

FOUR ECHINOSTOME TREMATODES FROM LOUISIANA BIRDS INCLUDING THE DESCRIPTION OF A NEW SPECIES*

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In connection with life history studies of trematodes encysted in Louisiana crayfishes and poeciliid fishes, various birds and mammals were collected and examined for trematodes at the Goodhope oil field, near Norco, Pass Manchac, and Grand Terre Island, Louisiana. Trematodes from some mammals in the Goodhope oil field have been reported in another paper (Lumsden and Zischke, 1961). The Goodhope and Pass Manchac localities are cypress-tupelo swamps bordering the southern and western shores of Lake Pontchartrain respectively. The Goodhope oil field is located approximately 20 miles west of New Orleans, Louisiana, on U.S. Highway 61; Pass Manchac, on Louisiana Highway 51, 15 miles north of LaPlace, Louisiana, at the junction of Lake Pontchartrain and Lake Maurepas. Grand Terre Island lies approximately one mile east of Grand Isle, Louisiana, in the Gulf of Mexico.

A single adult trematode of the genus *Patagifer* Dietz, 1909, was recovered from the intestine of an ibis taken at the Goodhope oil field. Two specimens of the same species, one a preadult and one containing a few immature uterine eggs, were found in the intestine of another ibis collected at Pass Manchac. These three specimens apparently represent a new species of *Patagifer*, for which the name *Patagifer vioscai* is proposed, in honor of the late Percy Viosca, biologist, Louisiana Wildlife and Fisheries Commission.

Specimens were fixed in aceto-formol-alcohol (AFA) under slight coverslip pressure, stained in Van Cleave's combination-hematoxylin and mounted in piccolyte. Measurements cited in the diagnosis of *P. vioscai* were taken from the holotype and are given in millimeters.

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Patagifer vioscai, sp. nov.

(Figures 1 to 4)

Host.—*Eudocimus albus* (Linn.), white ibis.

Location.—Small intestine.

Locality.—Goodhope oil field, near Norco, and Pass Manchac, Louisiana.

Holotype.—U.S. Nat. Mus. Helm. Coll. No. 39099.

Diagnosis.—*Patagifer*: Body elongate 8.567 long and 1.699 wide at level of acetabulum. Forebody 1.381 long. Anterior and posterior ends of body and sides of forebody curved ventrally; sides of hindbody parallel, posterior end of body tapering abruptly to a prominent conical tip. Cuticle rugate, spinose to posterior margin of acetabulum. Circumoral collar well developed, 1.557 wide, distinctly bilobed by dorsal and ventral indentations, bearing a total of 52 to 56 stout, tapered spines. Twenty-three to 25 crown spines arranged in single marginal row on each collar lobe; three spines on corner of each collar lobe not in series with marginal row crown spines; 1 pair of spines on each ventromedial corner distinctly posterior to marginal row crown spines. Ventral corner spines largest, 0.154 to 0.166 long by 0.041 to 0.047 wide; ventro-lateral marginal spines 0.128 long by 0.034 wide; lateral marginal spines 0.100 to 0.115 long by 0.031 to 0.034 wide; dorsal marginal spines 0.065 to 0.090 long by 0.014 to 0.022 wide. Cuticle extending out along sides of each spine from base to apex, forming a continuous web. Oral sucker subterminal, 0.142 long by 0.230 wide. Prepharynx short, pharynx in contact with oral sucker in holotype. Pharynx larger than oral sucker, 0.243 long by 0.230 wide. Esophagus 0.496 long. Ceca two, one on each side of body, bifurcating just anterior to fore margin of acetabulum, terminating blindly near posterior extremity. Acetabulum protruding ventrally in anterior third of body, 1.451 long by 1.522 wide. Sucker ratio approximately

