedition were some of them wholly and some of them partly enclosed in cysts, but none of them showed any trace of the projecting vesicle.

Tetrarhynchus holothuriæ, n. sp. (Plate XVI. figs. 5, 6, & 7.)

The larval form (but not the encysted form) is 6 mm. long by 1 mm. broad. Tapering posteriorly where there is a depression receiving the excretory pore. The two large bothria are subdivided by a ridge. The four introverts are provided with a cap of hooks pointing forward at the tip and a circular band of hooks pointing backward, between these two toothed regions is a considerable portion devoid of hooks.

Habitat. A common Holothurian, probably a *Molpadia*, taken off the mouth of the Patani River.

Tetrarhynchus sp. (Plate XVI. figs. 8 & 11.)

Some eight or nine small cysts about the size of very poor wheat-seeds were taken from the body of a sea-snake, *Enhydrina valakadien* Boie. Unfortunately the position of the cysts in the body is

* Mém. Soc. Normandie, xix. 1897–1899, p. 185.

unrecorded, but I should judge that they lay just under the peritoneal lining of the body-cavity. In one or two cases the worm itself was emerging, or had emerged, from the cyst, but I attribute that to the handling the cyst received as the worms were removed from the body of the host. The cestodes usually were bent but once within the cyst, as is shown in the figure (Pl. XVI. fig. 11).

Sections through these cysts (Pl. XVI. fig. 8) show that the form in question belongs to Vaullegeard's second group founded on the type of *Tetrarhynchus erinaceus* van Ben., in which the larvæ have a vesicle surrounding and protecting the head. This vesicle is clearly shown in the figure; within it the head of the larva and the neck, as far back as the muscular sacs into which the introverts are retracted, are coiled. These coils, being hidden by the vesicle, cannot be seen through the walls of the cyst; they are, however, sufficiently numerous to permit four or five sections of the head at different levels to be displayed in one section. The head passes into the body, which has two longitudinal excretory canals and shows no sign of reproductive organs; in fact, the only differentiation from the loose parenchymatous tissue is a layer of muscle-cells situated about halfway between the periphery and the centre.

The vesicle is folded over the head like an amnion; it is, however, not closed, but remains open by a pore guarded by thickened lips. I am inclined to think that these lips contain muscle-fibres, and that the aperture can be tightly closed if occasion arises. According to Vaullegeard the vesicle detaches itself when the larva becomes sexually mature.

The genus *Tetrarhynchus* is often regarded as exclusively a fish parasite: it has, however, been described in certain Molluscs, e. g. *Sepia officinalis* and the Pearl-Oyster, and perhaps in *Aphrodite aculeata*, though nobody seems to have found it in that animal since the distinguished courtier, philosopher, parasitologist, and poet, Francis Redi of Arezzo, recorded it in 1664. I have found no record of the genus occurring in Echinoderms, so that the discovery by the Skeat Expedition of the larval forms in a Holothurian is a matter of considerable interest. This form, though not mature, is not enveloped in a vesicle, and presents certain features which allow me to suggest a specific diagnosis.

The second form brought back from the coast of Lower Siam is equally new as regards its host. There has hitherto been recorded, so far as I can find, but one vertebrate host of the genus *Tetrarhynchus* outside of the class Pisces. This is *Testudo mydas*, in which, in 1840, Meyer described vesiculate larvæ. We can now add a second Reptilian host in the case of *Enhydrina valakadien* Boie, a sea-snake, belonging to the family Colubridæ, which is not unfrequently taken along the coast of India and Burmah, and which ranges from the Persian Gulf to the Malay Archipelago and Papuasia. These very poisonous ophidians are fish-eaters.

ACANTHOCEPHALA.

Fam. ECHINORHYNCHIDÆ.

ECHINORHYNCHUS PATANI, n. sp. (Plate XVI. figs. 9 & 10.)

The encapsuled larvæ of Echinorhynchidæ are by no means uncommon in snakes, and von Linstow * suggests that their corresponding adult forms are to be looked for in the bodies of raptorial birds. In the paper referred to, he enumerates species of these parasites taken from snakes the names of which he gives. Unfortunately many of the names are *nomina nuda*, and the hosts cannot now be identified, and the same is the case with the new species here described, as the name of the snake was not preserved.

