

THREE NEW TREMATODES FROM AMPHIUMA MEANS.

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Early in May, 1922, a single large male specimen of *Amphiura means* received from Louisiana was examined for parasites, and found to contain, in addition to five or six specimens of a nematode, presumably *Filaria amphiuræ*, encysted in the walls of the digestive tract, three species of flukes, all of which proved to be new species. It is interesting to note that one of the species, *Telorchis stunkardi*, new species, belongs to a genus which has hitherto not been known to occur in hosts other than reptiles; another, *Cephalogonimus amphiuræ*, new species, belongs to a genus which is represented in both reptiles and amphibians; and the third, *Megalodiscus americanus*, new species, belongs to an entirely new genus, the nearest relatives of which are found in fishes and amphibians. Each species of fluke was found to occupy a particular portion of the digestive tract. *Cephalogonimus amphiuræ* was found in about the third fourth of the digestive tract, intermingling in the posterior portion of its habitat with *Telorchis stunkardi*. Specimens of the latter occurred chiefly in the fourth fifth of the digestive tract. Of the third species, *Megalodiscus americanus*, only three specimens were found, all of them located in the rectum near the cloaca.

CEPHALOGONIMUS AMPHIURÆ, new species.

Plate 1, fig. 1.

Diagnosis.—Body 4.4 to 5.3 mm. in length, with a maximum width of from 1.22 to 1.3 mm., ovoid, flattened, widest in the third fifth of the body length, tapering thence toward both ends, which are bluntly rounded. Cuticle thickly covered with minute spines anteriorly, these becoming less numerous posteriorly, and absent entirely from the posterior third. Oral sucker 0.42 to 0.43 mm. in diameter, larger than the ventral sucker, which measures, when round, from 0.368 to 0.38 mm. in diameter. Center of ventral sucker about 1.2 mm., two-sevenths of body length, from anterior end. Pharynx about 0.192 mm. in diameter, preceded by a short prepharynx and

followed by a barely distinct esophagus, the distance from the posterior border of the pharynx to the inner border of the intestinal ceca about one and one-half times diameter of ceca. Intestinal ceca long and not quite equal, the left one longer, reaching to about one-tenth of body length, the right one to one-fifth, from posterior end.

Ovary, from 0.32 to 0.36 mm. in diameter, situated just behind ventral sucker and partially overlapping it, slightly displaced toward right side, its center 1.5 mm., or about one-third of body length, from anterior end. A flask-shaped seminal receptacle lies just posterior to the ovary, also toward the right side, occupying the space between ovary and anterior testis. Ootype and shell gland not clearly visible, since they are covered ventrally by the seminal receptacle and dorsally by the egg-filled coils of the uterus. Transverse vitelline ducts receive anterior and posterior forks on either side, in region of intestinal ceca. Vitelline glands on left side more extensive than on right, extending from a level just behind anterior border of ventral sucker to level of posterior border or posterior testis on right side, and to junction of second and terminal thirds of body on left side. Uterus, irregularly coiled and filled with very numerous eggs, passes posteriorly from the ootype on the left side in three specimens, on the right in one, crosses to the opposite side usually at some distance from the posterior end, although loops pass back to the extreme tip, and ascends, crossing diagonally back to the left side, if not already there, in the region of the testes, continuing forward a little to the left of the midline to the anterior border of the ventral sucker, thence following the cirrus sac to the genital papilla at the extreme anterior end. Testes nearly round, one directly behind the other in median line, and in contact or nearly so; anterior one about 0.41 to 0.48 mm. in diameter, posterior one about 0.39 to 0.47 mm. Cirrus sac long and flask-shaped, its posterior end, at level of ventral sucker, bending toward the dorsal side. It crosses diagonally under the left intestinal cecum and, becoming narrow, turns forward, inward, and dorsad to open, in common with the vagina, on a papilla at the antero-dorsal extremity of the worm. Excretory system with thick muscular walls around pore, into which opens a broad reservoir. Eggs thick-shelled, yellow, relatively small; in mounted specimens, where they are more or less collapsed, they measure about 26μ by 13μ .

Habitat.—Middle portion of intestine of *Amphiuma means*, from Louisiana.

Type.—Deposited in United States National Museum, Helminthological Collections, No. 25171.