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1:7. Genital pore median, immediately pre-acetabular and posterior to cecal bifurcation, followed by shallow genital atrium. Testes intercecal, tandem, in middle third of body, elongate with irregular margins; anterior testis 0.602 long by 0.333 wide; posterior testis almost in contact with anterior testis, 0.708 long by 0.333 wide. Cirrus sac curved, dorsal to acetabulum, extending 0.512 behind genital pore, inserting into right side of genital atrium; posterior two thirds of sac containing large seminal vesicle; anterior third containing prostatic gland cells; cirrus not observed. Ovary mesial, equatorial, pretesticular, 0.486 long by 0.409 wide, separated from anterior testis by oval Mehlis' complex. Mehlis' complex 0.281 long by 0.307 wide. Laurer's canal opening dorsally on midline of body at level of Mehlis' complex. Uterus arising ventrally from Mehlis' complex, enlarged proximally as a *receptaculum seminis uterinum*, then turning anteriorly; uterine coils in transverse loops between level of ovary and hind margin of acetabulum, distally forming weakly differentiated metraterm lying sinistral to cirrus sac and perforating left side of genital atrium. Eggs 0.084 to 0.112 long by 0.050 to 0.064 wide. Vitelline follicles extending from posterior margin of acetabulum to posterior end of body, lateral to or overlapping ceca on ventral surface, nearly confluent on dorsal surface of body. Excretory vesicle elongate, Y-shaped, bifurcating midway between posterior margin of hind testis and posterior end of body. Collecting tubules ascending one on each side of midline mesial to ceca to midlevel of acetabulum where they are no longer observable. Excretory pore subterminal, dorsal.

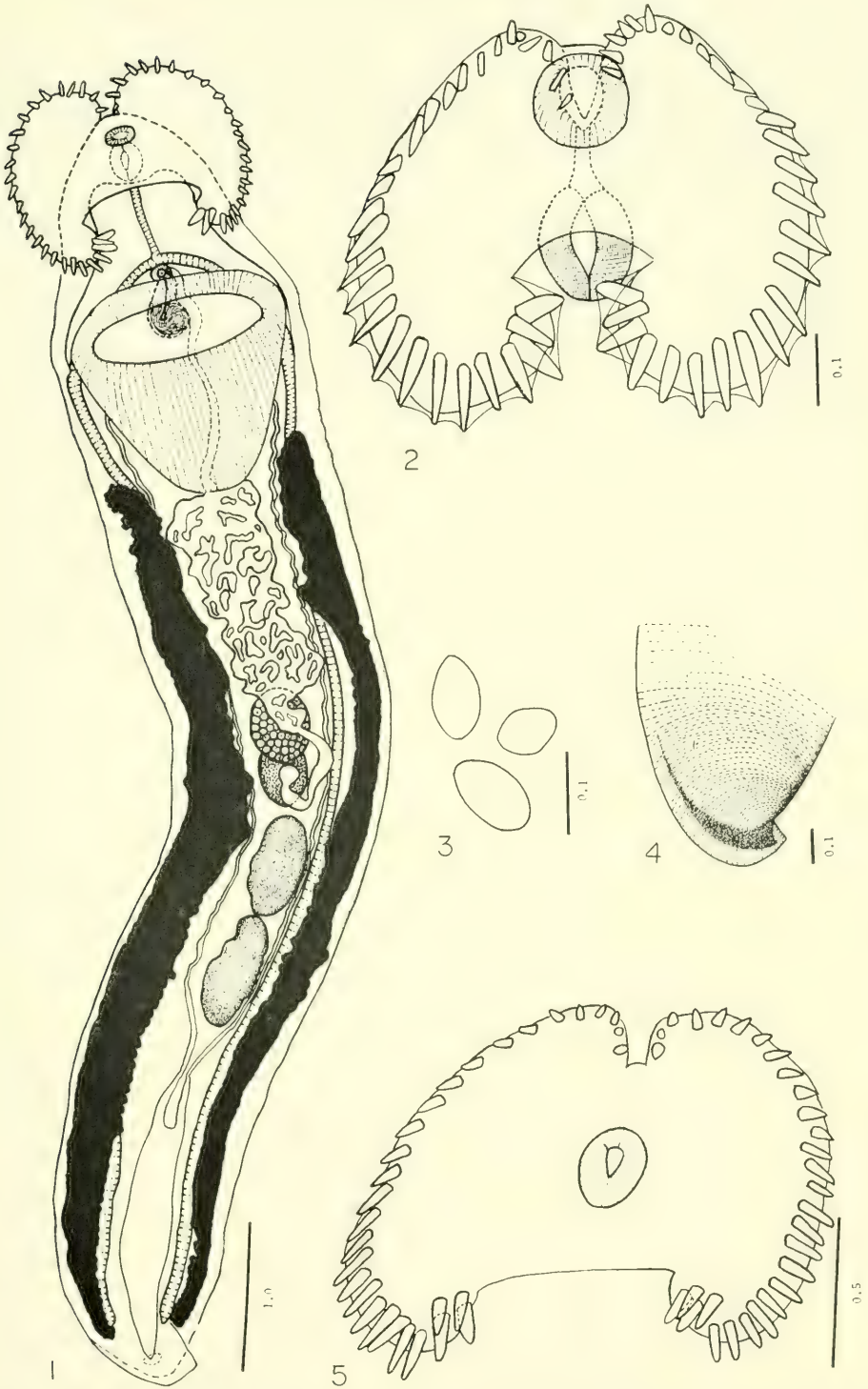
Discussion.—*Patagifer vioscai* is the tenth species of the genus to be described, and is the first record of *Patagifer* from North America. *P. acuminatus* Johnston, 1917, and *P. fraternus* Johnston, 1917, are indigenous to Australia; *P. bilobus* (Rud., 1819) Dietz, 1909, the type species, has been reported from Europe, Africa, and Australia; *P. consimilis* Dietz, 1909, from Brazil; *P. parvispinosus* Yamaguti, 1933, from China and Japan; *P. sarai* Saksena, 1957, *P. simarai* Nigam, 1944, and *P. wesleyi* Verma, 1936, from India; and *P. skrjabini* Hilmy, 1949, from Egypt.

