

XVIII. *Further Observations on Entozoa, with Experiments.* By T. SPENCER COBBOLD,
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Read December 20th, 1860.

ALTHOUGH, since my last communication, I have had fewer opportunities of examining Entozoa, I think it will be admitted that the new or otherwise important forms which have come under my notice, are of sufficient interest to be placed on record, in continuation of the series of papers previously submitted to the Society.

In the present instance, the number of different animals specially examined with reference to the presence or absence of internal parasites, amounts in all to forty-three, including seven fish, two reptiles, seventeen birds and nineteen mammals. Of these only three fish, one reptile, seven birds and the same number of mammals, were found infested. In so far as these numbers refer to species formerly living in the Zoological Society's menagerie, the proportion is small, and tends to confirm both the statement and explanation which I have before hazarded in respect of the comparative freedom from internal trematode parasites, found to obtain in foreign animals subjected to a condition of captivity.

1. *DISTOMA CONJUNCTUM* (mihi).

Distoma conjunctum, Cobbold, Linn. Soc. Proceed. vol. v., Zool. Div. p. 8.

Remarks.—As already briefly indicated in my synopsis of the Distomidæ, published in the Society's Proceedings (*loc. cit.*), this species of fluke infests the liver of the American Red Fox (*Canis fulvus*). The animal in question died at the Zoological Society's Gardens, Regent's Park, in December, 1858, and was dissected on the 24th of that month, the carcase being still quite fresh. The biliary ducts were found thickened and enlarged in several places, forming here and there small cysts of variable size. In these cavities—partly occupied by purulent matter—the distomes were lodged; and when placed in water they showed signs of life. Their extreme transparency at once displayed, under the microscope, the relative position and degree of development of the various organs, as shown by the accompanying figure (fig. 1, Plate XXXIII.), in which I may particularly remark the great breadth of the digestive cæca, the well-defined excretory canals passing transversely inwards from the botryoidal albumen-forming glands (Dotterstock), and also the large yolk-forming organ or ovary (Eikeimstock), placed in the centre of the body, immediately below the uterine folds. A still more noticeable feature, however, is seen in the unusual length and breadth of the contractile vesicle belonging to the excretory system. It occupies fully one-third of the longitudinal diameter of the body, and bifurcates at the summit, the course of each division being traceable almost as far forward as the bulb of the œsophagus; below, it is suddenly constricted, and terminates, as usual, by a small central aperture. The sac itself

* An abstract of this paper has been published in the Society's Proceedings, Zool. Div. vol. v. p. 255.

is comparatively narrow and tortuous at the upper half, where it passes between, and apparently contributes to separate, the two well-developed and irregularly oval-shaped testes. The inferior half is much broader, and is occupied by numerous glittering corpuscles, which are especially numerous at the lower end. The character of these particles has already been accurately described by Wedl, Wagner, and others; but I did not observe any of them connected together in the form of cellular masses, such as Claparède has described as occurring in the excretory ducts of *Holostomata*. In connexion with the reproductive system, I may notice the circumstance of a pair of these flukes being found sexually united, as represented in fig. 2; an observation so rare, that it has, I believe, led some to infer that the hermaphroditic flukes were capable of self-impregnation. Even Bilharz's discovery of a trematode specially furnished with a gynæcophoric canal, afforded no direct proof of a true sexual function in the androgynous *Distomata*, because in his aberrant form—as obtains also in a few others—the sexes are separate. Many thousands of flukes must have now passed under my examination, and yet this is the first instance in which I have observed a true sexual union; moreover, I am not acquainted with any similar observation on record, in so far as it affects the truly hermaphroditic species. In the instance now mentioned, the opposed suckers were so firmly adherent that it was found impossible to detach the animals without breaking them up piecemeal. Lastly, I may notice that the ova (*f'*, fig. 1) contained in the uterine folds have a longitudinal diameter of only $\frac{1}{750}$ of an inch.

2. PENTASTOMA DENTICULATUM, Rudolphi.

Pentastoma denticulatum, Rudolphi, Bremser, Wiegmann, Dujardin, Diesing and others.