The cysts are at most 10 mm. long by 5 mm. broad. The worm is bent twice, and the three limbs may lie in one plane or in two. One of the specimens had escaped from its cyst, and had already inserted its spiny head into some piece of tissue from which it was well nigh impossible to free it. Another had freed its head and straightened out its body, which, however, was still surrounded by a thin film-like sheath of tissue. The length of these specimens was 25 mm., the breadth of the trunk was 2 mm., of the head 1 mm. The hooks were arranged in 12–14 longitudinal rows, the hooks of one row being at the level of the space between two neighbouring hooks of the row right and left (Pl. XVI. fig. 10). In this way the hooks in the horizontal rings also alternated with one another. There were six of such rings, and the second and third row consist of markedly large hooks, twice as large at least as any of the others. Altogether there were six rings visible; there may have been one or more hidden by invagination, but I do not think so.

It is most unfortunate that the name of the snake which harboured this parasite is unknown, but the parasite seems to be a hitherto undescribed species. The names of those already known to be encapsuled in snakes are recorded by von Linstow as follows:—

(i.) *Ech. oligacanthoides* Rud., with 4–5 rows of hooks.
(ii.) *Ech. cinctus* Rud., with 140 rows of hooks of similar size.
(iii.) *Ech. obligacanthus* Rud., with 13 rows of hooks.
(iv.) *Ech. megacephalus* Westrumb, with very numerous rows of hooks and the proboscis swollen in the middle.
(v.) *Ech. dipsadis* von Lins., with some 12–14 rows of large hooks, followed by 20 rows of smaller hooks.
(vi.) *Ech. heterorhynchus* Par. Proboscis anteriorly slender with 11 rows of hooks, posteriorly enlarged with 16 rows of hooks.

Wedl has mentioned other larval forms found in snakes, but they are not in any case specifically identified.

* Arch. Naturg. 54 Jahrgang, i. 1888.

Echinorhynchus patani, n. sp. (Plate XVI. figs. 9 & 10.)

Length 25 mm., breadth 2 mm., breadth of head 1 mm. Hooks in 6 rings, perhaps 7 or 8, and in 12–14 longitudinal rows. The hooks in one ring are opposite the interspaces in the next. The 2nd and 3rd rings composed of unusually large hooks. The worms were folded twice with cysts some 10 mm. long by 5 mm. broad.

Habitat. The body of an unknown snake, possibly *Dipsadomorphus dendrophilus* Boie, taken at Patani, Lower Siam.

Echinorhynchus bufonis, n. sp. (Plate XVI. figs. 1, 2, & 4.)

Several specimens of what I regard as the same species of *Echinorhynchus* were taken from the alimentary canal of two species of *Bufo* obtained at Patani, which have been kindly identified for me as *Bufo melanostictus* Schneider, and in all probability *Bufo penangensis* Wilson & Gray, by Dr. Gadow.

Bufo is known to harbour the comparatively widespread *Ech. hæruca*, but I know of no other species of *Echinorhynchus* parasitic in this amphibian, and as the parasites from Patani differ in many respects from any descriptions which are available, I have established a new species.

The worms fall into two groups. The larger, probably the females, measure some 15 mm.; the smaller, probably males, some 5 mm., but there are many intermediate in length. The greatest breadth of the larger specimens is 1·5 mm. As a rule their outline and surface is smooth, but some were wrinkled either wholly or in part. The body is usually curved, and in the larger specimens markedly so. The most conspicuous feature in which this species differs from the majority of its congeners is that the proboscis or introvert is not median and terminal, but projects from the trunk a little way, sometimes more, sometimes less, from the anterior end; it usually slopes forward, but it may stand out at right angles to the axis of the body like the handle of a walking-stick (Pl. XVI. figs. 2 & 4). It is always protruded on the inner surface of the curve. This feature and its divergence from the more usual type are represented in the Gyphyrea, where *Aspidosiphon* bears the same relation to most other Sipunculids that this species does to other *Echinorhynchi*.

The number of hooks is comparatively small, there being some 6–8 rings, alternately arranged with 14–16 longitudinal rows. The rings being alternating, the number of hooks in each ring is half the number of longitudinal rows.

Echinorhynchus bufonis, n. sp. (Plate XVI. figs. 1, 2, & 4.)