Egrets, *Casmerodius albus* (Linn.), and boat-tailed grackles, *Cassidix mesamexicanus*

(Gmelin), collected at Pass Manchac were found uninfected with *P. vioscai*, although another echinostome, *Echinostoma revolutum* (Froelich, 1802) Looss, 1899, was recovered from one of the latter hosts. Sogandares-Bernal (personal communication) collected *E. albus* in Florida, but did not recover *Patagifer* from these ibises.

P. vioscai most closely resembles *P. bilobus*, differing from this and other species of the genus primarily in the arrangement of the crown spines. Dietz (1910) noted that the number of crown spines on one side of the collar varied from 26 to 29 in *P. bilobus*. Mendheim (1940) reported that, in one specimen of *P. bilobus* examined, there were 27 spines on each collar lobe, but, in another specimen, there were 27 spines on one side and 26 spines on the other. Odhner (1911) observed a difference of 3 or 4 spines on either side of the collar in some specimens of *P. bilobus*. Dr. Emile A. Malek, of the Tulane School of Medicine, has kindly provided the author with a specimen of *P. bilobus* from the sacred ibis in Egypt. This specimen possesses a total of 58 crown spines (29 on each collar lobe). The holotype of *P. vioscai* bears 26 spines on the left collar lobe and 27 on the right; no scars, possibly indicating loss of spines, were observed. The paratypes possess 28 spines on each half of the collar. In *P. bilobus* there are four spines arranged in overlapping pairs on each ventral corner of the collar not in series with but anterior to the marginal row of crown spines. In *P. vioscai*, however, there are only three spines on each corner not in series with the marginal spines; two of the former are posterior to the marginal row. In *P. bilobus* the ventral marginal spines are larger than the corner spines; in *P. vioscai* the ventral corner spines are larger than the ventro-lateral spines of the marginal row. In addition to the arrangement of the crown spines, *P. vioscai* differs from *P. bilobus* in having a pharynx larger than the oral sucker and a sucker ratio of 1:7, in contrast to a sucker ratio of 1:4 in the latter species. The forebody of *P. vioscai* appears to be somewhat longer than the forebody of *P. bilobus*. The ratio of forebody: hindbody in *P. vioscai* is 1:5.2; in *P. bilobus*, 1:6.6 to 7.2 (as computed from data reported by Dietz (1910)).