P. tanioides, in the young state, according to Gurlt, Küchenmeister, and especially Leuckart. See Mem. in Henle and Pfeiffer's Zeitsch. f. rat. Medecin, Bd. iv. p. 78, 1858.

Remarks.—Although it is clear from the investigations of Schubert and Van Beneden respecting the condition and development of the embryo of *Pentastoma*, that this genus is closely allied to the Acaridæ, its habits are so intimately associated with those of Entozoa proper, that there can be no impropriety in offering a short notice in this place.

On the 10th of February, 1859, I obtained numerous examples from the viscera of a Bubale (*Antilope Bubalis*, Pallas), which had died the day previous at the Zoological Society's Gardens. The greater part of these worms occupied the surface of the lungs and intestines; a considerable number, however, being enclosed in cysts beneath the pulmonary pleura. Fifteen or more having been taken away for the purposes of microscopic examination and experiment, I had ample opportunity of watching the movements of the cephalic claws whilst the animals were still living. I may here remark, that these claws do not in any way resemble those of the Tape-worm family, but, in strict accordance with other external features, show that the Pentastomes belong to an entirely different type. Placed under the half-inch objective, with the ventral surface uppermost, the transparency of the body permits a full view of the apparatus of hooks, as displayed in the accompanying drawing (fig. 3). It will be here noticed that the points of the claws are directed towards the observer, and not towards the longitudinal axis of the body as Küchenmeister's figure ('Parasiten,' tab. viii. fig. 11) would lead one to suppose; moreover, the claws are placed

obliquely in reference to the central line, the angle of divergence being about 25° . During the eversion and retractation of the claws, the vacant spaces directly above them dilate and contract, so as greatly to facilitate the prehensile action of the hooks. These depressions are obviously inversions of the ventral integument, forming socket-like pouches for the implantation of the hook-capsules. If one of the claws be isolated and viewed laterally, it will be seen to consist of two parts—namely, a strongly curved *hook* (*a*, fig. 4), and a *capsule* (*b*). The upper part of the latter forms a hood (*d*), for the lodgement, support, and protection of the hook; the lower tubular portion serving to fix the apparatus in the body, and at the same time to regulate the movements of the claw through the intervention of a muscular pulley (*g*), which enters the tube at the lower end. Acting antagonistically to this, we find an extensor muscle (*f*) inserted into the anterior border of the base of the hook itself. The summit or projecting point of the hood is flattened out, so as to form a three-cornered process (*e*), which covers and protects the sharp extremity of the hook when the latter is retracted.

In regard to other external appearances, my observations for the most part correspond with those already on record; but with reference to the rows of minute integumentary spines, it will be seen from my figure (3), that the uppermost row is placed somewhat more apart from the second—at least, at the sides; the whole forming a complete and graceful tracing, as it passes downwards on either side between the inferior and superior pair of cephalic claws. Further, I do not find the spines themselves to be simply conical, as hitherto represented, because their uniformity of outline is interrupted at the lower third, as shown at the left margin of figure 5; this appearance, indeed, can only be seen by a lateral view. The so-called stigmata (Athemlöcher of Nordmann) display a double outline, but no vessels could be traced in connexion with them.

With respect to the internal structure of this parasite, very little can be made out—a circumstance materially favouring the notion that we have to deal with an imperfectly developed animal. Throughout the body there exists a central clear space, and this is well defined by dark lateral masses, which narrow out on either side of the head, in the form of a horse-shoe-shaped band enclosing the mouth and the four chitinous claw-masses. These dark patches at first sight look like albumenogene organs, but a closer examination shows that they are entirely made up of large parenchymatous cellules, unconnected by any special fibres or tubes. In an isolated and highly magnified group of them, the granular contents and central nuclei at once became visible, as represented in fig. 6, where some have become flattened at the sides from accidental pressure*.