Cephalogonimus amphiumae is a typical representative of its genus. Including the present species, seven species have now been described in the genus, but one, *Cephalogonimus trachysauri* Mac-

Callum 1921 differs in so many features of its anatomy from other members of the genus that it should undoubtedly be placed in a new genus, and two others, *C. retusus* (Dujardin) and *C. europaeus* Blaizot 1910, from *Rana esculenta* in Europe, are probably identical. The type species, *C. lenoiri*, was described by Poirier from a turtle, *Tetrathyra vaillantii*, from Senegal. Two American species have heretofore been described, one, *C. americanus*, by Stafford (1902) from the intestine of *Rana virescens* and *R. clamitans* in Canada, the other, *C. vesicaudus*, by Nickerson (1912) from the intestines of soft-shelled turtles, *Aspidonectes* and *Amyda*, in Minnesota. Both *C. americanus* and *C. vesicaudus* differ from the type species and from *C. retusus* in having the testes arranged in an oblique manner instead of one directly behind the other; *C. amphiumae* agrees with the type species in this respect. The ovary of *C. amphiumae* is situated much nearer the median line of the body than that of any of the other species. This species also differs from all the others in the more anterior position of the acetabulum and genital glands, and in the fact that the vitellaria do not extend forward beyond the anterior margin of the acetabulum. In addition to these differences it is of larger size than any of the other described species, and has a relatively larger pharynx. It resembles *C. americanus* in having the oral sucker a little larger than the acetabulum, but differs in having the genital opening situated on an anterior papilla instead of being at some distance from the anterior end, on the dorsel side. The very short, almost negligible esophagus is intermediate between the condition found in *C. lenoiri*, *C. retusus*, and *C. americanus* on the one hand, and *C. vesicaudus* on the other.

TELORCHIS STUNKARDI, new species.

Plate 1, fig. 2.

Diagnosis.—Body 4 to 5 mm. in length, with maximum width of 0.58 to 0.64 mm. Sides nearly parallel, but the body tapers slightly in its posterior half, both ends bluntly rounded. Cuticle spiny anteriorly to about level of ventral sucker. Oral sucker about 0.215 mm. in diameter. Ventral sucker, at junction of first and second fourths of body, relatively very large, 0.356 to 0.288 mm. in diameter. Pharynx, preceded by a short prepharynx, also large, 0.096 to 0.106 mm. in diameter. Esophagus variable, 0.17 to 0.23 mm. in length. Intestinal ceca reach almost to posterior end of body.

Ovary spherical, 0.17 mm. in diameter, at junction of third and fourth sevenths of body length, with shell gland and ootype immediately behind it. Descending and ascending uterine coils to left and right sides, respectively, but overlapping considerably; metraterm broad, almost straight, extending about two-fifths of distance from

genital pore to ovary. Vitelline glands in distinct lobes, 10 on the right side and 9 on the left, on left side extending from midway between ventral sucker and ovary to about the beginning of the terminal fourth of the body, on right side extending farther anteriorly, to a point two-thirds the distance from ovary to ventral sucker. Testes in contact with each other, the posterior one a little more than its own diameter from posterior end; transverse diameters slightly greater than longitudinal. Posterior testis from 0.225 by 0.256 mm. to 0.256 by 0.32 mm.; anterior testis variable, smaller than posterior one, in some specimens very markedly so, from 0.144 by 0.192 mm. to 0.224 by 0.288 mm. Cirrus sac very long, extending in an open spiral from genital pore to ovary; about 0.106 mm. in diameter posteriorly. Excretory system typical. Eggs 42 to 45 μ by 18 to 20 μ , as measured from more or less collapsed eggs in preserved specimens.

Habitat.—Posterior portion of intestine of *Amphiuma means*, from Louisiana.

Type.—Deposited in United States National Museum, Helminthological Collections, No. 25170.

Telorchis stunkardi is of particular interest in being the only species of its genus, of which about 24 species are known, which occurs in an amphibian, all of the others being confined to reptiles. The species is, however, a typical representative of the genus. Both the oral and ventral suckers are of unusual size, in fact are relatively larger than in any other species of the genus. Another interesting and unusual characteristic is the tendency for the anterior testis to vary in size. In all specimens it is distinctly smaller than the posterior testis, and in some individuals very markedly so. In the majority of the species of the genus the testes are of approximately equal size, while in *T. ercolanii* the anterior one is larger. In respect to extent of intestinal ceca, presence of esophagus and prepharynx, position of genital glands and acetabulum, and general location of vitellaria, it agrees fairly closely with *T. nematoides*, described from *Tropidonotus natrix* in Europe, but in shape of body, in extent and lobulation of vitellaria, and in arrangement of uterine coils, it more closely resembles *T. aculeatus*, described from *Testudo* in Europe and said by Stunkard (1917) to occur in *Tropidonotus grahamii* in America.