P. acuminatus and *P. fraternus*, with 25 and 28 spines respectively on each collar



Figures 1-5. 1. *Patagifer vioscai*, sp. nov. ventral view of whole mount. 2. Same, ventral view of crown collar. 3. Same, uterine eggs. 4. Same, posterior end of body. 5. *Patagifer bilobus*, ventral view of crown collar. Figure 1 drawn with the aid of a microprojector, Figures 2-5 with a Leitz camera lucida. Projected scales have the value indicated in millimeters.

lobe, differ from *P. vioscai* in the position of the genital pore, which is anterior to the cecal bifurcation in those two species. There are three corner spines in *P. accuminatus* and four in *P. fraternus*. *P. consimilis* bears 26 to 29 relatively small spines, arranged as in *P. bilobus*, on each side of the collar. The collar of *P. consimilis* is considerably narrower than the body, which is spindle-shaped, the oral sucker is larger than the pharynx, and the sucker ratio is approximately 1:4. *P. parvispinosus* has 26 spines on each half of the collar, with four spines in two oblique rows on each ventral angle not in series with the marginal spines. The cuticle is entirely smooth (spinose to the posterior margin of the acetabulum in *P. vioscai*) and the acetabulum is four times larger than the oral sucker. *P. skrjabini* bears 20 marginal and 5 corner spines on each side of the collar. *P. wesleyi* possesses a total of 60 to 62 crown spines. Nigam (1944) distinguished *P. simarai* from *P. bilobus* on the position of the cirrus sac, which in *P. simarai* lies in front of, not overlapping, the fore margin of the acetabulum. Saksena (1957) separated *P. sarai* from *P. bilobus* on the basis that the cirrus sac was "only partly overlapped by the ventral sucker" in the former species. *P. bilobus*, *P. simarai* and *P. sarai* do not appear to differ significantly in any other respect. *P. simarai* possesses 27 spines on each collar lobe; *P. sarai*, 30. Some variation in the relative position of the cirrus sac and acetabulum was noted in specimens of *P. vioscai*, apparently due to twisting of the forebody and degree of curvature of the cirrus sac. *P. sarai* and *P. simarai* are probably synonyms of *P. bilobus*.

Himasthla alincia Dietz, 1909
(Figures 6 to 8)

Host.—*Totanus flavipes* (Gmelin), lesser yellowlegs, [new host record].

Location.—Small intestine.

Locality.—Grand Terre Island, Louisiana, [new locality record].

Diagnosis.—based on 4 mature specimens)—*Himasthla*: Body elongate, 18.266 to 20.532 long. Maximum width of body at level of anterior testis, 0.390 to 0.531; width at level of acetabulum 0.354 to 0.425. Forebody 0.461 to 0.743 long. Cuticle spinose to level of acetabulum. Circumoral collar 0.248 to 0.319 wide, bearing a total of 28

to 31 spines; 20 to 23 spines arranged in single dorsally uninterrupted marginal row; 4 spines in overlapping pairs on each ventral corner. Posterior corner spines largest, 0.050 to 0.053 long by 0.014 to 0.017 wide; anterior corner spines 0.034 to 0.039 long by 0.011 wide; marginal spines 0.041 to 0.047 long by 0.008 to 0.014 wide. Oral sucker subterminal, 0.070 to 0.100 long by 0.062 to 0.065 wide. Prepharynx 0.041 to 0.098 long. Pharynx 0.090 to 0.098 long by 0.065 to 0.084 wide. Esophagus 0.192 to 0.205 long. Ceca two, one on each side of the body, bifurcating just anterior to foremargin of acetabulum, terminating blindly near posterior extremity. Acetabulum 0.307 to 0.333 long by 0.256 to 0.307 wide. Sucker ratio approximately 1:3. Genital pore median, immediately preacetabular and posterior to cecal bifurcation. Testes tandem, intercecal, near posterior end of body, oval with smooth margins; anterior testis 0.743 to 0.779 long by 0.283 to 0.354 wide; posterior testis 0.089 to 0.204 behind anterior testis, 0.708 to 0.850 long by 0.283 to 0.390 wide. Cirrus sac elongate, dorsal to acetabulum, 2.042 to 2.148 long by 0.112 to 0.153 wide at base, containing seminal vesicle, prostate gland cells and spined cirrus. Ovary mesial or slightly dextral to midline, 0.166 to 0.192 long by wide. Mehli's gland between ovary and fore margin of anterior testis, 0.205 to 0.269 long by wide. Laurer's canal opening on dorsal surface of body at level of Mehli's gland. Uterus arising at Mehli's complex, ascending in transverse coils between vitellaria, becoming straighter anteriorly. Metraterm dorsal to cirrus sac, entering genital atrium anterior to male duct. Eggs 0.103 to 0.123 long by 0.065 to 0.078 wide. Vitelline follicles lateral, extending from a point 6.407 to 8.531 posterior to hind margin of cirrus to near posterior end of body. Excretory pore terminal.