Before finally quitting the consideration of this parasite, I may advert to the recently advanced opinion of Gurlt, Küchenmeister and others, respecting its assumed larval condition. After the perusal of Leuckart's original memoir†, kindly placed in my hands by Mr. Busk, I naturally felt desirous of repeating that distinguished zoologist's experiments. Accordingly (as I have already stated in the Quart. Journ. Micr. Sc.), on the 11th of February, I proceeded to infest two dogs. Into the nostrils of the first hound, stated to be

* Leuckart, in his recent work, 'Bau und Entwicklungsgeschichte der Pentastomen,' says they are glandular, and finds ducts in connexion with them.

† Henle and Pfeiffer's Zeitsch. *loc. cit.*—See also my translation in the 'Micr. Journal,' vol. vii. p. 182.

only ten months old, I introduced nine living Pentastomes, and in the second—an old dog—five examples. All the worms quickly disappeared, and I therefore fully expected a satisfactory result. I was doomed to disappointment. On the 4th of March the young animal was destroyed, and I made a most careful dissection of the head, without, however, finding a single Pentastome in any of the nasal, frontal or facial cavities. I regret to add, that the old dog was subsequently killed and thrown away during my absence, and I have not since had an opportunity of repeating the experiment. Prof. Leuckart, having seen the memorandum above-mentioned, suggests that the parasites may have been dislodged by the dog's sneezing.

3. *TRICHOCEPHALUS AFFINIS*, Rudolphi.

T. affinis, Rudolphi; Miram; Lamarck; Gurlt; Mayer; Dujardin; Diesing, Helminth. vol. ii. p. 296; Küchenmeister, Parasiten, p. 275.

T. Cameli, Rudolphi.

T. ovis, Abildgaard.

T. Giraffe, Clot-Bey (non descript.), in Bulletin Scient. de l'Acad. Imp. de St. Pétersb. 1839, tom. vi. p. 94; also in Isis, 1839, p. 663; Diesing, Syst. Helminth. vol. ii. p. 294 (species inquirendæ).

T. gracilis, Cobbold, Proceed. Zool. Soc. for 1860, p. 103 (non descript.).

Remarks.—In a paper, entitled “Contributions to the Anatomy of the Giraffe,” which I had the honour of communicating to the Zoological Society on the 14th of February last, the circumstance of my having detected *Trichocephali* in the cæcum and colon of that ruminant is already mentioned. At the time referred to, I purposely abstained from giving any particular account of the worm, but, believing it to be a distinct form, I recognized it provisionally under the title of *T. gracilis*. Subsequently, finding the latter title to be applicable to a *Trichocephalus* discovered by Olfers and Natterer in two species of *Agouti*, I abandoned it; and I have, moreover, since satisfied myself by a very careful investigation, that the species in question is identical with the *T. affinis* of Rudolphi. Under the synonym of *Trichocephalus Giraffæ*, Diesing has grouped this worm among his doubtful forms, its presence having been previously noticed by Clot-Bey in the small intestines of a giraffe dissected at Cairo in the year 1839.

Viewed with the naked eye (fig. 7), one can scarcely detect any difference between this form and the well-known *T. dispar* of the human subject—an observation which applies to some other species of the same genus. In my examples the females measure from $1\frac{3}{4}$ –2 inches in length, over all; the males reaching from 2– $2\frac{1}{4}$ inches. With the pocket lens, the surface of the worm appears smooth throughout, but when highly magnified, peculiar markings are seen on the anterior thin portion, which probably also extend over the body proper. The so-called neck presents a tolerably uniform thickness along its entire course; it is so narrow as to measure only from $\frac{1}{125}$ – $\frac{1}{120}$ th of an inch transversely, whilst the finely-pointed head itself, immediately below the mouth, has a diameter less than $\frac{1}{1000}$ th of an inch. In the fresh state the head appeared to be lobed, or rather, I may say, furnished with two alæform lobed appendages, as represented in fig. 8; but in preserved specimens these appearances either partially or entirely disappear, leaving one in doubt as to their true nature. Küchenmeister has noticed the evanescence of appa-