MEGALODISCUS, new genus.

Body conical or horn-shaped, round in cross section. Oral sucker large, with a pair of well-developed pharyngeal pockets with common median wall. Posterior sucker, facing postero-ventrally, extremely large, its diameter considerably greater than that of rest of body, shallow, with raised rim and raised center, in the middle of

the latter a circular cleft into which projects a plug. Esophagus opens into oral sucker on ventral side anterior to the pharyngeal pockets, turns posteriorly and then dorsally, curving around the pharyngeal pockets posteriorly. Wall of esophagus thick and muscular, the musculature becoming much thicker near the point of origin of intestinal ceca, but not forming a sharply defined esophageal bulb. Testes two, very large, globular, one behind the other in middle of ventral part of body. Ovary small, posterior, dorsal. Shell gland immediately posterior to ovary. Laurer's canal opens at level of ovary. Vitellaria in the form of distinct follicles arranged in a curved and largely transverse manner in posterior part of body. Cirrus pouch small, uterus joining with sperm duct just distal to it, forming a short hermaphroditic duct. No sucker around genital pore. Excretory system opens near posterior end of body on middorsal line, and enlarges into a reservoir posterior to ovary and shell gland. Eggs large, thin shelled.

Type of the genus.—*Megalodiscus americanus*, new species.

Habitat.—Rectum of *Amphiuma means*, North America.

The striking characteristics of the genus are the enormous size and peculiar structure of the posterior sucker, the form of the esophagus, the very large size of the testes, which show no tendency toward fusion, and the form and position of the vitelline follicles. In respect to the shape of the esophagus and structure of posterior sucker, *Megalodiscus* is somewhat intermediate between *Diplodiscus* and *Opisthodiscus*. It belongs to the subfamily Diplodiscinae as constituted by Cohn (1904).

MEGALODISCUS AMERICANUS, new species.

Plate 2, figs. 3-5.

Body conical, nearly round in cross section, the general shape being not unlike a curved horn with flaring mouth. Length 3.57 mm., with maximum diameter, before flaring out at junction of huge posterior sucker, of about 0.98 mm. Posterior sucker an enormous shallow disk, facing postero-ventrally, 1.7 mm. in diameter, nearly one and three-fourths times the diameter of the body. Sucker has raised rim and raised center, but in middle of central prominence is a relatively small circular cleft filled with a plug, this structure being reminiscent of the yolk plug of a frog's egg (fig. 5). The central plug shows no evidence of a terminal sucker such as is described by Cohn (1904) for *Opisthodiscus*. Oral sucker large and powerful, about 0.45 mm. in depth and 0.28 mm. in diameter at its anterior end. Pharyngeal pockets large and conspicuous, with common median wall, about 0.235 mm. long. Esophagus leaves oral sucker on ventral side, between and anterior to the pharyngeal pock-

ets, turns posteriorly and then dorsally behind the pockets, widening out into a rather elongate and not sharply defined esophageal bulb from the right and left sides of which the broad intestinal ceca emerge. Entire esophagus thick-walled and well supplied with muscles. Intestinal ceca, considerably greater in dorso-ventral diameter than in transverse diameter, reach almost to posterior sucker. Ovary small, median, slightly elongate, in posterior part of body, about at level of ends of intestinal ceca, on dorsal side; size about 0.26 by 0.195 mm. Ootype and shell gland, immediately followed by an enlargement of the tube which probably serves as a seminal receptacle, situated immediately behind ovary on dorsal side. Uterus coils transversely back and forth across body as it passes forward to genital opening, finally uniting with sperm duct immediately in front of cirrus pouch, and opening on the genital papilla by a short hermaphroditic duct. Laurer's canal passes a short distance anteriorly on dorsal side of uterus, opening on the middorsal surface about at the level of the middle of the ovary. Vitelline glands in form of about 18 spherical follicles on each side, quite distinct from one another, extending, along a curved line on either side from the level of the posterior testis on the ventral side, caudad, dorsad, and mediad, around the posterior ends of the intestinal ceca. A transverse vitelline duct stretches across the space between the two series of follicles, a common duct passing from this to the ootype. Testes two, somewhat irregular in shape, very large, the anterior one larger than the posterior. Anterior testis from about 0.4 to 0.5 mm. in diameter, the posterior one from 0.35 to 0.45 mm.; anterior one slightly to left and posterior one slightly to right, but almost directly one behind the other as seen in lateral view, nearer to ventral side of body. Vas deferens passes from anterior margin of posterior testis (connection with anterior testis not seen) in an antero-dorsal direction between the intestinal ceca, turns when near dorsal surface of body, and passes ventrally between intestinal ceca just posterior to esophageal bulb. This portion is considerably enlarged and serves as a seminal vesicle. Near ventral side of body sperm duct enters a small oval cirrus pouch, measuring 0.17 by 0.095 mm., through which it passes and then joins the uterus in a short hermaphroditic duct. Genital opening can be extruded from body, as shown in Figure 4, or withdrawn into a genital cloaca. Excretory pore on dorsal side, a short distance anterior to the posterior sucker. Eggs very large, about 115 to 123 μ by 51 to 57 μ .