Discussion.—*Himasthla* spp. are usually parasites of sandpipers (Scolopacidae), though gulls, herons and oystercatchers have also been reported as hosts for certain members of this genus. A single case of human parasitism was reported by Vogel (1933), who described *H. mueblensi* from the feces of the host. Reports of *Himasthla* from fishes (*H. tensa* Linton, 1928, *H. annulata* (Diesing, 1850) and *H. piscicola* Stunkard, 1960) probably represent accidental or incidental infections.

Various pelecypods serve as second intermediate hosts for these echinostomes. Stunkard (1934) exposed *Mya arenaria*, *Mytilus edulis*, *Modiola modiolas*, *Cumingia tellinoides*, *Pecten irradians*, *Ensis americana* and *Crepidula fornicata* to cercariae of *H. quissetensis* (Miller and Northrup, 1926) Stunkard, 1938. Metacercariae obtained from the gills, foot and mantle of each of these experimental hosts were fed to laboratory raised gulls, in which the worms developed to maturity. *H. ambigua* Palombi, 1934, was described from metacercariae encysted in *Tapes decussatus* from the Gulf of Naples. Lebour (1907) reported metacercariae of *H. secunda* Dietz, 1909, in *Mytilus*, sp., as did Palombi (1925). Stunkard (1960) reported that *Mya arenaria* harbors the metacercariae of *H. compacta* Stunkard, 1960. In Vogel's (1933) report of human parasitism by *H. mueblensi*, the suspected vector was the edible clam, *Venus morienaria*. Eight species of *Himasthla* have been reported from North America: (1) *H. compacta* Stunkard, 1960; (2) *H. elongata* (Mehlis, 1831) Dietz, 1909; (3) *H. incisa* Linton, 1928; (4) *H. mcintoshi* Stunkard, 1960; (5) *H. mueblensi* Vogel, 1933; (6) *H. quissetensis* (Miller and Northrup, 1926) Stunkard, 1938; (7) *H. tensa* Linton, 1940, reported from *Gadus morrhua* at Woods Hole, Massachusetts, was suppressed as a synonym of *H. elongata* by Stunkard (1960); (8) *H. alincia*, until just recently known only from Brazil, has been reported from Massachusetts by Stunkard (1960).

H. alincia most closely resembles *H. rhigedana* Dietz, 1909, *H. mcintoshi* Stunkard, 1960, and *H. leptosoma* (Creplin, 1829) Dietz, 1909. In these three species the vitellaria are present only in the posterior two-thirds of the body, whereas in other species of *Himasthla* the vitelline follicles extend to the level of the cirrus sac. The length of the cirrus sac distinguishes *H. alincia* from *H. leptosoma* and *H. rhigedana*. The cirrus sac in *H. alincia* is 6 to 7 times longer than the acetabulum, compared with a cirrus sac only 2 to 3 times as long as the acetabulum in *H. leptosoma* and *H. rhigedana*. *H. mcintoshi* possesses 35 crown spines 28 to 31 in *H. alincia* and the cirrus sac is tightly coiled, extending behind the acetabulum a distance approximately equal to the diameter of the ventral sucker.