rently similar structures surrounding the mouth of *T. dispar*, and therefore supposes that the lobes in question are due to the presence of a peculiar organ, capable of eversion and inversion, and not merely the result of accidental sarcode globules. Be that as it may, I have been surprised to notice how completely other well-marked external and internal characters alter or disappear from shrinking, &c., caused by immersion in spirit. This observation especially applies to a very peculiar longitudinal band, which commences a little below the head, and can be traced on one side of the neck the whole way down to the beginning of the so-called body; it is remarkably distinct in fresh specimens, but barely discernible in those preserved. This band was first discovered by Dujardin, who states it to consist of prominent and pointed papillæ. Wedl has also described it as consisting of little warts and spines; whilst Küchenmeister goes so far as to compare these little prominences to the hooklets present on the male copulatory organs. According, however, to my own examinations, this band is made up of projecting, bluntly pointed, polygonal, epidermal cells, which in certain adjustments of the focus refract transmitted light so strongly, that the band of them looks as if it consisted of a regularly arranged series of pigment spots (fig. 9 *a*); at other times the centre of each cell becomes clear (*a'*), and the irregularly polygonal character of each individual cell is rendered more apparent. On one side of the longitudinal band, Dujardin also figures and describes a series of minute superficial papillæ, which he associates with a festooned border of the band. I have not observed these prominences; and the festooned markings are clearly due to the subjacent convolutions of the œsophagus (*b*), which are singularly uniform in size and disposition. In the fresh state, the dermal rings (*c c*) are beautifully distinct; they are said to extend all round the filamentary neck, but I found the transverse lines, indicating their limits, to cease at a little distance apart from either side of the longitudinal band. Midway between the latter and the serrated border of the neck there exists internally a double row of oval corpuscles (*d d*); but, as no vessels or fibres were observed in connexion with them, and their contents were not visible, I will hazard no opinion respecting their nature.

Turning now to the reproductive organs, the first thing that strikes one has reference to the unusual length of the penis and its membranous sheath—a character believed to be peculiar to this species. In this respect, at least, it departs very materially from what is observable in *T. dispar*, where the sheath forms externally a funnel-shaped tube, which may possibly be a distinct organ. At all events, if specific differences have any existence—and unfortunately for zoological science, recent hypotheses tend to limit, if not virtually to deny, their value altogether—no one can any longer reasonably entertain the notion that *T. affinis* and *T. dispar* are one and the same species. The organ to which I have just referred as present in *T. affinis*, is itself included in a sheath-like muscular mass, which I suppose to be concerned in the evolution of the penis. The free end of this intromittent muscle is shown in fig. 11 *a*. I never saw this muscular mass everted, but the anal opening (*b*, fig. 11) is sufficiently capacious to give it free passage, if necessary. The everted part of the sheath of the penis (fig. 10, and *c*, fig. 11) measures about the $\frac{1}{19}$ th of an inch in length; it is perfectly transparent, not always uniform in breadth, but covered throughout its entire extent with minute, conical, sharply pointed spines,

whose apices are directed backwards towards the body of the animal. The occasional absence of uniformity in the diameter of the sheath seems to me to be a point of some importance; for, had not my examinations extended over a considerable number of examples, I might have been led to the belief that I had to deal with several distinct forms of *Trichocephalus*. At first, indeed, this conclusion seemed inevitable, but finding intermediate conditions between perfect uniformity and the presence of a large flask-shaped distension near the free extremity, I can only suppose the variations to be due to the degree of protrusion at which the organ has arrived. In the accompanying woodcuts I have outlined a few of these appearances (figs. 1, 2, 3), which are intended for comparison with the simple condition of the sheath shown in fig. 10, Plate XXXIII. The penis itself is about three times longer than the everted sheath, the exposed portion measuring the $\frac{1}{4}$ th of an inch; it is cylindrical, curved towards the tip, and coiled within the spirally twisted tail at its superior two-thirds; the free extremity is scimitar-shaped, and rather sharply pointed (fig. 12). I did not observe any markings on its surface, but internally there were lines indicating the presence of a groove or internal tube, such as has been described as occurring in *T. dispar*.