Habitat.—Rectum of *Amphiuma means*, in Louisiana.

Type.—Deposited in United States National Museum, Helminthological Collections, No. 25173; paratype, No. 25172.

EXPLANATION OF PLATES.

ABBREVIATIONS.

| | |
|-----------------------------|------------------------------------|
| c. s., cirrus sac. | sp. d., sperm duct. |
| e. p., excretory pore. | s. r., seminal receptacle. |
| e. r., excretory reservoir. | t., testes. |
| g. p., genital pore. | u., uterus. |
| l. c., Laurer's canal. | u. d., uterus, descending portion. |
| m., metratrem. | u. a., uterus, ascending portion. |
| o., ovary. | v., vitellaria. |
| oe., esophagus. | va., vagina. |
| o. s., oral sucker. | v. d., vitelline duct. |
| ph., pharynx. | v. s., ventral sucker. |
| s. g., shell gland. | |

PLATE 1.

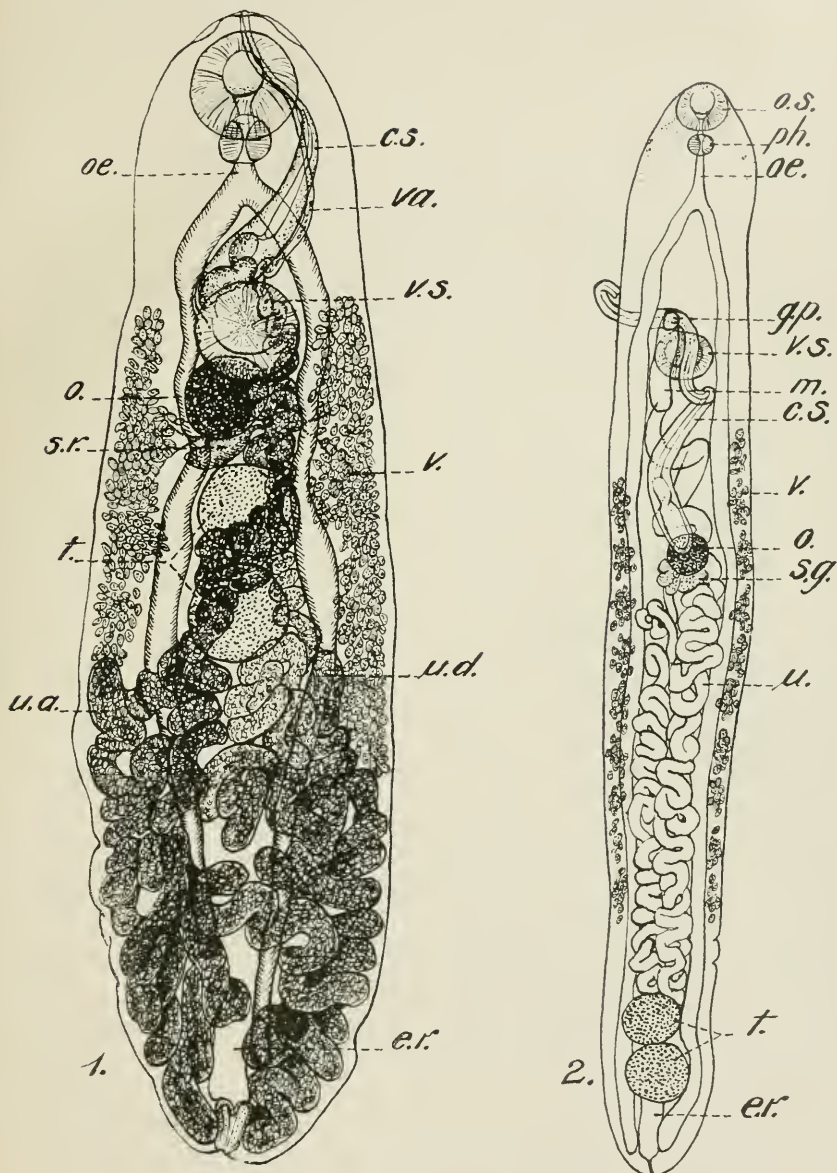
- FIG. 1. *Cephalogonimus amphiumac.* new species, ventral view. $\times 34$.
 2. *Telorchis stunkardi*, new species, dorsal view. $\times 34$.