Dietz (1910) described *H. alincia* as

bearing a total of 31 crown spines. Some specimens recovered from Louisiana sandpipers possessed only 28 spines, and all of the worms were larger (mean length 19.301) than Dietz's material (10.5 long) from *Ereunetes (Tringa) pusilla* in Brazil. Dietz did not describe the cirrus in the type material, which in the Louisiana specimens is covered with small, closely set spines.

Stephanoprora denticulata (Rud., 1802)

Odhner, 1910

(Figure 9)

Host.—*Thalasseus maximus* (Boddaert), royal tern, [new host record].

Location.—Small intestine.

Locality.—Grand Terre Island, Louisiana, [new locality record].

Discussion.—Linton (1928) reported specimens identified as *Mesorchis psuedoechinatus* (Olsson), actually *S. denticulata*, from *Larus argentatus*, *L. atricilla*, *L. delawarensis*, *L. marinus*, *L. philadelphia*, *Colymbus auritus*, *C. holbolli* and *Gavia immer* at Woods Hole, Massachusetts. Price (1932) reported *S. denticulata* from a California sea lion, *Zalophus californianus*, which had died in the National Zoological Park (Washington, D.C.). Hutton and Sogandares-Bernal (1960) recovered a single specimen of *S. denticulata* from *Larus argentatus smithsonianus* in Florida.

Echinostoma revolutum (Froelich, 1802)

Looss, 1899

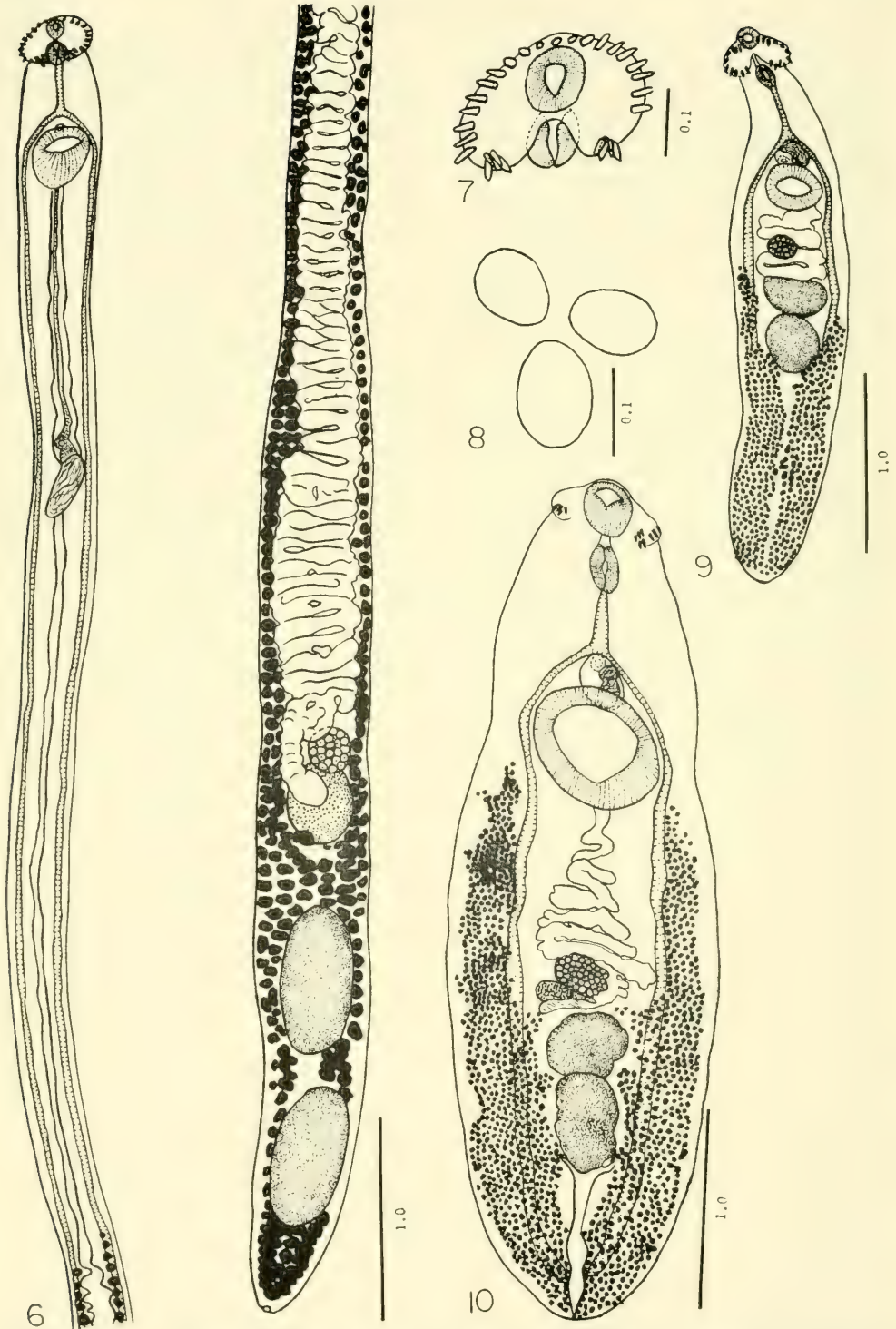
(Figure 10)