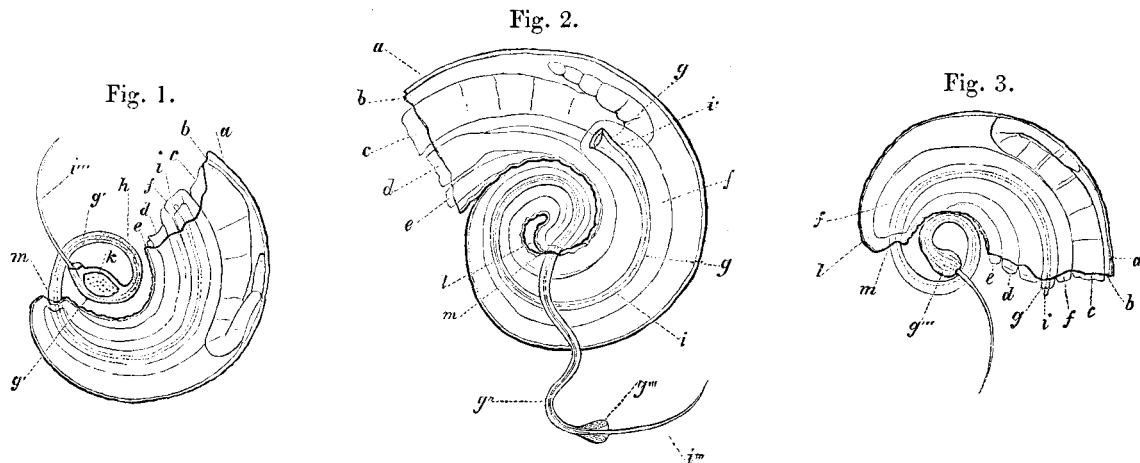
In regard to the organs of generation in the female, Küchenmeister states that there are no external appendages in *Trichocephalus* comparable to those known to exist in the allied *Trichosomata*. So far, however, from this being the case, there is, in the present species at least, a remarkably prominent, and more or less hour-glass-shaped sheath; this projecting vulva, if it may be so termed, being obliquely truncated at the free end, where it is also hollowed out, or rather inverted to give origin to the centrally enclosed vagina, whose orifice is somewhat constricted (fig. 13). The surface of this appendage is supplied with small spines, precisely similar to those described in connexion with the sheath of the male intromittent organ, the spines being likewise retroverted. This observation is confirmed by the statements of Mayer, who has described their occurrence at the vaginal orifice of *T. dispar*. Dr. Joseph Eberth, of Würzburg*, however, in a recent number of Siebold and Kölliker's 'Zeitschrift,' rather incautiously denies the assertions of Mayer†. Dr. Eberth, having discovered a series of long conical processes within the vagina of *T. dispar*, totally unlike those described by Mayer and myself, has inferred that the structures in question are the same as those seen by us. I translate and quote his own words:—"According to Mayer, these are similar in form and size to the spines on the appendix of the penis. By means of these backwardly-directed points, the spicule when introduced into the vagina is said to be retained during the copulatory act. These statements," he adds, "are not correct: the villi of the vagina are larger than the spines of the male, and their points are, on the contrary, directed forwards." The latter part of this observation is, doubtless, quite true; for it is evident that our little spines are entirely different from the curious villi discovered by Dr. Eberth.

The ova, previous to impregnation, as in other Nematodes, are, at a certain stage, flat and irregularly triangular in outline; the thin limiting membrane by which they are surrounded enclosing finely granular contents (fig. 14). In the perfectly developed egg,

* "Die Generationsorgane von *Trichocephalus dispar*," Zeitschrift for April 1860, p. 384.

† Zeitschrift für wissen. Zool., Band 9, s. 367.

the external chitinous capsule presents the same characters as in *T. dispar*; at either pole of the egg, where the shell terminates abruptly, an inner transparent membrane projects, in the form of a mammillary process (fig. 15). None of the eggs I examined appeared to contain fully developed embryos, but the interior yolk-mass exhibited evidences of segmentation, many of them displaying two nuclei. These ova have a longitudinal diameter of $\frac{1}{340}$ th to $\frac{1}{320}$ th of an inch.