Curved, with proboscis opening on the concave surface just behind the anterior end of the body, which extends beyond the point of emergence of the proboscis. Length 15 mm. or less; a number, probably males, only 5 mm. long. Few hooks, 6–8; rings with 7–8 hooks alternating with those of the next row.

Habitat. The alimentary canal of *Bufo melanostictus* Schneider and of *Bufo ? penangensis* Wilson & Gray, taken at Patani.

Echinorhynchus xenopeltidis, n. sp. (Plate XVI. fig. 3.)

Three curious specimens of Echinorhynchidæ were taken free in the body of *Xenopeltis unicolor*, the sole species and genus of the family Xenopeltidæ, which ranges over South-eastern Asia, from India to the Malay Archipelago. Unfortunately, the part of the host's body infested by the parasite is unnamed, but, presumably, it was the intestine.

The parasites are three in number, and measure respectively about 25 mm., 17 mm., and 15 mm. I say about, because they were all coiled in a curious, angular sort of way, so that it was not possible to straighten them. They are plump, fleshy-looking creatures with an average breadth of 2·5 mm., though in one specimen a breadth of fully 3 mm. was attained. They hardly taper at all at the ends, which are truncated.

Their most peculiar external features are two. The first is the colour. This, in specimens kept for some years in spirit, is a delicate, salmony pink, somewhat resembling a freshly peeled pink banana. I have never seen an Echinorhynchid with anything approaching this colour. The second feature is the wrinkling. This is very marked, and produces a very definite deepening of the colour. The areas into which the wrinkles divide up the skin become in the anterior end almost regularly quadrilateral, and a quite peculiar marking is the result. This is well seen in Pl. XVI. fig. 3.

The only specimen I sacrificed to the razor showed that these wrinkles are the expression of deep narrow grooves which penetrate the subcuticle almost as far as the basement membrane. Unfortunately the sections obtained did not clearly show the number of rings of hooks. They were not very numerous, perhaps some 8 to 12. In each of the three specimens the proboscis was retracted.

Echinorhynchus xenopeltidis, n. sp. (Plate XVI. fig. 3.)

Length varying from 15 to 25 mm. Average breadth 2·5 mm. Plump forms with anteriorly many wrinkles, which showed a tendency to break up the surface into squarish areas. Colour, a delicate salmon-pink. Hooks in ? 8–12 rows.

Habitat. Xenopeltis unicolor Reinw. Taken at Kwala Aring.

Echinorhynchus tigrinæ, n. sp.

Two complete specimens and a fragment were taken from the intestine of a *Rana tigrina* Daud. The former had a length of 10 mm. and an average breadth of 2 mm. They were of a slaty-grey colour, and marked by transverse grooves at irregular intervals.

The proboscis is very short and very small. It does not emerge

terminally, but rather from the side, where it is overtopped by the anterior end, and looks like a little head sunk in one of the enormous collars in vogue at the Regency period. The number of hooks is very small, only 4–5 rings, and but few hooks in a ring. At first I thought that the smallness of the number of the hooks indicated that we had to do with a young, or, at any rate, a not fully grown, individual, but the lumen of the trunk was crowded with ova in well-developed chitinous egg-shells. Each ovum is a long cell, rounded at the ends with a conspicuous nucleus in the centre. The egg-shell is rather more pointed at the ends, so that the egg with its shell forms a spindle-shaped object some ·08 mm. in length and ·02 mm. at the greatest diameter.

Echinorhynchus tigrinæ, n. sp.

Length 10 mm., average breadth 2 mm. Greyish, transversely wrinkled. Proboscis short, small, arising from behind the anterior end. Four or five rings of very few hooks. Ova spindle-shaped, 0·8 mm. × ·02 mm.

Habitat. Intestine of *Rana tigrina* Daud. Taken at Biserat, Jalor.

Some small fragments of another *Echinorhynchus*, too small to admit of identification, were taken from the intestine of the toad *Callula pulchra* Gray.

NEMATOMORPHA.

Professor Camerano has kindly described the specimens of this very difficult group and has published accounts, with full details as to the structure of the cuticle on which the classification of these creatures so largely rests, of four species, two of which, *Chordodes siamensis* and *Gordius paronæ*, are new. I extract the following from Camerano's descriptions :—

1. *Chordodes montoni* Camer.