Host.—*Cassidix mesamexicanus* (Gmelin), boat-tailed grackle [new host record].

Location.—Small intestine.

Locality.—Pass Manchac, Louisiana.

Discussion.—One of three boat-tailed grackles, *Cassidix mesamexicanus*, collected at Pass Manchac, Louisiana, was infected with 24 *E. revolutum*. Most of these worms were sexually mature. The posttesticular portion of the body in these specimens appears shorter than normal for *E. revolutum*, but the worms agree in all other respects with the diagnosis by Beaver (1937) for this species. *E. columbae* Zunker, 1925, (which according to Beaver (1937) is a synonym of *E. revolutum*) similarly possesses a short posttesticular region. Morphological variation, particularly in body size and shape, apparently can be induced by such factors as host species and host diet.



Figures 6-10. 6. *Himasthla alincia*, ventral view of whole mount, showing anterior and posterior ends of body. Portion of midbody omitted. 7. Same, ventral view of crown collar. 8. Same, uterine eggs. 9. *Stephanoprora denticulata*, ventral view of whole mount. 10. *Echinostoma revolutum*, ventral view of whole mount. All drawings made with the aid of a Leitz camera lucida. The projected scales have the value indicated in millimeters.

Lumsden and Zischke (1961) observed reduction of the hindbody in some specimens of *Rhopalias macracanthus* Chandler, 1932, recovered from a heavily infected opossum, possibly attributable to abnormal location of the worms in the host's intestine imposed by overcrowding. Furthermore, artifacts may be produced in fixation. Body shape may also be dependent on the age of the worm. The author concurs with Beaver (1937) that the arrangement of the collar spines is the most reliable diagnostic character for members of this group of trematodes. Specimens recovered from Louisiana *Cassidix mesamexicanus* bear a total of 37 crown spines, the arrangement of which corresponds to that typically found in *E. revolutum*: 5 spines on each corner of the collar, 6 spines on each lateral margin and 15 alternating spines on the dorsal surface.

Babero and Lee (1961) reported Louisiana nutria, *Myocastor coypus*, infected with *E. revolutum*, adding that snails, *Heliosoma* sp., were occasionally found in the intestines of these hosts. One of eight *Heliosoma trivolvis* *lentum* collected by the author at Pass Manchac released echinostome cercariae closely resembling the cercaria of *E. revolutum* as described by Beaver (1937). Beaver (1937) noted that *H. trivolvis* could serve as both first and second intermediate host for *E. revolutum*.

SUMMARY

Patagifer vioscai, n. sp., from the white ibis, *Eudocimus albus*, appears distinct from other members of the genus primarily in the arrangement of the crown spines. The new species constitutes the first record of *Patagifer* from North America.

Himasthla alincia, formerly known only from *Ereunetes pusilla* in Brazil and Massachusetts, is reported from Louisiana lesser yellowlegs, *Totanus flavipes*. The original description of this echinostome is amended to include variation in the total number of crown spines (28 to 31) and a spined cirrus.

Stephanoprora denticulata is reported for the first time from Louisiana. Its occurrence in the royal tern, *Thalasseus maximus*, is a new host record for this trematode.