Figs. 1, 2, 3. *a*, Epidermis; *b*, cutis; *c*, cut caecal end of the testis; *d*, seminal duct; *e*, intestine; *f*, intromittent muscle surrounding *g*, the sheath of the penis; *g*', infundibuliform portion; *g*'', exserted portion, armed with minute retroverted spines; *g*'', flask or cup-shaped expansion of the free extremity of the sheath; *h*, rings formed by contraction of a portion of the sheath; *i*, penis; *i*'', infundibuliform upper extremity of the penis or spicule; *i*'', free pointed end of the same; *k*, an oval granular mass in one of the flask-shaped expansions, apparently consisting of spermatid particles; *l*, cloacal cavity; *m*, anus. Drawn, with the aid of a camera, from specimens mounted and preserved in glycerine.

In regard to the solution of Küchenmeister's hypothesis, which assumes the encysted *Trichinae* to be only immature forms of the more highly developed *Trichocephalus*, my experiments have again been attended with merely negative results; but this has possibly arisen more from the unsuitableness of the particular hosts selected and operated on, than from any other cause. From economical considerations, I confess to have refrained from experimenting on sheep and pigs. On the 8th of December, 1859, I fed a rabbit with portions of raw potato, on which were placed three fresh female *Trichocephali*, all of them being readily devoured. On the 13th January following the rabbit was destroyed, and carefully examined, when neither *Trichinae* nor eggs of *Trichocephalus* could be detected. On the day above mentioned I also fed a chicken with three other fresh *Trichocephali*; these worms having all been previously obtained from the giraffe. The bird perished from exposure to severe cold on the sixth night succeeding the experiment. When, however, I dissected it several days afterwards, although the muscles showed no *Trichinae*, I was to a certain extent gratified to find several egg-shells of the *Trichocephali* still lodged in the intestinal caeca. Most of the egg-capsules were empty; but a few of them exhibited thinly scattered and disintegrated contents*.

* Since the above was written, I observe that Leuckart's recent investigations disprove the notion that *Trichinae* are the young of *Trichocephalus*. See his treatise entitled 'Untersuchungen über *Trichina spiralis*, zugleich in Beitrag zur Kenntniss der Würmkrankheiten.' 4to. Leipzig u. Heidelberg, 1860. See also 'Ann. des Sci. Nat.,' 4me sér. tom. xiii. p. 318.

The interest of this last-mentioned dissection did not altogether terminate here, as I was partly rewarded for my trouble by finding in the duodenum of the chicken a multitude of loose tape-worm joints, or proglottides in a somewhat unusual condition. There were also present a few imperfect Strobilas, whose joints had undergone no apparent alteration in form. Of course the loose joints had no genetic relation to the Entozoa which formed the subject of experiment; but, viewed independently, they appeared of sufficient interest to demand separate investigation. Accordingly I requested Prof. Huxley to examine them, and he kindly assisted me in arriving at a true explanation of their character. These proglottides were more or less oval, rounded, compressed, semi-opaque, whitish bodies; to the naked eye discernible only by contrast with the coloured intestinal contents. They varied in size, the larger averaging $\frac{1}{25}$ th of an inch in breadth; these latter containing fully developed 6-hooked embryos. Each individual of the brood (fig. 16) was enclosed in an outer and inner envelope; the middle pair of hooks, or boring apparatus, being simple and straight, and those of the lateral pairs lobed. The mature embryo measured $\frac{1}{400}$ th of an inch in diameter over all. The point of interest in regard to these joints lies in the circumstance of their probable early separation from the head of the parent Strobila while living; this being rendered likely from the fact that Prof. Huxley found among the proglottides a tape-worm head with only one joint attached. Although some days had elapsed since the chicken's death, the frozen condition of the bird had prevented any structural disintegration of the tissues of the worm-segments; and I did not observe any free six-hooked embryos in the intestinal mucus. On the whole, therefore, it is fair to conclude that immature joints had become detached from the Strobila, and had attained their sexual maturity independently; a view, which, if confirmed by subsequent observation, will render the individuality of each proglottis remarkably significant.