1895. L. Camerano, Bull. Soc. Zool. France, xx. p. 99.
1897. L. Camerano, Mem. Acc. Torino, ser. 2, xlvii. p. 387.
1899. L. Camerano, Atti Acc. Torino, xxxiv. figs. 3, 3 *a*.
1901. L. Camerano, Boll. Mus. Torino, xvi. no. 408.

A single specimen, a male, was taken by Mr. Laidlaw whilst making its exit from a large Mantis captured at the foot of Gunong Inas, Perak. The length could not be determined, as the worm was in pieces. The colour of the spirit-specimen is white at each end, black and velvety in the middle.

The cuticle showed the characteristic markings described by the author in the first-named specimen, which came from China, other specimens have been described from Perak.

2. *Chordodes punctatus* Camer.

1895. L. Camerano, Notes Leyden Mus. xvii.
1897. L. Camerano, Mem. Acc. Torino, ser. 2, xlvii. p. 384.
1899. L. Camerano, Atti Acc. Torino, xxxiv.
1901. L. Camerano, Boll. Mus. Torino, xvi. no. 408.

A single male specimen taken on an island off Kedah measured 23·2 mm. Its colour was a darkish brown lightening towards each tip. The cuticle resembled other examples described from Deli in Eastern Sumatra and from Perak.

3. *Chordodes siamensis* Camer.

1903. L. Camerano, Boll. Mus. Torino, xviii. no. 437.

A single female specimen, brownish-black in colour, but lighter towards the ends, 20 cm. long. This specimen was taken at Biserat.

4. *Gordius paronæ* Camer.

1903. L. Camerano, Boll. Mus. Torino xviii. no. 437.

Three male specimens taken at Kota Bharu, varying in length from 17·5 cm. to 22·5 cm.

NEMATODA.

The Nematoda have been described by Dr. von Linstow in the 'Archiv für mikroskopische Anatomie und Entwicklungsgeschichte,' Band lxii. 1903, p. 108. I here give only a list of the species and of their respective hosts, and must refer the reader to the memoir mentioned for further details.

1. *Ascaris infundibulicola* v. Lins.

From the alimentary canal of *Python reticulatus* Gray, killed in Tremangan.

2. *Ascaris solitaria* v. Lins.

A single undeveloped female was found in the stomach of *Dipsadomorphus dendrophilus* Boie, taken at Kwala Aring.

3. *Ascaris dipsadomorphii* v. Lins.

A number of larvæ found in the cysts scattered through the mesentery of *D. dendrophilus* Boie, Kwala Aring.

4. *Heterakis rimula* v. Lins.

Out of *Centropus sinensis* Steph.

5. *Heterakis circularis* v. Lins.

From the same host as No. 4.

6. *Cheilospirura ophthalmica* v. Lins.

From the eye of *Turnix taigor* Sykes.

7. *Cheilospirura siamensis* v. Lins.

From *Centropus sinensis* Steph., probably from the eye.

8. *Oxyurus siamensis* v. Lins.

From the stomach of *Liolepis bellii* Gray.

9. *Oxyurus coronata* v. Lins.

From the large intestine of *Galeopithecus volans* Linn., taken at Patalung.

10. *Oxysoma tuberculatum* v. Lins.

From the alimentary canal of *Megalophrys montana* Wagl.

11. *Filaria longicirrata* v. Lins.

From the subcutaneous tissue of *Galeopithecus volans* Linn.

12. *Filaria sciuri* (?) v. Lins.

A single immature female found under the skin of *Sciurus caniceps* Gray. Von Linstow regards the naming of this specimen as provisional.

13. *Filaria corynodes* v. Lins.

From under the skin of *Semnopithecus albocinereus*, Kwala Aring; see also von Linstow, MT. Mus. Berlin, i. 1899, p. 23.

14. *Angiostomum brachylaimus* v. Lins.

From *Bufo melanostictus*, probably from the lungs.

15. *Lissonema rotundata* v. Lins.

From *Centropus sinensis* Steph., probably from the alimentary canal.

LINGUATULIDÆ.

Porocephalus moniliformis (Diesing).

Synonym. *Pentastoma moniliforme* Diesing Denk. Ak. Wien, xii. 1856.