Echinostoma revolutum was recovered from a boat-tailed grackle, *Cassidix mesamexicanus*, a new host record. *Heliosoma trivolvis* *lentum* may serve as both a primary

and secondary host for *E. revolutum* in Louisiana.

ABSTRACT

Patagifer vioscai, n. sp., from the white ibis, *Eudocimus albus* (Linn.), is described. *Himasthla alincia* Dietz, 1909, and *Stephanoprora denticulata* (Rud., 1802) Odhner, 1910, are reported for the first time from Louisiana. New host records include *S. denticulata* in the royal tern, *Thalasseus maximus* (Boddaert), *H. alincia* in the lesser yellowlegs, *Totanus flavipes* (Gmelin), and *Echinostoma revolutum* (Froelich, 1802) Looss, 1899, in the boat-tailed grackle, *Cassidix mesamexicanus* (Gmelin). The original description of *H. alincia* is amended.

REFERENCES CITED

- BABERO, B. B. and LEE, J. W. 1951. Studies on the helminths of nutria, *Myocastor coypus* (Molina), in Louisiana with checklist of other worm parasites from this host. *J. Parasitol.* 47: 378-390.
- BEAVER, P. C. 1937. Experimental studies on *Echinostoma revolutum* (Froelich) a fluke from birds and mammals. *Illinois Biol. Monographs* 15: 1-96.
- DIETZ, E. 1910. Die Echinostomiden der Vögel. *Zool. Jahrb. (supp.)* 12:265-512.
- HUTTON, R. F. and SOGANDARES-BERNAL, F. 1960. Studies on the helminth parasites from the coast of Florida. II. Digenetic trematodes from shore birds of the west coast of Florida. 1. *Bull. Mar. Sci. Gulf and Carib.* 10: 40-54.
- LEBOUR, M. V. 1907. Some trematodes in *Mytilus*. *Proc. Univ. Durham Philosophical Soc.* 2: 231-238.
- LINTON, E. 1928. Notes on trematode parasites of birds. *Proc. U. S. Nat. Mus.* 73: 1-36.
- LUMSDEN, R. D. and ZISCHKE, J. A. 1961. Seven trematodes from small mammals in Louisiana. *Tulane Stud. Zool.* 9: 87-98.
- MENDHEIM, H. 1940. Beiträge zur Systematik und Biologie der Familie Echinostomatidae (Trematoda). *Nova Acta Leopoldina* 8: 489-588.
- NIGAM, V. V. 1944. New trematodes of the family Echinostomatidae Poche, 1925. (Part III.) Genus *Patagifer*. *Allahabad Univ. Stud. Sect. Biol.* 9-13.
- ODHNER, T. 1911. Nordostafrikanische Trematoden grossenteils von Weissen Nil von der Schwedischen Zoologischen Expedition gesammelt. *Res. Swedish Zool. Exp. Egypt and White Nile IV.* 1-70.
- PALOMBI, A. 1925. Di un nuovo ospitatore della cercaria dell *Echinostomum secundum* Nicoll, 1906: *Mytilus galloprovincialis* Lamk. *Boll. Soc. Nat. Napoli* 36: 49-51.

- PRICE, E. W. 1932. The trematodes of marine mammals. *Proc. U. S. Nat. Mus.* 81: 1-68.
- SAKSENA, J. N. 1957. Studies on a new species of the genus *Patagifer* Dietz, 1909 (Trematoda: Echinostomatidae). *Proc. Natl. Acad. Sci. India Sec. B.* 27: 265-268.
- STUNKARD, H. W. 1934. The life history of *Himasthla quissetensis* (Miller et Northrup, 1926). *J. Parasitol.* 20: 336.
- 1960. Further studies on the trematode genus *Himasthla* with descriptions of *H. mcintoshi* n. sp., *H. piscicola* n. sp., and stages in the life history of *H. compacta* n. sp. *Biol. Bull.* 119: 529-549.
- VOGEL, H. 1933. *Himasthla muehlensi* n. sp. ein neuer menschlicher Trematode der Familie Echinostomidae. *Ctbl. Bakt. I.* 127: 385-391.