PLATE 2.

- FIG. 3. *Megalodiscus americanus*, new species, dorsal view. $\times 34$.
 4. Same, lateral view. $\times 34$.
 5. Cross section of posterior sucker of *Megalodiscus americanus*. $\times 22$.

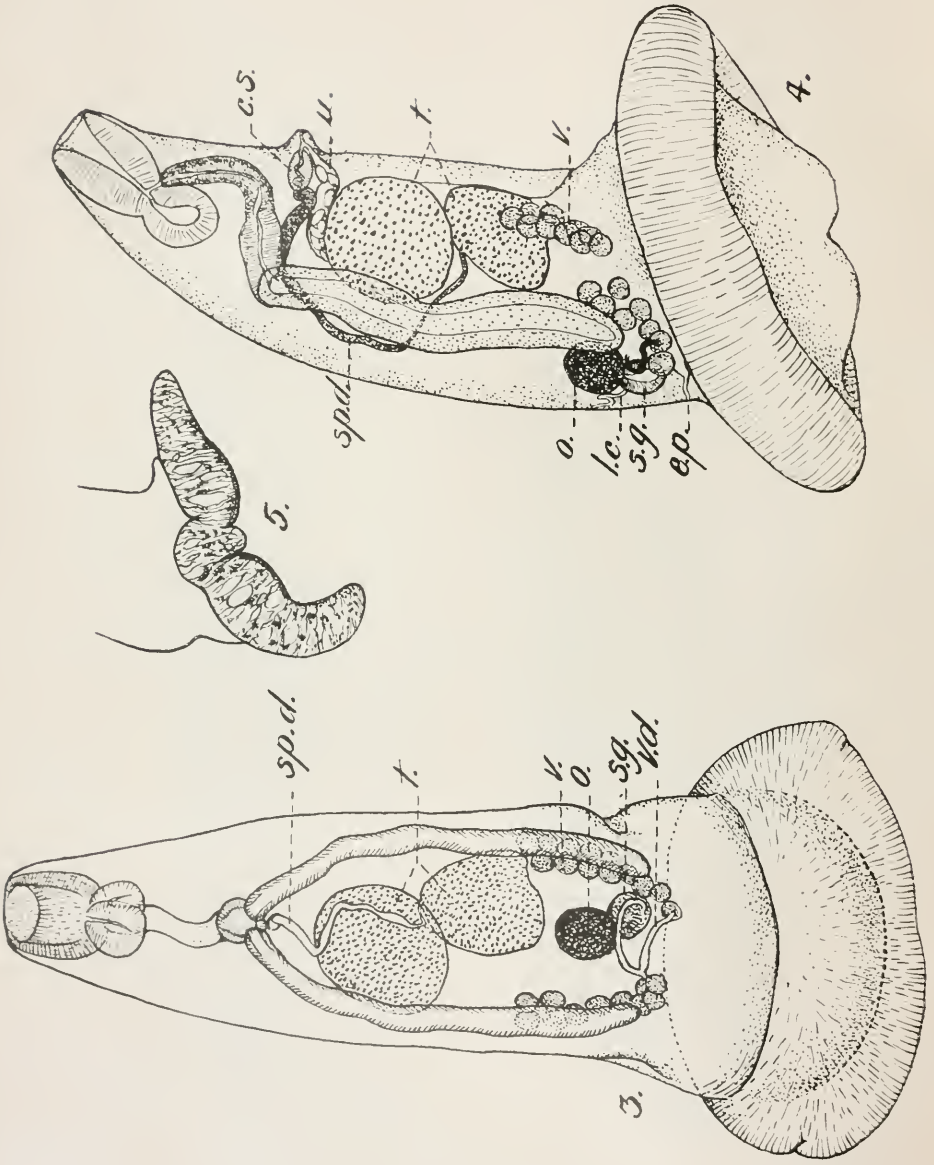
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NEW TREMATODES FROM AMPHIUMA MEANS.

FOR EXPLANATION OF PLATE SEE PAGE 7.



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