Three specimens of this common parasite were taken from the lungs of a *Python reticulatus* Schneid., at Biserat; and six or seven specimens, varying a good deal in size, from another Python of the same species at Tremangan.

SPOROZOA.

Order SARCOSPORIDIA Balbiani.

Several specimens of this order were found amongst the muscles and the tissues at the base of the tongue of a *Bos bubalis* killed at Kwala Aring. Dr. von Linstow has described these specimens as a new species—*Balbiana* (*Sarcocystis*) *siamensis*—in the article mentioned under the Nematoda. I have figured these life-size, on Pl. XVI. fig. 12.

LISTS OF HOSTS CONTAINING THE PARASITES COLLECTED ON THE SKEAT EXPEDITION.

ECHINODERMA.

A Holothurian, probably a *Molpadia*, infested by *Tetrarhynchus holothuriæ*, n. sp.

INSECTA.

A Mantis was infested by the Gordian Worm, *Chordodes montoni* Camer.

AMPHIBIA.

Bufo melanostictus Schneider and ? *Bufo penangensis* Wilson & Gray had *Echinorhynchus bufonis*, n. sp., in their intestines, and *Angiostomum brachylaimus* v. Lins. probably in its lungs.

Callula pulchra Gray, infested by indeterminable species of *Echinorhynchus*.

Megalophrys montana Wagl. had in its stomach examples of *Oxysoma tuberculatum* v. Lins.

Rana tigrina Daud., infested by *Echinorhynchus tigrinæ*, n. sp.

OPHIDIA.

Dipsadomorphus dendrophilus Boie, infested by *Ascaris solitaria* v. Lins. in the stomach, a single specimen, and by *Ascaris dipsadomorphi* v. Lins. in numerous cysts on the mesentery; and almost certainly by certain Bothriocephalid larvæ and by *Echinorhynchus patani*, n. sp.

Enhydrina valakadien Boie, infested by a cystic form of *Tetrarhynchus* whose species is not determinable.

Python reticulatus Schneid. had its lungs infested by *Porocephalus moniliformis*, and another specimen contained many examples of *Ascaris infundibulicola* in its alimentary canal.

Xenopeltis unicolor Reinw., infested by *Echinorhynchus xenopeltidis*, n. sp.

LACERTILIA.

Liolepis bellii Gray, contained in its stomach examples of *Oxyurus siamensis* v. Lins.

AVES.

Centropus sinensis Steph. contained specimens of *Heterakis rimula* v. Lins., and of *H. circularis* v. Lins., and of *Cheilospirura siamensis* v. Lins., the last-named probably from the eye. A new genus and species, named by von Linstow *Lissonema rotundatum*, was found in this species, probably in the alimentary canal.

Turnix taigoor contained in its eye examples of *Cheilospirura ophthalmica* v. Lins.

MAMMALIA.

Bos bubalis was infested at the root of its tongue with specimens of a Sarcosporidian, regarded by von Linstow as new and named by him *Balbiana siamensis*.