Appendix.—In this place, as on a former occasion, I have thought it useful to note down, more or less briefly, such other interesting forms of Entozoa as have incidentally come under my observation; at least, I have here particularized a selection of them. Some of these parasites will elsewhere demand a more extended notice. From the Perch I have obtained two forms of *Echinorhynchus*, accompanied by a solitary example of the well-known viviparous Nematode, *Cucullanus elegans*. Being an adult female, it contained germs, eggs, and young in every possible stage of development. From a Pike I procured three very juvenile examples of *Tricuspidaria nodulosa*. In this parasite, and in immediate connexion with the sub-epidermal calcareous corpuscles, I have discovered peculiar vessels with flask-shaped ends, the latter surrounding the corpuscles. I have already described these structures in the 'Quart. Journ. Micr. Sc.*'; but I may here be permitted to add that, as they appear to be quite independent of the ordinary excretory system of vessels, I have since, on further consideration, arrived at the conclusion that they are rather to be regarded as special organs for the secretion and formation of the corpuscles than as a vicarious development of the excretory vascular system.

From the intestines of a large snapping Turtle (*Chelydra serpentina*) I have procured

* Vol. vii. in Memoranda, p. 115 and p. 202.

some unusually slender forms of *Echinorhynchi*, which were accompanied by several unimportant-looking Nematodes.

Amongst birds I may mention the occurrence of numerous tape-worm proglottides infesting a black-throated species of *Amadina*; and in the intestinal cæca of the Cheer Pheasant (*Phasianus Wallichii*), as also in those of the Black-backed Kaleege (*Euplocornis melanotis*), multitudes of the oft-recurring *Ascaris vesicularis*. The last-named bird was bred in the Zoological Society's Gardens. Here also may be noticed the existence of many examples of no less than three entirely different species of *Strongylus* infesting respectively the proventriculus, intestines, and cæca of an Ashy-headed Goose (*Bernicla poliocephala*). One of these parasitic forms appears to be new; but, of the others, the second is clearly referable to *Strongylus tubifex*, and the third is probably *S. nodularis*. The intestines of a Tinamou (*Tinamus* —?) likewise yielded several specimens of a new *Strongylus*.

From a Starling (*Sturnus vulgaris*) shot by me on the 10th of January last, I obtained a solitary example of the *Tænia farciminalis*, the lowermost joints of which, though still firmly adherent to the strobila, were amply furnished with mature eggs containing six-hooked embryos, having a diameter of about $\frac{1}{350}$ th of an inch. I have figured one of these in the shell (fig. 17), to contrast with those found in the cestode infesting the chicken. The last-named parasite I suppose to have been *Tænia infundibuliformis*.

Turning to Mammalia, I have to notice the occurrence of multitudes of Pentastomes in the abdominal cavity and viscera of a Cape Guevi (*Cephalophus pygmæus*), these being in all respects similar to those I have described from the Bubale Antelope. In a Spring-bok (*Gazella Enochore*) I also encountered two characteristic specimens of the so-called *Cysticercus tenuicollis*; and in one of the bronchial tubes of the American Red Fox (*Vulpes fulvus*), from which the new Distome, *D. conjunctum* (mihi), was procured, there were found two specimens of *Trichosoma ærophilum*. The eggs of the last-named worm are scarcely distinguishable in outline from those of *Trichocephalus affinis*, their longitudinal diameter being only a trifle less—that is to say, about the $\frac{1}{350}$ th of an inch (fig. 18). From the common Rat I have secured an example of *Tænia pusilla*, measuring upwards of 20 inches in length; and lastly, I may mention some remarkably large *Cysticerci* infesting the abdominal cavity of the Æthiopian Wart Hog (*Phacochærus æthiopicus*), and of the Red River Hog (*Potamochærus penicillatus*). These gigantic Scolices are apparently referable to two distinct forms of tape-worm; but, as their separate description and comparison will involve many other points of interest, I do not offer any further particulars respecting them in the present communication*.