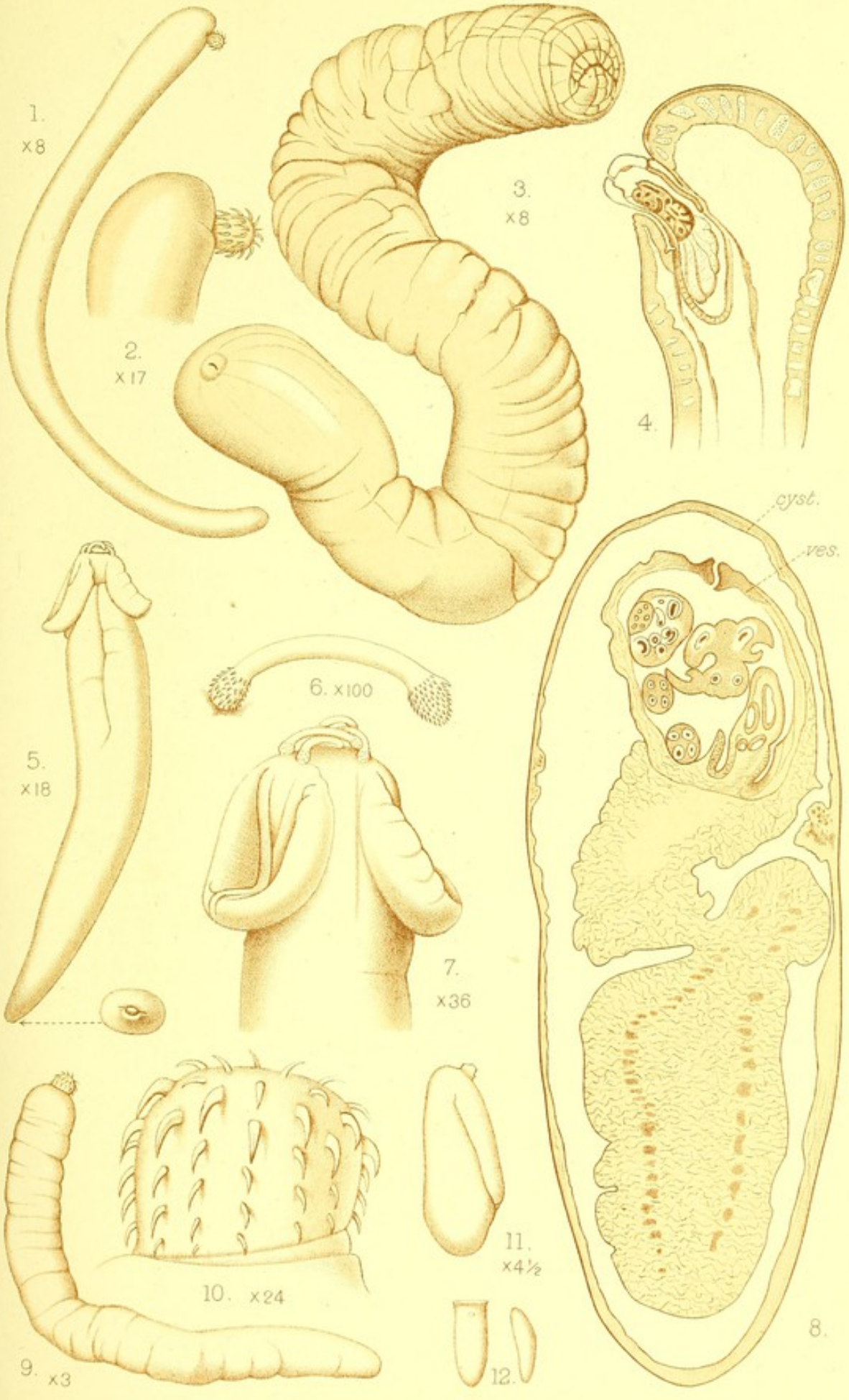
Sciurus caniceps Gray, had under its skin an example of a *Filaria*, provisionally named by von Linstow *Filaria sciuri*.

Galeopithecus volans Linn. was infested in its large intestine with *Oxyurus coronata* v. Lins., and in its subcutaneous connective tissue with *Filaria longicirrata* v. Lins.

Semnopithecus albocinereus was subcutaneously infested by *Filaria corynodes* v. Lins.

EXPLANATION OF PLATE XVI.

Fig. 1. Side view of *Echinorhynchus bufonis*, × 8, p. 150.
2. Anterior end of the same, × 16, p. 150.
3. *Echinorhynchus xenopeltidis*, × 8, p. 151.
4. Section through the anterior end of *E. bufonis* to show the angle at which the proboscis leaves the body, p. 150.
5. *Tetrarhynchus holothuriæ*, × 18, and the indented posterior end, p. 146.
6. A single hooked arm of the same, × 100, showing the arrangement of the hooks, p. 146.
7. An enlarged view of the head of the same, × 100, showing the arms and the bothria, p. 146.
8. A longitudinal section through the cyst and the contained larva of a *Tetrarhynchus* from the sea-snake *Enhydrina valakadien*, showing the cyst and the vesicle (*ves.*) surrounding the head, p. 147.
9. *Echinorhynchus patani*, × 3, p. 149.
10. Head of the same, × 24, p. 149.
11. View of one of the cysts, × 3, containing the *Tetrarhynchus* found in the sea-snake *E. valakadien*, p. 147.
12. Two specimens, life-size, of the *Balbiana siamensis* found in *Bos bubalis*, p. 155.



E. Wilson, Cambridge.

ENTO-PARASITES FROM LOWER SIAM.