* In the recently published 'Proceedings of the Zoological Society' for 1861, Part I., I have since given a minute description of these *Cysticerci* (p. 93, plate xvii.); and in a separate paper published in the same Part of the 'Proceedings' the new forms of Entozoa above mentioned are described under the following titles:—*Echinorhynchus inflexus* from the Turtle; *Cestodeum Amadinæ* from the Amadina; *Strongylus acuticaudatus* from the Ashy-headed Goose; and *Strongylus spiculatus* from the Tinamou. Three of these species are likewise figured in plate xx.

EXPLANATION OF PLATE XXXIII.

- Fig. 1. *Distoma conjunctum* (mihi). $\times 25$ diameters: *a*, oral sucker; *b*, ventral sucker; *c*, œsophageal bulb; *d, d*, digestive cæca; *e*, reproductive papilla; *f*, uterine folds; *f'*, egg $\times 220$ diameters; *g*, ovary; *h, h*, excretory ducts of (*i, i*) the albumenogene glands; *k, k*, testes; *l*, contractile vesicle.
- Fig. 2. A pair of the above-named Distomes, sexually connected. Slightly enlarged.
- Fig. 3. Upper fourth of *Pentastoma denticulatum*. $\times 60$ diameters, with the ventral surface exposed. It exhibits the mouth with its chitinous ring, the four cephalic claws with the hooks retracted, the alternating rows of integumentary spines and stigmata, a central clear space and dark lateral masses of cellular parenchyma.
- Fig. 4. One of the cephalic claws isolated and magnified 100 diameters: *a*, the moveable hook; *b*, tubular portion of the chitinous capsule with its longitudinal groove (*c*) near the anterior border; *d*, the hood; *e*, the three-cornered point-cover; *f*, extensor, and *g*, retractor muscles of the hook.
- Fig. 5. Diagram of a portion of integument, $\times 250$ diameters: *a*, spines; *b*, stigmata. The spaces between the rows of spines are vertically shortened one-third.
- Fig. 6. Group of parenchymatous cellules from the lateral dark masses, showing central nuclei and granular contents. $\times 220$ diameters.
- Fig. 7. Two examples of *Trichocephalus affinis*, male and female. Slightly enlarged in breadth.
- Fig. 8. Head of one of the above, showing the small oral aperture and lateral alaform appendages. $\times 220$ diameters.
- Fig. 9. Portion of the so-called neck displaying—*a*, longitudinal band of epidermal cellules; *a'*, four of the cellules under an altered focus; *b*, œsophageal folds; *c, c*, dermal rings; *d, d*, oval corpuscles. $\times 230$ diameters.
- Fig. 10. Spirally twisted portion of the body of a male *Trichocephalus*, magnified 20 diameters, showing the entire extent of the penis and its sheath, without any flask-shaped expansion.
- Fig. 11. Caudal extremity of the same: *a*, lower end of the sheath-like intromittent muscle; *b*, anal opening; *c*, sheath of the penis, or *appendix copulatorius*, with conical retroverted spines. $\times 110$ diameters.
- Fig. 12. Pointed free end of the penis. $\times 220$ diameters.
- Fig. 13. Membranous vulva of the female *Trichocephalus* furnished with retroverted spines, and enclosing the commencement of the vagina. $\times 140$ diameters.
- Fig. 14. Four unimpregnated ova. $\times 220$ diameters.
- Fig. 15. Fully developed egg. $\times 180$ diameters.
- Fig. 16. Egg containing a six-hooked embryo or proscœlex, removed from a free and mature proglottis, occupying the intestine of a common fowl. $\times 180$ diameters.
- Fig. 17. Egg with enclosed embryo from *Tænia farciminalis*. $\times 220$ diameters.
- Fig. 18. Egg of *Trichosoma ærophilum*. $\times 230$ diameters.

